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2009 F2E Work Plan
Food-Waste to Energy Facility Predesign

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Prepared for

Central Marin Sanitation Agency
1301 Anderson Drive
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K/J Project No. 0968013*01

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Executive Summary

In early 2009, a Methane Capture Feasibility Study (Feasibility Study) was completed by Kennedy/Jenks Consultants for the City of San Rafael and CMSA. The study analyzed whether food waste could be cost-effectively diverted from the Redwood Landfill and screened and fed to the existing anaerobic digesters at the CMSA wastewater treatment plant to produce extra digester biogas. The premise was that the savings from diverting the food waste from the landfill, and the additional electricity produced from the digester biogas would pay for the improvements needed to accomplish this. The community also benefits from this by diverting solid waste from the landfill and reducing greenhouse gas (GHG) emissions. The Feasibility Study indicated that it would be cost-effective, and therefore CMSA developed the 2009 F2E Work Plan to move forward with further analyses of this project.

The F2E Work Plan included a task for the predesign of the Food-Waste to Energy Facility, which is described in this report. In general, the report refines the facilities developed in the Feasibility Study to analyze how they can be incorporated into the CMSA facilities. The report also includes an operations plan for the facilities, and updates the project costs to refine the cost-effectiveness analysis of the project.

Following is a summary of the primary analyses and findings in the report:

- The CMSA digestion and energy recovery system has the capacity to accept at least 15 tons (one truckload) of food waste per day even with only one digester operating, as long as no more than 5000 gallons per day of fats-oils-grease (FOG) is accepted. With two digesters in service, CMSA could accept 15 tons of food waste and still have capacity to accept up to 13,000 gallons per day of FOG. Overall, when two digesters are in service, the energy recovery system limits the capacity to 17,000 gallons of FOG or 57 tons of food waste.
- The two digesters have excess capacity to accept up to 31,000 gallons per day of FOG, or 103 tons per day of food waste. To take advantage of this capacity, the energy recovery system would need to be expanded.
- If installed, the preferred location of the food waste facility is in the vicinity of the digesters, near the proposed FOG receiving facility.
- Three food waste facility alternatives were developed and analyzed; a separate food waste facility, an expansion of the proposed FOG facility to accept food waste, and modification of the FOG facility to accept food waste.
- A cost-effectiveness analysis of the alternatives indicated that modifying the proposed FOG facility to accept food waste in addition to FOG was most cost-effective, with a likely simple payback of less than 2 years. Key variables in the analysis are the tipping fee that CMSA will charge to accept the food waste and the cost of natural gas. For the analysis, these were estimated at $20/wet ton and $1/therm respectively.

The predesign also included several analyses related to the project. Following are the findings from these analyses.

- The impact of the food waste facility on the existing facilities was reviewed, and the interconnection elements were identified. The cost of the interconnection elements is included in the capital cost of each alternative.

- Food waste addition will have no noticeable impact on the treatment processes to remove hydrogen sulfide, siloxane, and moisture from the digester gas.

- The reduction of GHG emissions by diverting food waste from Redwood Landfill was estimated. Assuming 15 tons per day (one truckload) of food waste is diverted; GHG emissions will be reduced by approximately 1578 metric tons per year.

- Potential sources for funding the project were reviewed; however, only one grant funding opportunity was identified at this time. PG&E agreed to contribute $15,000 to the project.

- A review of the California Environmental Quality Act (CEQA) checklist of environmental impacts indicated that the project would likely have no impact on the environment, and a Negative Declaration determination would be appropriate.

The recommended alternative is to modify the FOG facility to accept food waste. The extra incremental cost to design and construct the facility is approximately $180,000, assuming this is completed as part of the Digester Improvements and FOG facility design in a timely fashion.

Section 1: Background

1.1 Introduction

In early 2009, a Methane Capture Feasibility Study (Feasibility Study) was completed by Kennedy/Jenks Consultants for the City of San Rafael and CMSA. The study analyzed whether food waste could be cost-effectively diverted from the Redwood Landfill and screened and fed to the existing anaerobic digesters at the CMSA wastewater treatment plant to produce extra digester biogas. The premise was that the savings from diverting the food waste from the landfill, and the additional electricity produced from the digester biogas would pay for the improvements needed to accomplish this. The community also benefits from this by diverting solid waste from the landfill and reducing greenhouse gas (GHG) emissions. The Feasibility Study indicated that it would be cost-effective, and therefore CMSA developed the 2009 F2E Work Plan to move forward with analyses of this project. The F2E Work Plan consists of three primary tasks:

- Outreach and Education Related to the Project
- Predesign of the Food-Waste to Energy Facility
- CEQA and Permit Review

The predesign of the Food-Waste to Energy Facility is described in this report. In general, the report refines the facilities developed in the Feasibility Study to analyze how they can be incorporated into the CMSA facilities. The report also includes an operations plan for the facilities, and updates the project costs to refine the cost-effectiveness analysis of the project.

The predesign of the Digester Improvements and FOG Facility (Digester/FOG Predesign) was included in the F2E Plan to ensure that any improvements would be coordinated with the potential Food-Waste to Energy Facility. With proper coordination, it's believed that the digester improvements can be designed for handling the potential addition of fats-oil-grease (FOG) and processed food waste (F2E project) at no additional expense to CMSA. The Digester/FOG Predesign reviewed and identified the improvements needed to rehabilitate the anaerobic digester components to ensure that this coordination occurs and was completed in December 2009.

1.2 Background

The Central Marin Sanitation Agency (CMSA) has included a project in its CIP to rehabilitate its anaerobic digesters to preserve their ability to reliably stabilize the treatment plant sludge, improve process reliability and increase energy efficiency. This rehabilitation is anticipated to include a new mixing system, rehabilitation or replacement of the covers, and replacement and/or improvement of a variety of appurtenant equipment, and ancillary improvements.

The existing anaerobic digester system was installed in 1984. The operational environment is harsh on equipment and structures in that it consists of corrosive conditions and handling of sludge that contain grit. Consequently major maintenance of the system is often needed after

20 years to cost-effectively preserve the long term ability of the system to perform reliably. The purpose of Digester/FOG predesign was to identify the major maintenance and/or improvements needed to achieve this. In addition, this predesign develops the improvements needed to add FOG to the digesters so that all the improvements are cost-effectively coordinated. Since CMSA will be adding FOG, and is considering adding food waste to the digesters, the predesign of the potential food waste facility needs to be completed now to identify the impact of this facility on the digester system. This will allow the digester improvements to be refined as needed to ensure that digesters have the capability to handle FOG and the potential food waste addition.

1.3 Acknowledgements

This report was prepared by Kennedy/Jenks Consultants, with contributions from project team members who are listed below.

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Section 2: System Capacity for Food Waste and FOG

2.1 Background

The Feasibility Study concluded that the CMSA digesters have the capacity to accept 15 tons per day of food waste and 1425 gallons per day of FOG. The Digester/FOG Predesign Report refined the analysis of the Feasibility Study and concluded that existing digestion and energy recovery system has the capacity to handle 17,000 gallons per day of FOG with two digesters in service and no change in the digester operating level.[1] Based on this, the report recommended the construction of a FOG receiving tank that could store this volume to match the capacity of the digestion and energy recovery system. If 17,000 gallons per day of FOG is not available, then the digestion and energy recovery system has capacity to accept food waste as well as FOG. This section of the report reviews the capacity of the digestion and the energy recovery system to handle FOG and food waste.

2.2 Digester and Energy Recovery System Capacity

The capacity of the digesters to process wastewater solids and FOG addition, and potentially food waste, is based on the volatile solids capacity of the digesters and the hydraulic retention time in the digesters. In addition, the Energy Recovery System (digester gas treatment and compression and cogeneration) has a maximum capacity to handle gas produced from the digestion process in its current configuration. If the digesters produce more gas than the current Energy Recovery System capacity, it would trigger the need for expensive capacity improvements to utilize the additional gas generated. The excess gas could be flared; however, this would waste the energy content of the gas. Following is a description of the capacities of each of these components.

2.2.1 Volatile Solids Capacity of the Digesters

The volatile solids loading rate for wastewater solids for a well heated, well-mixed digester ranges from 0.10 to 0.20 pounds of volatile solids/cubic foot/day (#VS/cf/day)[2]. The loading of food waste to digesters can be as high at 0.53 #VS/cf/day.[3] Based on this information, we have selected 0.20 #VS/cf/day as the design volatile solids loading rate. In our opinion, this is a conservative loading rate for the blend of wastewater solids and FOG, and potentially food waste because FOG and food waste have a higher fraction of solids that can be effectively digested. This assumes that the digester heating system is working well as reported by CMSA staff, and that a new digester mixing system will be installed as recommended in the Digester/FOG Predesign Report. Overall, this loading rate will allow CMSA to achieve a minimum of 38% volatile solids reduction to maintain its Class B reuse options. As shown in Table 2-1, the digestion system has the following capacities with the existing side water depth (SWD) of 26 feet:

[1] This limitation is based on the capacity of the existing energy recovery system. If the energy recovery system is expanded, then the capacity could be increased to 31,000 gallons per day of FOG, which is the digester capacity.

[2] WEF Manual of Practice 8, 1998

[3] EPA Region 9 Report on “Anaerobic Digestion of Food Waste”, Gray, etc. March 2008

Table 2-1 Volatile Solids (VS) Capacity of the Digesters

Number of Digesters	Side Water Depth (ft)	VS Capacity (#/day)	Gas Production (cf/day)
Existing Sludge Level Operation			
1	26	30,140	294,000
2	26	60,280	588,000

2.2.2 Hydraulic Retention Time in the Digesters

The U.S. Environmental Protection Agency (EPA) 503 regulations for Class B biosolids are based on a Time/Temperature relationship that corresponds with pathogenic organism deactivation. The second criterion, required retention time for Class B biosolids, is 15 days at 95^{o}F. As shown in Table 2-2, the digesters have excess hydraulic retention time at the projected future wastewater solids flow of 55,500 gallons per day with the current side water depth of 26 feet. This excess capacity is sufficient to allow the addition of 19,000 gallons per day of FOG or 79 tons of food waste while still maintaining a 15 day retention time with only one digester in service.

Table 2-2 Hydraulic Retention Time (26 Ft SWD)

	Hydraulic Retention Time (days)	
Loading Condition (Existing Side Water Depth of 26 feet)	1 Digester	2 Digesters
Future WW Solids only (55,000 gpd)[1]	20	40
With FOG (19,000 gpd)	15	30
With Food Waste (79 tons)	15	30

1. Total solids loading to the digesters was an average of 50,500 gpd from July 2007 to June 2008. Assuming a 0.5% growth rate, the loading in 20 years will be approx. 55,000 gpd.

2.2.3 Energy Recovery System Capacity

The digester gas is treated and compressed prior to delivery to the cogeneration system. The primary treatment components include iron sponges, a gas dryer, and siloxane filters and their appurtenances. The capacity of these components is approximately 260 cfm, or 374,400 cf/day. This flow rate closely matches the reported and theoretical gas consumption rate of the 750 kW cogeneration engine. If digester gas is produced at a rate higher than this when storage is at capacity, then the excess gas will be flared. Therefore, the increased loading from FOG and potentially food waste needs to be controlled to prevent digester gas production from exceeding this system capacity when gas storage is at capacity. While the capacity of the digester gas treatment, compression, cogeneration systems can be increased, the funding for this is currently not in the capital improvement program. However, the economics of increasing energy recovery system capacity can be revisited in the future based on the success of the waste resource recovery program.

An additional consideration is that the plant energy consumption averaged 600 kW between July 2007 and December 2008. Therefore, if CMSA produces more than 600 kW with the cogeneration system, it loses some power production benefits unless it can export the excess power to PG&E. Without exporting, CMSA may wish to limit the digester gas production to approximately 300,000 cf/day; although this is still more than double the current digester gas production rate of 130,000 cf/day. To take full advantage of power production benefits, CMSA staff has initiated discussions with PG&E to review the viability of entering into a net metering agreement. (While the power production benefits currently decrease when producing more than 600 kW, CMSA would realize benefits of increased tipping fees and GHG reduction.)

To determine the level at which the energy recovery system capacity will limit the addition of waste products to the digesters, we estimated the equivalent VS loading to the digesters that will produce the quantity of digester gas that the energy recovery system can handle. Table 2-3 summarizes the capacity of the energy recovery system and the equivalent VS loading for the digester gas capacities.

Table 2-3 Energy Recovery System Capacity

Digester Gas Handling and Equivalent VS Loading

Description (Existing Side Water Depth of 26 feet)	Digester Gas cf/day [(1)]	Equivalent VS Loading (lbs/day)
Current Wastewater Solids Loading	133,000	16,400 [(2)]
Energy Recovery (ER) Capacity	374,000	41,100
Available ER Capacity for FOG and/or food waste	241,000	24,700 [(3)]

Notes:

1. 15 cf of digester gas produced per VS reduced
2. Assumes 54% VS destruction
3. Assumes 65% VS destruction as an average for the blend of FOG, food waste, and wastewater solids.

Based on the above, the energy recovery system can handle an additional 241,000 cf/day of digester gas with its current capacity, which is equivalent to an additional VS load of 24,700 lbs/day to the digesters. This additional VS load is equivalent to adding approximately 17,000 gallons per day of FOG, or approximately 57 tons of food waste per day.

In the following section of the report, we will express the capacity of the Energy Recovery System in terms of VS loading so that it can be easily compared to the VS capacity of the various digester operating conditions to demonstrate which variable will limit how much waste material can be added to the digesters.

2.2.4 Available Capacity

Table 2-4 summarizes the excess VS capacity available for the digesters and the energy recovery system to handle FOG and food waste, after reserving capacity for the current wastewater solids loading. The capacity is listed for the operating conditions with either 1 or 2 digesters in service for a side water depth of 26 feet, which is the current operating level.

Table 2-4 Excess VS Capacity to Accept FOG or Food Waste

Number of Digesters	Excess VS Capacity (lbs/day)	FOG Capacity (gallons/day)	or	Food Waste Capacity (wet tons/day)
Existing Digestion Capacity				
1	13,740	10,000	or	32
2	43,800	31,000	or	103
Energy Recovery System (VS equivalent capacity)				
1 or 2	24,800	17,000	or	57

Table 2-5 summarizes the capacity of the existing system to handle FOG or food waste for the various operating conditions, based on the controlling design variable. Overall, the existing system has plenty of capacity to handle FOG or food waste. As can be seen, the existing system can receive approximately 10,000 gpd of FOG or 32 tons of food waste even with only one digester in service. Next in capacity is the energy recovery system, which has excess capacity to handle the gas produced by approximately 17,000 gallons/day of FOG, or 57 tons/day of food waste. Finally, when two digesters are in service, the capacity to receive FOG increases to 31,000 gallons/day or 103 tons/day of food waste.

Table 2-5 FOG or Food Waste Addition Capacity - Operating Conditions and Design Variables

Operating Condition	Design Variable	FOG Capacity (gallons/day)	or	Food Waste Capacity (wet tons/day)
One digester in service (26 ft SWD)	VS Loading	10,000	or	32
Energy Recovery System	Gas handling capacity	17,000	or	57
One digester in service (26 ft SWD)	Hydraulic Retention Time	19,000	or	79
Two digesters in service (26 ft SWD)	VS Loading	31,000	or	103

2.2.5 Capacity Summary

CMSA has the capacity to accept food waste and FOG even if only one digester is in service. As an example, if CMSA took one 15 ton truckload of food waste per day, it would still have the capacity to accept approximately 5000 gallons per day of FOG. Table 2-6 shows the volume of food waste that CMSA can accept based on varying quantities of FOG accepted when one digester is in service.

Table 2-6 Capacity to Accept FOG and Food Waste
One Digester in Service

FOG Addition (gal/day)	and	Food Waste Addition (wet tons/day)
0		32
1,000		29
2,000		26
3,000		22
4,000		19
5,000		16
6,000		12
7,000		9
8,000		6
9,000		3
10,000		0

When two digesters are in service, the energy recovery system capacity controls the amount of food waste and FOG that can be accepted. As an example capacity for this condition, if CMSA took 15 tons of food waste per day, it would still have the capacity to accept approximately 13,000 gallons per day of FOG. Alternatively, when taking 30 tons of food waste (2 truckloads), CMSA would still be able to accept over 8000 gallons per day of FOG. Table 2-7 shows the volume of food waste that CMSA can accept based on varying quantities of FOG accepted when two digesters are in service, which is limited by the energy recovery system capacity.

Table 2-7 Capacity to Accept FOG and Food Waste

Two Digesters in Service Capacity Limit by Energy Recovery System

FOG Addition (gal/day)	and	Food Waste Addition (wet tons/day)
0		57
1,000		54
2,000		51
3,000		48
4,000		45
5,000		42
6,000		38
7,000		35
8,000		32
9,000		28
10,000		25
11,000		22
12,000		19
13,000		15
14,000		12
15,000		9
16,000		5
17,000		2

2.3 Food Waste Availability

2.3.1 Food Waste Supply

Food waste haulers have expressed interest in working with CMSA to deliver food waste to the treatment plant for feeding to the digesters. (The calculations in the previous section indicate that CMSA has sufficient capacity to handle food waste.) To prepare the food waste for delivery, a food hauler will need to invest in equipment and staff to sort, screen, and deliver the food waste. To justify this investment, a food waste hauler may need a commitment from CMSA that it will accept a specified quantity of food waste. 15 tons per day, or one truckload, has been a quantity that has been discussed, and consequently this quantity should be included as a base amount under all scenarios. CMSA should be able to accept this quantity at all times, as long as the FOG deliveries are within the limits noted previously.

2.3.2 Food Waste Screening and Grinding

Ideally, the food waste hauler should screen and grind the food waste sufficiently so that further screening is unnecessary by CMSA. The screening consists of removing utensils, plastics, bread wrappers, plastic wrap, and other larger materials that are not digestible and will cause clogging or excessive maintenance of the pumps. The grinding process should reduce the solids size to approximately 1-inch or less. At the East Bay Municipal Utility District (EBMUD) food waste facility, a screening process had to be installed at the treatment plant because some of the delivered food waste contained problematic debris. While the screening process reduced

O&M of downstream equipment, the screening process itself has required significant O&M effort, and equipment design modifications. If CMSA needs to screen the food waste, it would significantly increase the processing cost, and result in handling and disposal of the screenings. One food waste hauler has indicated a general willingness to screen the waste sufficiently based on initial discussions, and CMSA should encourage this approach. This approach has worked well at the West Lafayette, Indiana food waste facility, where the food waste delivered has been free of problematic debris, and screening at the treatment plant site has been unnecessary. Overall, this is the approach that CMSA should pursue.

Section 3: Predesign: F2E Processing Facilities

3.1 Description of Facilities

Following is a general description of the major components of a facility that are needed to receive, prepare, and feed food waste to the digesters.

- Truck Unloading Area. An area where the truck can park, dump its load of food waste, and then wash down any debris that has spilled.
- Food Waste Storage/Slurry Tank. A below grade concrete tank in which the truck can dump its food waste. In addition the tank provides the storage needed to dilute the food waste into a slurry so it can be pumped to the digesters. Finally, the storage is needed so that the food waste can be carefully metered to the digesters at an appropriate rate.
- Storage Tank Mixing. A system to mix the slurry tank.
- Grinding. A system to grind the slurry to prevent larger pieces from clogging the downstream equipment and piping.
- Feed Pump. A pump with variable flow capacity to feed the food waste slurry to the digesters at a controlled rate.

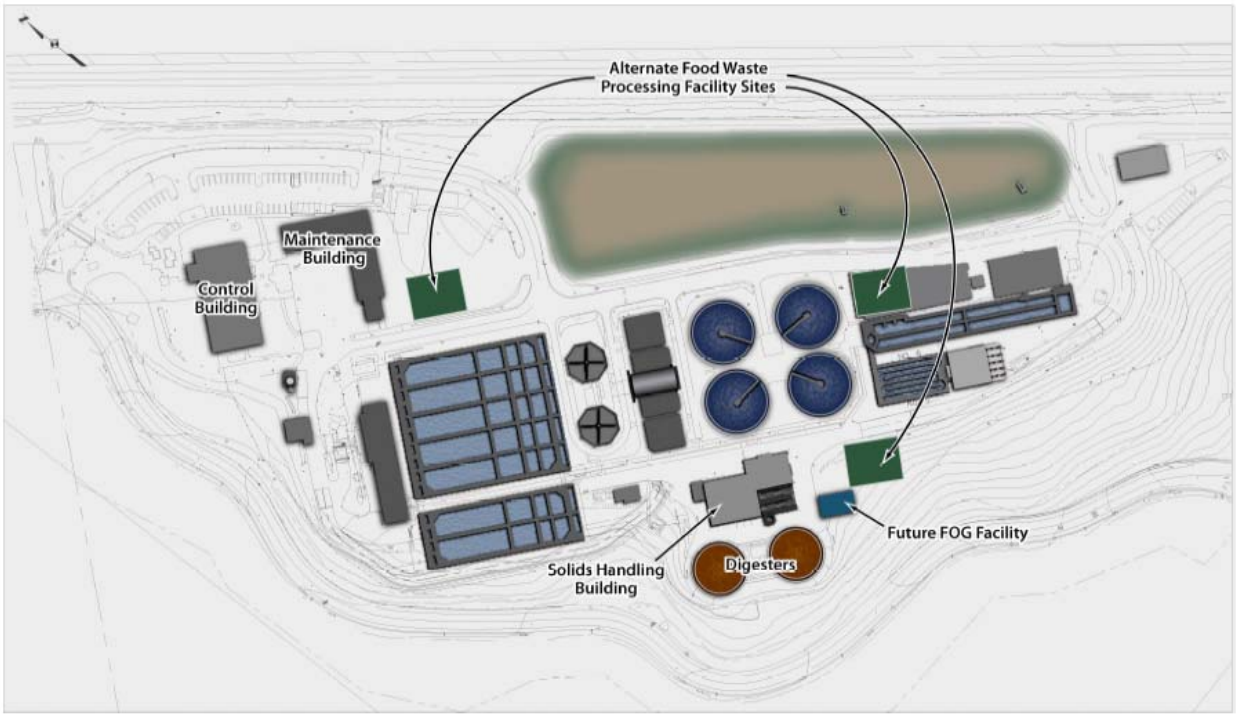
Based on these needed components, the following sections describe the development of the location, design, and plan to operate and control the food waste facility.

3.2 Siting Alternative Analysis

3.2.1 General

Three potential sites for the facilities were identified in the Feasibility Study, and are shown on Figure 3-1. These sites have sufficient area for the facilities, and are accessible by the delivery trucks. Following is a review of the suitability of these sites.

Figure 3-1: F2E Processing Facilities - Potential Locations



3.2.2 Adjacent to Maintenance Building

This site is in the paved parking area southeast of the Maintenance Building. The site has sufficient space for the food waste receiving and processing facility and is closer to the controlled plant entrance gate. This site would allow easier monitoring of the movement of the food waste transfer trucks at the plant site. However, from geotechnical data provided by Fugro (Fugro, 2005) it appears that the area around the Maintenance Building is located on bay mud. It is likely that the structures at this location would need to be constructed on piles to prevent settlement. CMSA staff indicated that the site has settled several feet since construction, thus confirming the need for piles.

This site is over 700 feet from the digesters, and routing the interconnection piping to and from the facility would be challenging. In addition, it would require significant operation and maintenance for pumping the high solids concentration (5% to 8%) food waste slurry this distance. The primary concern is that this piping would be susceptible to clogging due to the size, length, and number of bends. The clogging probability will be increased since the flow in the pipe will not be continuous, thus settling is likely when not pumping. While cleanouts and flushing connections can be added to facilitate maintenance, the bottom line is that O&M staff would likely need to spend significant time keeping this pipe operational.

Overall, because of the high capital cost due to piles and long pipelines, and the likely high O&M attention required, this site will likely be very expensive to implement. Consequently, it is not the preferred location.

3.2.3 Adjacent to Chlorine Contact Tank

This site is northeast of the existing contact tanks, and is approximately 400 feet from the digesters. It is not as convenient as the Maintenance Building site for access and monitoring of the food waste transfer trucks. Because of the distance from the digesters, this site has the same O&M disadvantages as the Maintenance Building site, although less extreme. To minimize the cost and expense of the slurry feed piping, the slurry feed could be connected to the secondary clarifier scum piping, which is already fed to the digesters. However, plant staff have indicated that this piping already needs attention to keep it clean, and adding the slurry will likely increase maintenance. Furthermore, interconnecting the slurry feed with scum piping will complicate operations since the pipeline could not be used for both services simultaneously.

Some other disadvantages of this site are as follows:

- Digested sludge appears to be a good option for slurrying the food waste since it would not add water to the process, and would better condition the food waste prior to addition to the digesters. However, the cost of pumping and cleaning the digested sludge piping to this site would make this undesirable. Therefore, utility water would need to be used for slurrying.

- The proposed FOG facility could not potentially be combined with the food waste processing facility, thus taking advantage of the similar components of both facilities, and reducing costs. The FOG Management Feasibility Study recommended locating the FOG facility southeast of the Solids Handling Building.

- A pile foundation would likely be required.

This site may be the best site to minimize the potential for odors to be noticeable off site since it's farthest from the plant property line. However, since odor control is part of the project, this should not be a major issue.

Overall, the distance from the digesters is a major disadvantage of this site. In addition, because of lengthy pipelines, this alternative would be more expensive than the Solids Handling Building area alternative described below. Therefore, this site is not preferred.

3.2.4 Adjacent to Solids Handling Building

This site is in the undeveloped area southeast of the existing Solids Handling Building. This is the closest site to the digesters and would be adjacent to the proposed FOG facility. This site would not require a pile foundation; however some rock excavation and installation of a retaining wall may be required. The site is closest to the plant property line, and therefore will rely upon proper performance of the odor control system to make sure that odors are not noticeable off-site. Since CMSA staff already operate and maintain odor control systems, this should not be an issue.

Because this site is closest to the digesters and the Solids Handling Building, it is the preferred site for the interconnection piping and utilities, because maintenance of the interconnection piping will require the least attention. There is sufficient area for food waste transfer trucks to maneuver in and out of the site, although site access will need to be designed so that the biosolids hauling truck access is not adversely impacted.

An additional benefit of this site is the potential to combine the food waste facility with the FOG facility. This could result in reduced construction and O&M costs, and allow for opportunities to share utility connections. Overall, this site will minimize O&M needs and cost, and will likely be the least expensive site to develop. Consequently, this is the preferred site.

3.3 Utility Connections and Impact on Existing Facilities

3.3.1 General

The food waste receiving facility will need to be connected to and integrated with a variety of plant facilities. These connections, which are described below, are key input into orienting the food waste receiving facility southeast of the Solids Handling Building. In addition, the facility needs to be coordinated with the proposed FOG receiving facility, which is planned to be located in this area. Finally, since many of the utility connections are similar to those needed for the FOG facility, the food waste facility could be developed to maximize the potential to share these connections.

3.3.2 Truck Off-Loading Area

The facility will need to be located so that there is sufficient area for the truck containing up to 15 tons of food waste to maneuver in and out of the site. Based on information from a local food waste hauler, the trucks will be approximately 30 feet length and with a turning radius of 35 feet.

This area will also be used to contain and wash down any spills. The drainage from this site will need to go to the plant drain system so that it does not get into the storm drainage system. A sump and pump in the basement of the Solids Handling Building collects drainage from the building and discharges it into the plant drainage system. However, draining the flow containing food waste to this sump may increase maintenance of this pump and piping. To avoid this issue, the drainage could be connected into the 8-inch plant drain pipe in Gallery F, which is also the recommended drainage location for the FOG facility.

Another approach would be to drain the off loading area into the storage tank. With this approach, the drain would have a P-trap to prevent the storage tank odors from escaping via the drain inlet. The disadvantage of this approach is that rain water would be added to the slurry tank, and consequently, this is not recommended.

3.3.3 Utility Water

The facility will need utility water to wash down any spills, water to clean the slurry tank, and to potentially slurry the food waste. Within the basement of the Solids Handling Building, a 3-inch utility water pipe is available, and this would be a good connection point. This will supply

sufficient quantity of water and pressure to meet all needs. The utility water supply line to be installed for the FOG facility can be reused by the food waste facility.

It may be desirable to heat the utility water prior to delivering it to the food waste facility to improve the ability to rinse grease covered surfaces. The waste heat from the cogeneration engine could be used to heat the utility water via a new heat exchanger or a tankless type water heater system could be installed near at the receiving station. The utility water to be delivered to the FOG facility will be heated using one of these methods.

3.3.4 Slurry Tank Dilution

Sludge from the digesters is an alternative to using utility water to slurry the food waste in the receiving tank. With this approach, excess water is not added to the process, and the food waste is better conditioned for addition to the digesters. The disadvantage to this approach is a potential increase in odors from the food waste slurry tank, and the potential for the pipe to clog since sludge flow would not be continuous.

The sludge from the digesters appears to have sufficient head so that pumping would be unnecessary. The preliminary hydraulic calculations indicate that over 900 gpm would be available using gravity flow at the current digester level of elevation 29. Connecting to the suction piping to the centrifuge feed piping would be a convenient way to achieve this.

3.3.5 Slurry Tank Drainage

The food waste slurry tank will need to be dewatered for periodic maintenance, so provisions are needed to dewater the portion of the tank that can't be pumped to the digester. The nearest plant drain piping is the 8-inch plant waste drain in Gallery B. However, the elevation of this drain pipe is above the elevation of the food waste tank sump, which is approximately elevation 90, so gravity flow is not possible. To drain the tank without adding a dedicated drainage pump, the slurry tank mixing pump could be used by interconnecting it to pump to the drain pipe in Gallery B.

The FOG storage tank also needs to be drained, and the Digester/FOG Predesign included piping to drain the tank to Gallery B. The food waste slurry tank drainage could be interconnected to the FOG drain piping.

3.3.6 Screening Removal

The facility is anticipated to include a rock trap grinder, which will grind materials and return the most of the grindings to the process. However, heavy denser materials such as rocks and metal will settle and need to be removed from the grinder into a small portable storage bin. A hoist will need to be installed to lift the screenings from the equipment area.

The above screening will be sufficient as long as food waste is clean, and free of large undigestible solids, such as ground up utensils, plastics, and other larger materials that can cause clogging or excessive maintenance of the pumps. EBMUD's food waste has not been clean, and they experienced pump clogging and excessive maintenance. Consequently, they

installed a paddle finisher to further screen the food waste to avoid these problems. However, the screening process has been maintenance intensive, and CMSA should avoid the use of this process. This process should not be necessary since CMSA plans to specify the quality of the food waste that it will accept.

3.3.7 Feed to Digesters

The processed food waste will be pumped to the digesters at a rate of up to 100 gpm. To minimize the potential for clogging, this pipe should be a minimum of 6-inches in diameter. However, the velocity in this pipe will be slightly more than 1 foot per second at this flow rate. While solids should not settle in the pipe at this velocity, heavier materials such as grit may settle. Consequently, provisions for flushing the pipe are recommended. To achieve this, the slurry tank mixing pump can be interconnected with the feed piping so that over 300 gpm could be routed through the feed line at the end of the feeding cycle.

The feed pipe needs to be connected to feed both digesters, and should be connected to a line that has continuous flow to the digester. Based on this, the preferred connection location is the discharge of each of the new digester mixing pumps.

Instead of installing a new feed pipe from the food waste facility to the digesters, the metered food waste slurry can be discharged to the digested sludge recirculation piping that will be installed as part of the FOG facility. This recirculation system is being installed to insure that the FOG is fed to piping that maintains an adequate scouring velocity to prevent grease build-up from the FOG addition. Adding the food waste slurry to this piping would minimize the potential settling issues due to low velocities, and would eliminate the need for flushing described above. Consequently, this is the recommended approach.

When digested sludge is being withdrawn from a digester for dewatering, that digester should not receive food waste. Since staff typically operates the centrifuges during partial and off-peak demand periods, this will likely coincide with food waste feeding, so staff will need to open/close the food waste feed valves to prevent simultaneous feeding and withdrawal. The potential need to automate these valves should be reviewed during final design.

3.3.8 Sludge Dewatering

The addition of 15 tons of food waste will increase the digested sludge production by about 1600 pound of solids per day, based on the following assumptions:

- 25% solids content
- 92% volatile solids content
- 85% volatile solids destruction

Based on average operating data from July 2007 through June 2008, the plant produced approximately 11,000 pounds of digested sludge solids per day. Staff reports that they operate the centrifuges between 8 and 10 hours per day to dewater these solids. Therefore, the addition of food waste will increase solids production by about 15%. (The actual increase may be less since some treatment plants adding FOG have reported a decrease in solids

production.) Staff has indicated that the increase in solids will be handled by increasing the dewatering rate so that no extra operational time would be needed.

3.3.9 Electrical Power

The food waste facility will require 480 volts to supply the variety of equipment, and the nearest source of power is the Solids Handling Building. The new FOG facility will also require 480 volt power, and the Digester/FOG Predesign concluded that a new MCC would be more cost-effective than attempting to modify the existing MCCs to accommodate power demand. Based on this, it will also be more cost-effective to use a new MCC for the food waste facility electrical power. The food waste electrical power could come from the new MCC for the FOG facility, which would reduce costs. The location of the new FOG MCC will be determined during final design.

3.3.10 PLC Control and Monitoring

The facility will need to be controlled and monitored by a PLC, and accessible for control and monitoring by the plant SCADA system. Since a new PLC is being installed for the FOG facility, it will be most cost-effective to use this PLC for the food waste facility if possible.

3.4 Impact on Digester Gas Filtration Equipment

3.4.1 General

CMSA has a robust system to clean the digester gas before delivering it to the cogeneration engines. The purpose of this system is to reduce contaminants in the digester gas to reduce maintenance on the engine and to meet emissions limits. The system consists of hydrogen sulfide removal, moisture removal, and siloxane removal. Below is a brief description of the system components and the potential impact to the systems by adding food waste to the digesters.

3.4.2 Hydrogen Sulfide

CMSA removes hydrogen sulfide from the digester gas to meet SO_x emissions limits in the exhaust from its cogeneration engine, as well as to reduce corrosion within the cogeneration engine. This is accomplished by adding ferric chloride to the primary sludge piping to reduce the hydrogen sulfide concentration in the digester gas to a target between 100 and 200 parts per million (ppm). The hydrogen sulfide concentration is further reduced by approximately 40% by using four iron sponges to scrub the digester gas. The iron sponges are 100 cubic foot vessels containing media impregnated with 15 pounds of iron oxide, manufactured by Marcab. Based on the Digester/FOG Predesign, the iron sponges will be replaced with new units as part of that project, most likely using a media to achieve removal.

The primary source of hydrogen sulfide in the CMSA system is from sea water infiltration into the sewer system. This may account for up to 85% of the sulfide in the wastewater and the digester gas. The sulfide component from food waste will be relatively low compared to this, adding approximately 1% of the sulfide load. Since the ferric chloride dosage is to meet a general target range, rather than a precise setpoint, the food waste addition will likely not

change dosage rates. In addition, the iron sponge sulfide removal process is a batch loading process, and the media is currently replaced after approximately two years of service. Consequently, the addition of food waste will likely not even be noticed with this process, or the replacement process.

The addition of food waste will cause an increase in the volume of digester gas that needs to be treated. However, increasing the digester gas volume alone will not increase the cost of operating these processes. Since the food waste will likely not cause a significant increase in the sulfide concentration of the digester gas, it will not cause any difference in the operation, or cost of these two removal processes.

3.4.3 Siloxane

CMSA removes siloxane from its digester gas to avoid the development of silica build up within the engine, which increases engine maintenance costs by greatly reducing the operating hours between engine overhauls. The siloxane is removed using filters containing a carbon media specifically designed for siloxane removal.

The primary source of siloxane is from personal care products, although it is present in some frying oils. Overall, the amount of siloxane in the food products should be minimal, and the addition of food waste will likely not noticeably increase the siloxane load on the filter and will not noticeably impact the life of the siloxane media.

The addition of food waste to the digesters will increase the volume of digester gas passing through the filters; however, this should not impact the media life.

3.4.4 Moisture

CMSA removes moisture from its digester gas to minimize the potential for corrosion within the cogeneration engines, thus reducing maintenance needs and costs. Removing the moisture also helps with siloxane filter performance. The moisture is removed using a refrigerated gas dryer which reduces the temperature of the digester gas to approximately 40 degrees, at which point the moisture is condensed and removed. While the addition of food waste to the digesters should not increase the moisture content of the digester gas, it's somewhat irrelevant since the gas dryer operation and maintenance cost is generally independent with varying moisture content. Consequently, the food waste addition will have no noticeable impact on this process.

3.5 Operations Plan

3.5.1 General

The anticipated 15 tons of food waste will likely be delivered to the plant during the day shift, in either one truck, or a few smaller trucks. In either case the food waste will be delivered in a batch(s), but must be carefully fed to the digesters at a rate that will avoid producing more digester gas than can be either stored or used by the energy recovery facilities. Since the food waste is readily digestible, digester gas production increases quickly after the food waste is added in a well mixed digester. One potential approach is to pace the food waste addition based on the digester gas system pressure and the capacity of the energy recovery facilities,

which is 260 cfm. When the digester gas pressure is low, the food waste could be added to produce more than 260 cfm to build up pressure (increase storage) to the high pressure limit. However, as the digester gas pressure approaches the high pressure limit, the food waste feed rate would be reduced to match the capacity of the energy recovery facilities. (To the extent possible, the food waste should be fed only to the digester not being dewatered.)

Since wastewater solids production decreases during the low flow period between 11 PM and 6 AM, this will be the likely time frame to meter the food waste into the digesters. Alternatively, the food waste could be fed continuously to the digesters to match the current 24 hour digester feeding schedule used by CMSA to even out food distribution to the digesters, and potentially reduce upsets.

3.5.2 Food Waste Delivery

One to two food waste delivery trucks per day will likely unload food waste into the food waste slurry tank. The food waste will be unloaded through a manually operated hatch in the slurry tank. When the truck arrives, a CMSA operator will need to be available to assist with the unloading process. (As the delivery program becomes more routine, it's possible that a CMSA operator may not be needed to assist with the unloading.)

3.5.3 Odor Control

The odor control system will likely need to be operated continuously when food waste is in the storage tank. The system will likely consist of a biofilter similar to that manufactured by Biorem. This system has been successfully used to control odors at the Millbrae FOG facility and the West Lafayette Food Waste/FOG facility.

3.5.4 Food Waste Slurry

After the food waste has been unloaded, the CMSA operator will open the digested sludge dilution valve to add sludge to create a 6 to 8% slurry with the food waste and digested sludge. The West Lafayette has reported success using digested sludge to create the slurry at this solids concentration.

3.5.5 Food Waste Mixing

After completing the slurry, the CMSA operator will start the food waste slurry tank mixing pump, and set a feed delay timer on the food waste control panel. After mixing the slurry for the preset mixing time (about 60 to 90 minutes), the slurry will be ready for metering into the digester.

3.5.6 Food Waste Slurry Feeding

Once the feed delay timer has expired, the food waste metering pump will be permitted to start feeding food waste slurry to the digesters. In the Auto mode, the speed of the pump will be varied (based on digester gas pressure or other operating variable) to feed the slurry at a rate that will avoid producing more digester gas than can be either stored or used by the energy recovery facilities.

3.6 Equipment Description and Layout

3.6.1 Slurry Tank

The slurry tank needs to be a below grade concrete tank to receive the food waste, which will be unloaded by dumping from the delivery truck. Since the solids content will be about 25%, digested sludge will need to be added to create a slurry of approximately 6 to 8% solids that can be pumped. Based on this, the tank will need to store a slurry volume of approximately 15,000 gallons. Consequently, to allow for freeboard, the slurry tank should have a volume of approximately 20,000 gallons.

3.6.2 Slurry Tank Mixing

A slurry tank mixing system is needed to create the slurry of food waste and digested sludge, and to keep the contents from separating. Pumps have proven effective at mixing food waste at the West Lafayette, Indiana facility, and have an excellent track record for mixing digesters. In addition, they are easier to maintain than surface mixers since the equipment is outside the tank. A 300 gpm chopper pump is recommended to both mix the tank and provide a method to reduce the size of the solids in the slurry. The discharge of the mixing pump will go to a nozzle near the top of the tank to minimize the potential to form a scum layer at the surface.

3.6.3 Food Waste Slurry Metering Pump

The West Lafayette facility has had success pumping the food waste slurry using a progressing cavity pump since it has a relatively “clean” food waste supply. In contrast, the EBMUD food waste stream contained debris (utensils, etc.) that clogged their progressing cavity pumps. Consequently, they switched to a Watson Marlow hose pump, which has been able to pump this debris with less clogging. While the plan is for the food waste haulers to screen their food waste to produce a relatively “clean” food waste product, we recommend use of a hose pump until the food waste separation facility process is developed and we can more accurately predict the quality of the food waste. The pump should have a variable capacity range of 25 to 100 gpm, which will allow the slurry to be fed in 2 to 7 hours.

3.7 Food Waste Facility Alternatives

3.7.1 General

Following is the description of the three alternatives to add food waste to the digesters. Each alternative assumes that that food waste delivered will be screened well enough such that CMSA does not need to include additional screening equipment.

Not constructing a food waste facility is an alternative if none of the food waste facility alternatives prove to be cost-effective. This will be used as a baseline to test the cost-effectiveness of the food waste facility alternatives. The cost analyses of the alternatives are included in Section 4 of this report.

3.7.2 Separate Food Waste Facility

This alternative is the construction of a completely separate food waste receiving facility in the vicinity of the proposed FOG facility. This alternative would have a 20,000 gallon receiving tank dedicated to food waste, and would have a capacity to store approximately 15 tons of food waste assuming it's diluted to a 6% slurry. The primary advantage of this alternative is to develop a food waste facility that is entirely separate from the FOG facility, and would not need to be coordinated with the construction of the FOG facility. The major disadvantage of this alternative is that it would require more space than the other alternatives, and consequently fitting this into the relatively tight space constraints will be challenging. A conceptual plan view of this facility is shown in Figure 3-2.

3.7.3 Expand FOG Facility to Receive Food Waste

This alternative involves expanding the proposed FOG facility to construct a dedicated food waste facility, while sharing components with the FOG facility to the maximum extent possible. The primary advantage of this alternative is that it minimizes construction costs while including a separate 20,000 gallon storage tank and separate equipment for the food waste. This alternative would also provide the maximum capacity to store food waste; 15 tons in the food storage tank, and up to 15 tons in the FOG storage tank, when the FOG volume is less than 5,000 gallons. (The FOG volume would be part of the slurry for the food waste, so the FOG storage tank could still handle 15 tons of food waste.) The major components that would be shared include the following:

- Recirculation Pump and Piping System
- Motor Control Center
- PLC
- Odor Scrubber
- Common Wall construction

A conceptual plan view of this facility is shown in Figure 3-3.

3.7.4 Modify FOG Facility to Receive Food Waste

This alternative involves modifying the design of the FOG facility developed in the Digester/FOG Predesign so that it would be suitable for receiving food waste in addition to FOG. It includes using the proposed FOG storage tank and equipment for food waste in addition to FOG. The primary items to be modified are as follows:

- Replace the progressing cavity pump with a hose pump to feed the FOG and food waste to the digester
- Add a rock trap grinder upstream of the hose pump
- Add a rock trap upstream of the mixing pump

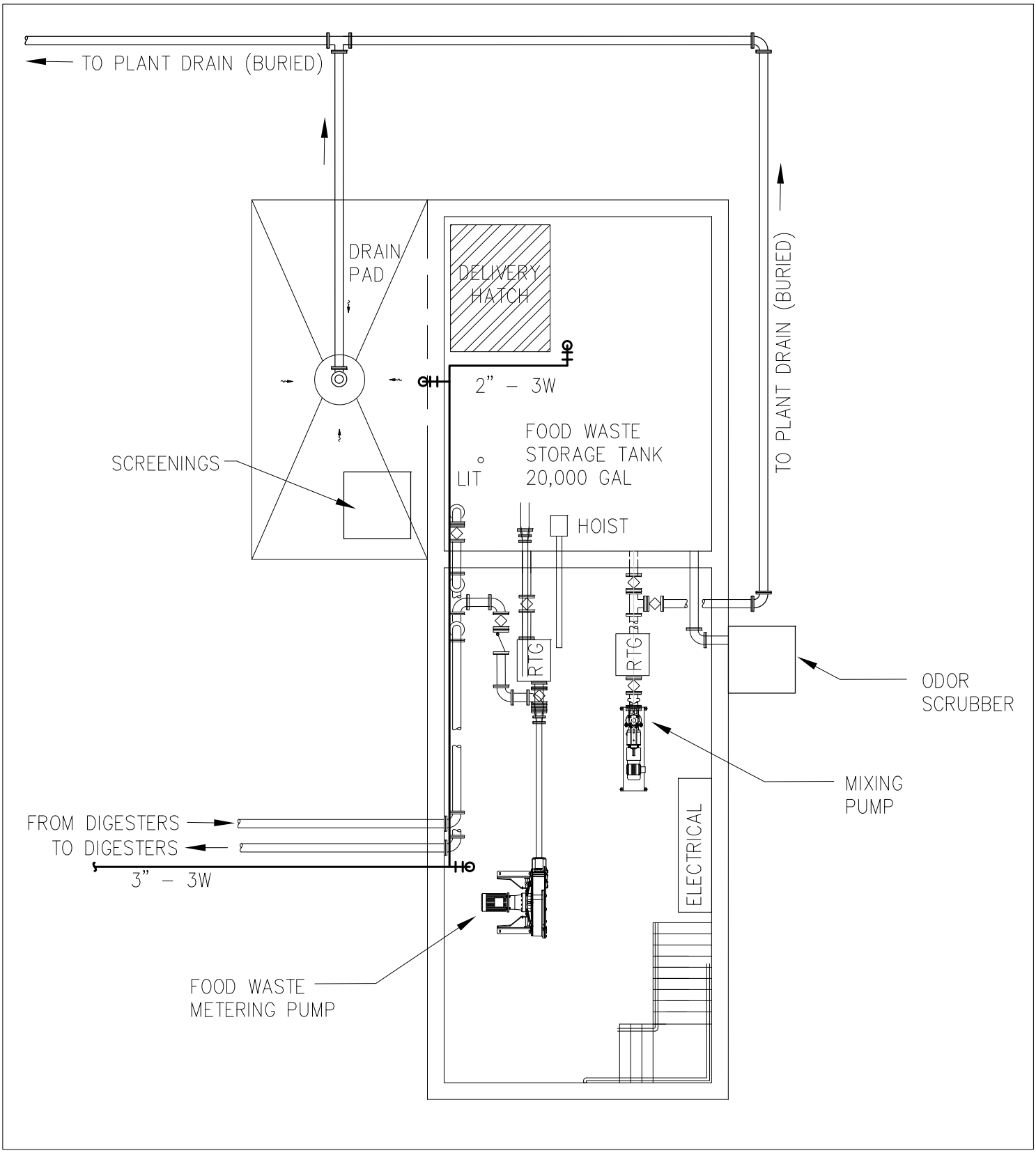
- Add a food waste receiving hatch
- Add a concrete pad and drain for the food waste truck
- Include piping to add digested sludge to the storage tank to slurry the food waste
- Add a jib crane to remove rock trap grindings from the equipment area
- Additional PLC programming to coordinate operations of food waste and FOG

The primary advantage of this alternative is to allow CMSA to receive up to 15 tons of food waste on an interim basis with the lowest capital and O&M costs. With this alternative, CMSA would be able to phase the installation of capacity increases for the food waste facility as needed to meet demand. A conceptual plan view of this alternative is shown in Figure 3-4.

The approach of receiving food waste and FOG in a single storage tank, and then feeding the blend to a digester in a single stream has been successfully used at the West Lafayette facility, and this is the planned approach when their full scale FOG addition starts in 2010. The success of this approach is dependent upon receiving a clean food waste stream so that additional screening of the food waste is unnecessary by CMSA.

3.7.5 No Food Waste Facility

The intent of including this is to recognize that CMSA does not have to construct a food waste facility. This alternative is therefore used as a baseline to test the cost effectiveness of the other alternatives.



GENERAL PLAN

0 5 10

1/8"=1'-0"

NOTES:
1. FOR CLARITY NOT ALL PIPING AND EQUIPMENT IS SHOWN.

Kennedy/Jenks Consultants

CENTRAL MARIN SANITATION AGENCY
FOOD WASTE PREDESIGN

SEPARATE FOOD WASTE FACILITY LAYOUT

0968013*01
JAN 2010

FIGURE 3-2

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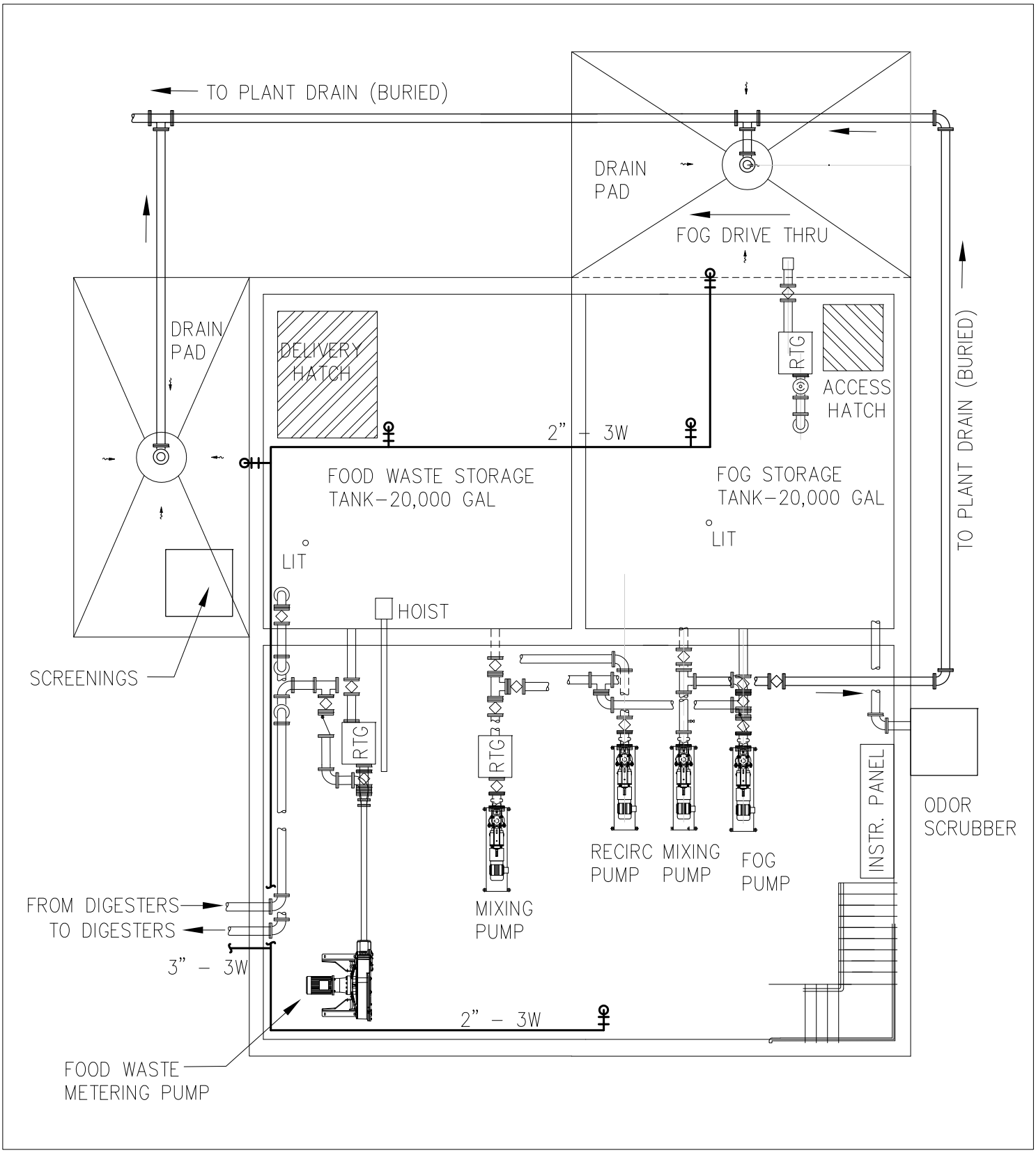

GENERAL PLAN

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1/8"=1'–0"

NOTES:
1. FOR CLARITY NOT ALL PIPING AND EQUIPMENT IS SHOWN.

Kennedy/Jenks Consultants

CENTRAL MARIN SANITATION AGENCY
FOOD WASTE PREDESIGN

FOG FACILITY
EXPANDED FOR FOOD WASTE

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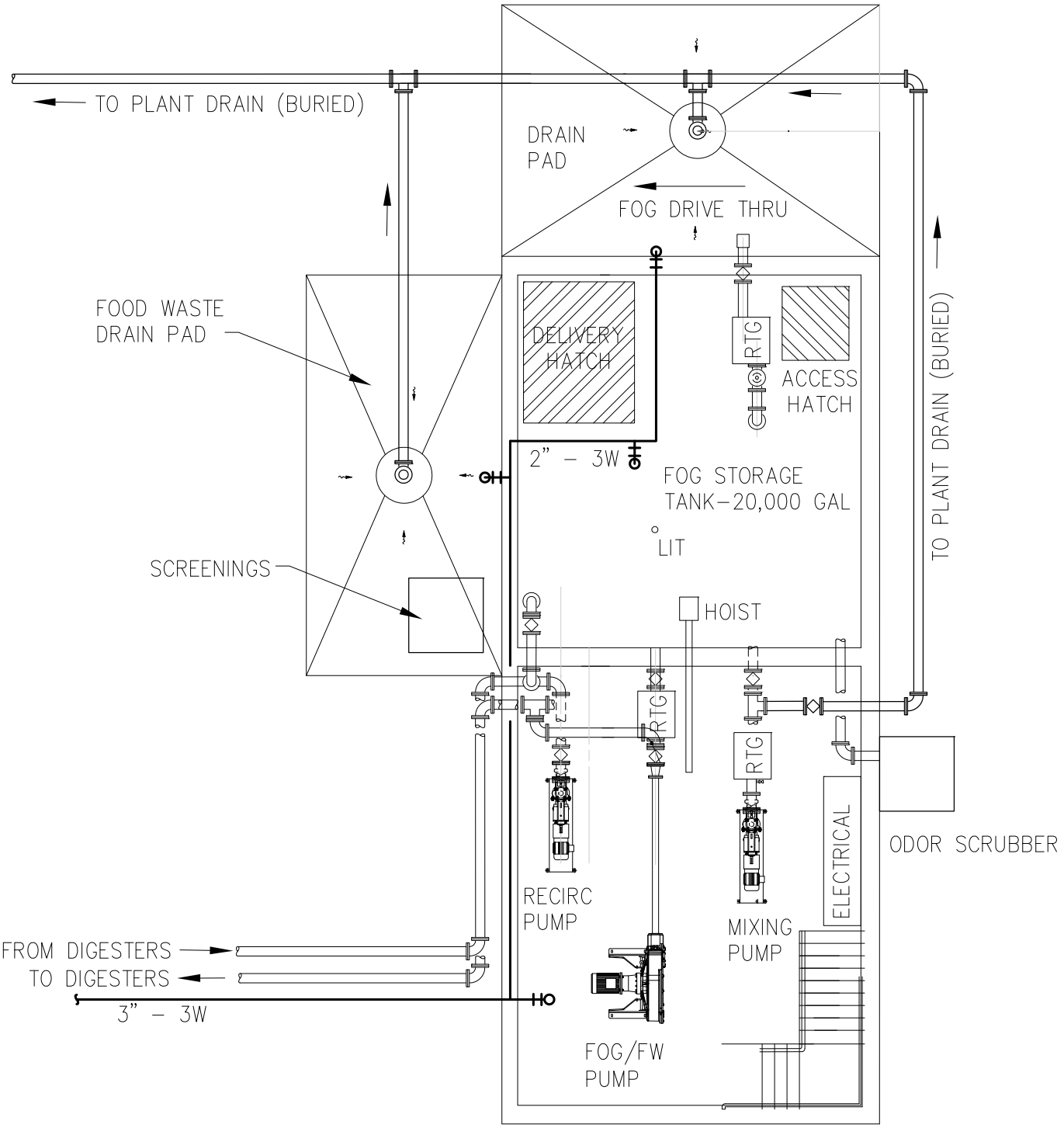
JAN 2010

FIGURE 3-3

C:\Documents and Settings\MikeBarnes\My Documents\CMSA\Food Waste to Energy Predesign\Figures\Fig 3.3 FOG Exp for Food Waste.dwg 1–22–10 02:45:19 PM



GENERAL PLAN

0 5 10

1/8"=1'–0"

NOTES:
1. FOR CLARITY NOT ALL PIPING AND EQUIPMENT IS SHOWN.

Kennedy/Jenks Consultants

CENTRAL MARIN SANITATION AGENCY
FOOD WASTE PREDESIGN

FOG FACILITY MODIFIED FOR FOOD WASTE

0968013*01
JAN 2010

FIGURE 3-4

Section 4: Project Costs

4.1 Capital Cost of Alternatives

4.1.1 General Assumptions

Following is a list of the general assumptions for the capital cost analysis

- A paddle finisher, or comparable equipment, is not needed for final screening to remove undigestible solids for any of the alternatives. MSS plans to screen the food waste sufficiently at their solid waste transfer station prior to delivery to CMSA.
- Contractor overhead and profit is estimated at 20%.
- An estimating contingency of 25% is included.

4.1.2 Separate Food Waste Facility

This alternative consists of constructing a separate, standalone facility for food waste. It essentially duplicates the proposed FOG facility, except that it contains a few additional components for handling food waste. This facility would have the capacity to receive 15 wet tons per day of food waste. The cost to design and construct this facility is approximately $940,000.

4.1.3 Expand FOG Facility to Include Food Waste

This alternative consists of expansion of the proposed FOG facility to handle food waste. A new 20,000 gallon food waste storage/slurry tank as well as food waste equipment would be constructed in an adjacent facility connected to the FOG facility. The food waste facility would maximize use of common elements of the FOG facility to minimize construction costs. This facility would have the capacity to receive approximately 30 wet tons of food waste per day when the FOG delivery is less than 5,000 gallons per day. The cost to design and construct the expansion of the FOG facility would be approximately $530,000.

4.1.4 Modify FOG Facility to Include Food Waste

This is the least cost alternative to receive food waste since it consists of modifying the proposed FOG facility to handle food waste in addition to FOG. The items in the FOG facility to be modified are as previously listed in Section 3.7.4. This alternative would have the capacity to receive 15 wet tons per day of food waste as long as FOG deliveries are less than 5,000 gallons per day. The cost to design and construct the modifications is approximately $180,000.

4.1.5 No Food Waste Facility

CMSA will incur no capital cost if it chooses not to add a food waste facility.

4.2 O&M Costs

4.2.1 General Assumptions

Following is a list of the general assumptions to develop the O&M costs and revenue for the alternatives:

- Food waste will be delivered 300 days per year.
- CMSA will charge a tipping fee of $20/wet ton to accept the food waste.
- The increased production of digester gas will replace the need for CMSA to buy natural gas. Natural gas is assumed to cost approximately $1/therm, which is the average cost that CMSA has paid in the last few years.
- It will take approximately 1 operator hour to accept every truck load (15 tons) of food waste. It will take approximately 4 hours of maintenance staff time per month to maintain the facilities. This results in a total of 413 extra O&M hours per year, assuming deliveries occur daily. The average fully burdened O&M rate is approximately $64/hour.
- 15 tons/day of food waste will result in an extra 3.3 wet tons/day of biosolids to dewater and dispose of offsite. (This is a conservative estimate, and could be less if the food waste/FOG addition improves the volatile solids destruction of the wastewater solids.) The total disposal cost for CMSA is $37/wet ton. To account for the extra dewatering electricity cost, we have assumed an extra run time of 0.5 hours per day.
- The extra energy costs for the food waste facility consists of operating equipment with a total of approximately 25 horsepower. The average electricity rate for CMSA is $0.14/kWH.

4.2.2 Alternative Payback Analysis

Table 4-1 summarizes the cost savings, revenue and extra costs of each of the alternatives, assuming that 15 wet tons per day of food waste is delivered. The annual cost savings is then used to calculate a simple payback of the alternative. Using these criteria, all the alternatives have a simple payback of less than 6 years. However, this may be optimistic since the food waste supply may be limited initially while the food waste hauler starts up its food waste collection program. Based on this, Table 4-2 illustrates the payback if only 10 tons per day of food waste is available. Under this scenario, the simple payback period for the alternative to modify the FOG facility is still very good at a payback of less than 2 years. Expanding the FOG facility has a payback of approximately 6 years, while the separate food waste facility has a payback of approximately 10 years.

Table 4-1 Alternative Cost Analysis-Food Waste Supply at 15 Wet Tons/Day

Variable		Separate FW Facility	Expand FOG Facility for FW	Modify FOG Facility for FW
	Food Waste Capacity/Supply (wt/day)	15	15	15
	Dig. Gas Produced (cf/day)	80,000	80,000	80,000
Annual Cost Savings/Revenue				
	Natural Gas	$144,000	$144,000	$144,000
	Tipping Fee Revenue	$90,000	$90,000	$90,000
	Total Annual Savings	**$234,000**	**$234,000**	**$234,000**
Extra Annual Costs				
	Labor.	$22,000	$22,000	$22,000
	Electricity	$8,000	$8,000	$8,000
	Biosolids Disposal	$45,000	$45,000	$45,000
	Total Annual Costs	**$75,000**	**$75,000**	**$75,000**
Net Annual Savings		**$159,000**	**$159,000**	**$159,000**
Design and Construction Cost		**$940,000**	**$530,000**	**$180,000**
Simple Payback (Years)		**5.9**	**3.3**	**1.1**

Table 4-2 Alternative Cost Analysis-Food Waste Supply at 10 Wet Tons/Day

Variable		Separate FW Facility	Expand FOG Facility for FW	Modify FOG Facility for FW
	Food Waste Capacity/Supply (wt/day)	10	10	10
	Dig. Gas Produced (cf/day)	53,000	53,000	53,000
Annual Cost Savings/Revenue				
	Natural Gas	$96,000	$96,000	$96,000
	Tipping Fee Revenue	$60,000	$60,000	$60,000
	Total Annual Savings	**$156,000**	**$156,000**	**$156,000**
Extra Annual Costs				
	Labor.	$22,000	$22,000	$21,000
	Electricity	$8,000	$8,000	$8,000
	Biosolids Disposal	$30,000	$30,000	$30,000
	Total Annual Costs	**$60,000**	**$60,000**	**$59,000**
Net Annual Savings		**$96,000**	**$96,000**	**$97,000**
Design and Construction Cost		**$940,000**	**$530,000**	**$180,000**
Simple Payback (Years)		**9.8**	**5.5**	**1.9**

4.3 Recommended Project

One food waste hauler has indicated that they are very interested in delivering clean food waste to CMSA, and are proceeding with a plan to install screening and grinding facilities to prepare the food waste for this application. They have estimated that they can deliver up to 15 tons of commercial food waste from restaurants and grocery stores in their service area. If they accept food waste from outside their service area they may be able to furnish greater than 15 tons per day. Since the exact volume is still somewhat indeterminate, it would be best to start slowly. Consequently, the alternative to modify the proposed FOG facility to accept food waste is the better option for the following reasons:

- Lowest capital cost of $180,000.
- Payback on the capital cost will be slightly more than 1 year if 15 tons per day of food waste is accepted and just less than 2 years if 10 tons per day are accepted.
- Would allow CMSA to receive up to 15 tons of food waste per day as long as the FOG deliveries are less than 5,000 gallons per day.
- It gives CMSA time to review handling food waste prior to designing and constructing a dedicated food waste facility. In addition, if the volume of food waste delivered does not exceed 15 tons, then it allows CMSA the option to continue using the modified FOG facility without making an additional capital investment.

4.4 Potential Funding Sources

K/J continuously tracks potential funding sources for energy projects such as the food waste facility described in this report. A technical memorandum that analyzed the potential funding sources for this project is included in Appendix A.

At this time, we could not find any funding source that is directly applicable to the CMSA project. However, since the programs are constantly changing, monies may become available, and therefore the programs should be monitored, focusing on the most promising programs, which are:

- The Green Project Reserve, administered via the SRF program, may have more funds available in 2010.
- The Resource Recovery Challenge, administered by the EPA, may also have funds available in 2010.
- The Climate Action Reserve is developing an Organic Waste Digestion Protocol that will presumably allow cap and trading of GHG reductions by diverting food waste from landfills to anaerobic digesters. While the program is speculative at this point, it should be followed to see how it develops since it is specifically targeting projects like the proposed CMSA project.

PG&E is also a possibility, although they don't have a specific fund to draw from. In a meeting in September 2009, Josh Townsend of PG&E stated that he may be able to get some funding from his current budget. Subsequently, he was able to obtain $15,000 in funding to support the food waste project.

Funding may be available from the California Energy Commission (CEC), but only if an agency is willing to sell power back to the grid or if an agency installs a fuel cell. Consequently, we did not consider these as likely sources of funding for CMSA at this time. Details are described in the TM in Appendix A. However, we are pursuing other potential funding sources through the CEC, such as Renewable-based Energy Secure Communities (RESCO) funding offered via the CEC's Public Interest Energy Research (PIER) Renewables program.

Section 5: Environmental Issues

5.1 F2E Energy Usage

CMSA realizes significant electricity savings by operating its cogeneration system. While the cogeneration system was out of service for repairs in early 2009, the monthly plant electricity cost increased from $6,000 to $43,000. Because of the high electricity expense, CMSA purchases natural gas to produce electricity when digester gas is not available.

The food waste facility would require operating equipment with a total connected horsepower of approximately 25, for approximately 8 hours for each day food waste is delivered. Assuming an electricity rate of $0.14/kWH, and 300 operating days per year, this translates to approximately $8,000 per year. The digester gas produced by feeding an average of 10 wet tons per day will save the purchase of approximately $96,000 of natural gas per year.

5.2 Greenhouse Gas Emissions

We completed a general estimate of the greenhouse gas emissions (GHG) that would change as a result of the project. The summary of the calculations are included in Appendix B.

The net result is that the diversion of 15 wet tons of food waste from the landfill to the CMSA digesters would reduce GHG emissions by approximately 1578 metric tons per year.

5.3 CEQA Initial Study Checklist

5.3.1 General

The CEQA Appendix G, Environmental Checklist Form (Form) is a checklist that is used to complete an Initial Study of a project to determine whether the project has environmental impacts that would either need to be mitigated, or addressed in an Environmental Impact Report (EIR). We completed the Evaluation of Environmental Impacts section of this Form to review whether the proposed Food–Waste to Energy Facilities at the CMSA wastewater treatment plant (Project) has any environmental impacts that would potentially trigger an EIR.

The completed Form is included as Appendix C to this report.

5.3.2 Evaluation of Environmental Impacts

Based on our initial assessment we checked the “No Impact” box for each of the questions in the 17 categories of Evaluation of Environmental Impacts section of the Form. At the end of each category, we included a brief explanation to support our answer to the questions.

In summary, we believe the project will not have a significant effect on the environment. Based on this, we believe a negative declaration would be the appropriate determination for the proposed Food-Waste to Energy Facilities at the treatment plant.

Appendix A: Potential Funding Sources TM

10 July 2009

Technical Memorandum No. 3

To: Jason Dow

From: Ari Elden, LEED AP

Review: Mike Barnes, P.E., Kennedy/Jenks

Subject: CMSA Food-Waste to Energy - Funding Sources
Task Order 1A – F2E Predesign Tasks
K/J 0968013*01

Introduction

As outlined in Task 1.5 of the project scope, Kennedy/Jenks Consultants (K/J) has been tracking various opportunities for Central Marin Sanitation Agency (CMSA) and the Food-Waste to Energy (F2E) project. This memo outlines various opportunities that K/J has identified as relevant to the F2E project. This list is constantly changing and being updated as details of planned and new funding opportunities become available.

A summary of funding opportunities that we have reviewed for CMSA is included in Attachment A. Of these opportunities, we have identified the 4 most likely sources of funding as listed below. For these sources, we have made initial inquiries to refine the likelihood of whether CMSA could receive funding. The results of these inquiries for each opportunity are in bold below.

Funding Opportunities Outline

1. PG&E (**To be determined in a meeting with PG&E arranged by Stephanie Lovette of the City of San Rafael)**
    a. Rebates & Incentives
    b. Feed-In Tariff
    c. Net Metering
    d. SGIP (fuel cells)
    e. Demand Reduction
    f. Power Purchase Agreement
2. ARRA 2009
    a. Energy Efficiency and Conservation Block Grants (EECBG) – US DOE
        i. Cities and counties received direct allocations of funding (JPA ineligible for direct funding)
        ii. JPAs and special districts are not eligible to apply for competitive grants (only small cities and counties that did not receive initial funding)
        iii. City of San Rafael was allocated $575,400

b. Renewable Energy Grants – US Treasury
    i. Details are currently vague
    ii. K/J will track this opportunity and notify CMSA when/if a potential grant becomes available
c. Deployment of CHP, District Energy, and Waste Energy Recovery Systems – US DOE
    i. $156M provided by ARRA 2009 to 4 areas of interest
    ii. Area of interest 3: Industrial Waste Energy Recovery
        1. The term 'waste energy recovery' means the collection and reuse of energy from sources such as exhaust heat or flared gas from any industrial process; waste gas or industrial tail gas that would otherwise be flared, incinerated, or vented
        2. Funding to provide **new** integrated waste energy recovery systems and **replacement** of inefficient existing systems.
d. State Revolving Fund (SRF)
    i. Green Project Reserve
        1. 20% of all funds allocated to the states must be used towards "Green Infrastructure Projects". ($56 million in 2008 for CA)
        2. Administered/regulated by the EPA
        3. Some states unable to fulfill 20% requirement
        4. Those funds to made "re-available" in February 2010
        5. Requires SRF application.

3. Resource Recovery Challenge (RCC) – EPA
    a. Funds for 2009 already allocated (4 projects funded for a total of **$120,000**)
    b. WTE + AD are eligible projects
    c. CMSA eligible to apply for 2010 funding
    d. http://www.epa.gov/waste/rcc/index.htm
4. Tradable Permits (AB32 - cap-and-trade)
    a. Renewable Energy Credits (RECs)
    b. Climate Action Reserve
        i. Climate Reserve Tons (CRTs)
        ii. Organic Waste Diversion Protocol (OWD)
            1. Incentivizing diversion of food waste from landfills to anaerobic digesters
            2. Protocol expected to be finalized late summer
    c. Climate Trust
        i. $4 per metric ton of carbon equivalent emissions avoided.
        ii. Project minimum of 50,000 MT in project lifetime. **Our initial estimate is that CMSA would likely not be able to meet this. However, this estimate is dependent upon how much methane is uncaptured at the landfill, which is a pretty broad estimate.**

Recommendations

At this time, we could not find any funding source that is directly applicable to the CMSA project. However, since the programs are constantly changing, monies may become available, and therefore the programs should be monitored, focusing on the above mentioned programs. In particular, the following programs look promising:

- The Green Project Reserve, administered via the SRF program, may have more funds available in February 2010
- The Resource Recovery Challenge, administered by the EPA, may also have funds available in 2010
- The Climate Action Reserve is developing an Organic Waste Digestion Protocol that will presumably allow cap and trading of GHG reductions by diverting food waste from landfills to anaerobic digesters. While the program is speculative at this point, it should be followed to see how it develops since it is specifically targeting projects like the proposed CMSA project.

PG&E is also a possibility. Stephanie Lovett of the City of San Rafael has asked to be the liaison in dealing with PG&E, and we suggest setting up a meeting with them when the project has been further refined. We believe that July would be an appropriate time for this meeting, after review of the progress submittals and the July 1 progress meeting.

Funding may be available from the California Energy Commission (CEC), but only if an agency is willing to sell power back to the grid, or if an agency installs a fuel cell. Consequently, we did not consider these as likely sources of funding for CMSA at this time. Details are described on Page 4 of Attachment A. However, we are pursuing other potential funding sources through the CEC, such as Renewable-based Energy Secure Communities (RESCO) funding offered via the CEC's Public Interest Energy Research (PIER) Renewables program.

Enclosure(s): Attachment A

cc: Ken Katen, CMSA
Chris Finton, CMSA
Rob Cole, CMSA
Joel Faller, K/J
Daniel Patten, K/J

Attachment A

Food-Waste To Energy (F2E) Funding Resources - CMSA

Funding Type	Funding Name	Administering Agency	Available Funds	Targeted Recipients	Website	Contact	Applicability to CMSA	
							Publicly Funded Project	Privately Funded Project
Grants/Loans	CA Clean Water State Revolving Fund (SRF)	State Water Resources Control Board	At least 20% of the $280 million of ARRA 2009 funding provided to the CA SRF is available for "green infrastructure, water or energy efficiency or other environmentally innovative activites." Funding includes grant and loan portions.	Public Agencies	http://www.epa.gov/region09/eparecovery/index.html	Christopher Stevens (cstevens@waterboards.ca.gov) State Water Resources Control Board 916-341-5698	Eligible	N/A
					http://www.waterboards.ca.gov/water_issues/programs/grants_loans/srf/econ_recovery_info.shtml	Juanita Licata (licata.juanita@epa.gov) CWSRF Program Manager EPA Reg 9 Water Infrastructure Office 415-972-3450 Clean Water State Revolving Fund		
	Green Project Reserve (GPR) SRF	State Water Resources Control Board & EPA	States must provide at least 20% of their grants for green projects, including green infrastructure, energy or water efficiency, and environmentally innovative activities. Must be under contract or construction on or before 2/17/2010. If a state does not have enough projects to utilize the full 20% of their allocated funds towards "Green" projects, that money will be re-allocated. Anticapted in 2/2010.	Public Agencies	http://www.epa.gov/ow/eparecovery/	Christopher Stevens (cstevens@waterboards.ca.gov) State Water Resources Control Board 916-341-5698	**Eligible**	N/A
					http://www.epa.gov/water/eparecovery/docs/STIMULUS_Green_Reserve_Webcast_Slides%203-12-09.pdf			
					http://216.75.69.10/downloads/stimuluswebcast/GreenProjectWebcasts.htm	Juanita Licata (licata.juanita@epa.gov) CWSRF Program Manager EPA Reg 9 Water Infrastructure Office 415-972-3450 Clean Water State Revolving Fund		
	Deployment of CHP, District Energy, and Waste Energy Recovery Systems	DOE	$156 million from the American Recovery and Reinvestment Act to support projects that deploy efficient technologies in the following four areas of interest: Combined Heat and Power (Area of Interest 1); District Energy Systems (Area of Interest 2); Industrial Waste Energy Recovery (Area of Interest 3); Efficient Industrial Equipment (Area of Interest 4).	?	http://www.epa.gov/chp/funding/funding/usdeploymentofchpdistrictenerg.html		**Eligible**	**Eligible**
	Energy Efficiency and Conservation Block Grants (EECBG)	DOE's Office of Energy Efficiency and Renewable Energy (EERE) / California Energy Commission (CEC)	$2.8 billion available to cities and counties nationally. $400 million in competitive energy grants. CEC expects to receive $56 million (60% available to small cities & counties, 40% available at CEC's discretion)	Units of local governments (Cities, Counties), Indian Tribes, and States	http://www.eecbg.energy.gov/	Monica Herrera 916-654-4381	N/A	N/A
					http://www.eecbg.energy.gov/grantalloc.html			
					http://www.energy.ca.gov/recovery/			
	California Supplemental Energy Payments (SEPs)	CPUC/DOE	$3.1 billion nationally, estimated $226 million to CPUC	Monies will be directed to energy efficiency retrofits of buildings and industrial facilities, and to support renewable energy projects.	http://www.epa.gov/chp/funding/funding2/calcasupplementalenergypayment.html		Eligible	Eligible
					http://www.energy.ca.gov/renewables/documents/index.html#overall			
					http://www.energy.ca.gov/recovery/documents/2009-03-23_Initial_Application_Activities_CA.pdf			

Attachment A

Food-Waste To Energy (F2E) Funding Resources - CMSA

Funding Type	Funding Name	Administering Agency	Available Funds	Targeted Recipients	Website	Contact	Applicability to CMSA	
							Publicly Funded Project	Privately Funded Project
Grants/Loans (ctnd.)	Clean Renewable Energy Bonds (CREBs)	U.S. Department of Treasury	$1.6 billion available to finance facilities that generate electricity	Available funds divided into thirds: 1) State, local, and tribal governments; 2) Qualifying public power providers; 3) Qualifying projects of electric cooperatives	http://www.ustreas.gov/recovery/programs		Eligible for tax exempt bonds	N/A
	Renewable Energy Grants	U.S. Department of Treasury	?	?	http://www.dsireusa.org/library/includes/GenericIncentive.cfm?Incentive_Code=US53F&currentpageid=3&EE=1&RE=1 http://www.epa.gov/chp/funding/funding/usrenewableenergygrants.html	USDT Office of Financial Stability: 202-622-5993	N/A	**Eligible**
	Qualified Energy Conservation Bonds	U.S. Department of Treasury	$2.4 billion of qualified conservation bonds to finance State, municipal, and tribal government programs and initiatives designed to reduce greenhouse gas emissions	Units of local governments (Cities, Counties), Indian Tribes, and States	http://www.ustreas.gov/recovery/programs		N/A	N/A
	California Loans for Energy Efficiency Projects	CEC	$26 million in loan funds fixed at 3.95%	Cities, counties, special districts, public schools, public hospitals, and other public-care facilities	http://www.energy.ca.gov/contracts/efficiency_pon.html		N/A	N/A
	Western Regional Biomass Energy Program	Western Governors' Association	Older program, funds already all allocated		http://www.westgov.org/wga/initiatives/biomass/	Ann Walker Program Director -- Forest Health, biomass 303 623-9378 ext. 109 or cell: 541-993-1139	N/A	N/A
	Waste Diversion Grants	California Integrated Waste Management Board (CIWMB)	?	?	http://www.epa.gov/region5/solidwaste/funding.htm#g2 http://www.ciwmb.ca.gov/rmdz/ http://www.epa.gov/region09/funding/funding-sources/solid-waste.html http://www.epa.gov/region09/waste/ http://www.epa.gov/region09/waste/solid/projects/index.html http://www.epa.gov/region09/waste/organics/ad/index.html http://www.epa.gov/region09/waste/solid/index.html http://www.ciwmb.ca.gov/ContactUs/	Jacques Franco - CIWMB (916) 341-6608 JFranco@ciwmb.ca.gov		
	Recycling Market Development Zone (RMDZ)	California Integrated Waste Management Board (CIWMB)	4% loan up to $2M for up to 75% of project cost. Conversion projects maybe be eligible, but are a low priority for RMDZs, better suited for recycled end-user product.	Businesses and not-for-profit organizations	http://www.ciwmb.ca.gov/RMDZ/Loans/	Michael Wonsidler Phone: 858-874-4081 Michael.Wonsidler@sdcounty.ca.gov	JPA not eligible	4.00% Loan up to $2M or 75% of project cost
	Greenhouse Gas Offsets	The Climate Trust	Funds available to project that meet requirements including: reduction of 50,000 mt CO2 in project lifetime	$4/mt	http://www.climatetrust.org/solicitations_open.php	Peter Weisberg 503-238-1915 ext 207	**Eligible**	**Eligible**
	Resource Conservation Funds 2009	EPA Region 9	Funds available to projects that address solid waste reduction and management. EPA Region 9 anticipates awarding approximately 2 to 4 cooperative agreements and/or grants totaling approximately $120,000	States, local, Tribal, interstate, and intrastate government agencies and instrumentalities; and nonprofit organizations that are not 501(c)(4) organizations that lobby, including nonprofit educational institutions and nonprofit hospitals. Individuals and for-profit organizations are not eligible to apply.	http://www.epa.gov/region09/funding/rcra.html	Saskia van Gendt (vangendt.saskia@epa.gov) Phone: (415) 947-4103	Eligible (Closed for 2009)	Eligible (Closed for 2009)

Attachment A

Food-Waste To Energy (F2E) Funding Resources - CMSA

Funding Type	Funding Name	Administering Agency	Available Funds	Targeted Recipients	Website	Contact	Applicability to CMSA	
							Publicly Funded Project	Privately Funded Project
Grants/Loans (ctnd.)	Infrastructure State Revolving Fund Program (ISRF)	I-Bank	Provides low-cost financing to public agencies for a wide variety of infrastructure projects. ISRF Program funding is available in amounts ranging from $250,000 to $10,000,000, with loan terms of up to 30 years. Interest rates are set on a monthly basis.	Public agencies (including JPAs)	http://www.ibank.ca.gov/Programs/infrastructure.html	Diane Cummings E-mail: dcummings@ibank.ca.gov Phone: (916) 324-4805	Eligible	N/A
	Public Agency Program - Water/Wastewater	California Statewide Communities Development Authority (CSCDA)	Issues pooled revenue bonds for seeking to finance or refinance public capital improvements to water, wastewater, and sewer facilities throughout California (projects range from $250k-$50,000,000 with repayment terms up to 40 years at low fixed rate)	Municipalities and special districts	https://www.psacommunities.org/fs/apps/?app=14	Terrence Murphy at (925) 933-9229 ext. 223 or Mimi Henderson of Henderson Capital at (510) 835-0610.	Eligible	NA
	Pollution Control Tax-Exempt Bond Financing Program	California Pollution Control Financing Authority	Program provides private activity tax-exempt bond financing. Businesses approach with bond underwriter and apply for variable rate bonds weekly rates **(as low as 1.7%)**	California businesses	http://www.treasurer.ca.gov/cpcfa/bondfinancing.asp	Doreen Smith, CPCFA 916-651-6503	N/A	**Eligible**

Attachment A

Food-Waste To Energy (F2E) Funding Resources - CMSA

Funding Type	Funding Name	Administering Agency	Available Funds	Targeted Recipients	Website	Contact	Applicability to CMSA	
							Publicly Funded Project	Privately Funded Project
Credits/Rebates	Renewable Electricity Production Tax Credit (PTC)	U.S. Department of Treasury	Closed-Loop Biomass = 2.1¢/kWh Open-Loop Biomass & Municipal Solid Waste = 1.0¢/kWh	Commercial, Industrial	http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=US13F		N/A	**Eligible**
	Business Energy Investment Tax Credit (ITC)	IRS / U.S. Department of Treasury	30% for Fuel cells, 10% for Microturbines, 10% for Combined Heat and Power (CHP)	Corporate Tax Credit for Commercial, Industrial, & Utility	http://www.dsireusa.org/library/includes/incentivesearch.cfm?Incentive_Code=US02F&Search=Technology&techno=combined_heat_power%A4tpageid=2&EE=1&RE=1		N/A	**Eligible**
	Feed-In Tariff (FIT)	California Public Utilities Commission/SDG&E	Customer-generators enter 10-, 15-, or 20-year contracts with utilities to sell electricity produced by renewable energy systems (up to 1.5 MW). Rates vary based on time of day and year contract is signed. Tariff set at market price referant (MPR).	Water, waste water, and every other customer of PG&E, SDG&E, SCE, and other utilities. Can enter a "full buy sell" or an "excess energy" agreement	http://dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA167F&state=ca&CurrentPageID=1&RE=1&EE=1 http://www.sdge.com/business/ratesTariffs.shtml	Kevin Barker, CEC 916-651-6176	**Eligible. Note: Any customer-generator who sells power to the utility under this tariff may not participate in other state incentive programs (i.e. net metering, SGIP).**	**Eligible. Note: Any customer-generator who sells power to the utility under this tariff may not participate in other state incentive programs (i.e. net metering, SGIP).**
	Self-Generation Incentive Program (SGIP)	California Public Utilities Commission / CA Center for Sustainable Energy (CCSE)	Rebate from $2.50/W to $4.50/W for fuel cells	Retail customers of PG&E, SDG&E, SCE, or SoCal Gas	http://www.cpuc.ca.gov/PUC/energy/DistGen/sgip/index.htm http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA23F&state=CA&CurrentPageID=1&RE=1&EE=1CEC http://www.sdenergy.org/ContentPage.asp?ContentID=35&SectionID=24 http://www.sdge.com/business/selfGeneration.shtml http://www.cpuc.ca.gov/PUC/energy/DistGen/sgip		**Eligible. Note: Any customer-generator who sells power to the utility under this tariff may not participate in other state incentive programs (i.e. FIT).**	**Eligible. Note: Any customer-generator who sells power to the utility under this tariff may not participate in other state incentive programs (i.e. FIT).**
	Net Metering	Local Utility Providers (SDG&E)	New energy generation must be used on site. Program credits monthly bill, at existing tariff, for surplus energy generated.	Utility customers	http://www.sdge.com/business/netMetering.shtml		**Eligible**	**Eligible**
	Renewable Energy Credits (RECs)	California Public Utilities Commission	Distributed generation (DG) owners are allowed to keep or sell the renewable energy credits (RECs) associated with their facilities.		http://www.epa.gov/chp/funding/funding2/calcadgrenewableenergycreditsr.html		Eligible	Eligible
	Existing Renewables Facilities Program (ERFP)	CEC	Production based incentives to keep facilities operating and profitable. Acts as a price guarantee ($/kwh) if market price dips below target price.	Existing renewable energy generating facilities (in operation prior to 1996) are eligible for incentive	http://www.energy.ca.gov/renewables/existing_renewables/index.html	Jason Orta Phone: 916-653-5851 E-mail: jorta@energy.state.ca.us	N/A (Only eligible is selling power back to the grid)	N/A (Only eligible is selling power back to the grid)
	Emerging Renewable Program (ERP)	CEC	Rebate for fuel cells of $3.00 per W, eligible systems < 30 kW	Commercial, Industrial, Residential, Schools, Low-Income Residential, Agricultural, Institutional	http://www.dsireusa.org/library/includes/incentive2.cfm?Incentive_Code=CA30F&state=CA&CurrentPageID=1&RE=1&EE=1 http://www.energy.ca.gov/renewables/emerging_renewables/index.html http://www.consumerenergycenter.org/erprebate/		Eligible depending on size of fuel cell	Eligible depending on size of fuel cell
	Renewable Energy Production Incentive (REPI)	DOE's Office of Energy Efficiency and Renewable Energy (EERE)	The Renewable Energy Production Incentive (REPI) provides a production payment of 1.5 cents/kWh (1993 dollars indexed for inflation) available for the first ten years of operation.	Public agencies and non-profits	http://www.eere.energy.gov/repi/		Very little funding	N/A
	SCE - Biomass Standard Contract	Southern California Edison	Maximum production incentive = $95.72/MWh	Commercial, Industrial, Agricultural	http://www.sce.com/EnergyProcurement/bsc.htm		N/A (PG&E)	N/A (PG&E)

Appendix B: Greenhouse Gas (GHG) Calculations

CMSA Food to Waste Energy: General Estimate of Major Changes in GHG Emissions Resulting From Project

Assumptions and Parameters Used in Calculations

Parameter	Value	Units	Source
Estimated GHG reductions from landfill diversion of food waste			
Food waste mass	15	wet short tons/day	D.P.
Emissions factor for food discards in landfill	0.08	MT Ce/wet metric ton	Solid Waste Management And Greenhouse Gases: A Life-Cycle Assessment of Emissions and Sinks, 2nd EDITION, EPA530-R-02-006, May 2002, Exhibit 7-6. Value used is for landfilled waste with CH4 recovery and flaring, food discards. http://www.epa.gov/climatechange/wycd/waste/downloads/greengas.pdf
Days per year emissions occur	365	days/yr	D.P.
Conversion of MTCe/wet metric ton to MTCO2e/wet short ton	3.33	gCO2e/gCe * lb short ton/lb metric ton	--
Estimated GHG emissions avoided	**1457**	**MT CO2e/yr**	calculated
Estimated GHG reductions from biogenic methane instead of natural gas			
Gas Production from FW in digester	79000	cu ft/day	D.P.
Methane content of digester gas	60%	percent CH4	D.P.
Energy density of FW2E methane	600	Btu/cu ft	D.P.
Energy from FW2E Methane	*28.44*	*MMBtu/day*	Calculated. Approximate that this equals energy avoided from natural gas combustion.
CO2 Emissions factor for stationary combustion of natural gas	0.0546	kg/cu ft	The Climate Registry General Reporting Protocol 3.1, Table C7.Carbon Dioxide Emission Factors for Stationary Combustion. January 2009. http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
CH4 Emissions factor for stationary combustion of natural gas	0.001	kg/MMBtu	The Climate Registry General Reporting Protocol 3.1, Table C8. Methane and Nitrous Oxide Emission Factors for Stationary Combustion by Fuel Type and Sector. January 2009. http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
N2O Emissions factor for stationary combustion of natural gas	0.00010	kg/MMBtu	The Climate Registry General Reporting Protocol 3.1, Table C8. Methane and Nitrous Oxide Emission Factors for Stationary Combustion by Fuel Type and Sector. January 2009. http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
volume/heat content for natural gas (generic value)	0.00097	cu ft/MMBtu	Energy Information Administration. http://www.eia.doe.gov/emeu/aer/txt/ptb1304.html
conversion factor for mass	0.45372	lb/kg	--
Global warming potential of CH4	23	MT CO2e/ MT CH4	IPCC 2001
Global warming potential of N2O	296	MT CO2e/MT N2O	IPCC 2001
Days per year emissions occur	365	days/yr	D.P.
GHG emissions avoided from reduction in utility natural gas combustion	*140*	*MT CO2e/yr*	calculated
density of methane at standard conditions	662	g/m^3	Default factor from Local Government Operations Protocol For the quantification and reporting of greenhouse gas emissions inventories. Version 1.0. September 2008. Equation 10.1: Stationary CH4 from Incomplete Combustion of Digester Gas
CH4 destruction efficiency	0.99	unitless	Default factor from Local Government Operations Protocol For the quantification and reporting of greenhouse gas emissions inventories. Version 1.0. September 2008. Equation 10.1: Stationary CH4 from Incomplete Combustion of Digester Gas
conversion factor	0.0283	m^3/ft^3	--
Days per year emissions occur	365	days/yr	D.P.
Global warming potential of CH4	23	MT CO2e/ MT CH4	IPCC 2001
conversion factor	1.E-06	MT/g	--

Reduction in emissions from incomplete combustion of digester gas from FW2E (negative number indicates an increase in emissions)	*-75*	*MT CO2e/yr*	Calculated based on the Local Government Operations Protocol For the quantification and reporting of greenhouse gas emissions inventories. Version 1.0. September 2008. Equation 10.1: Stationary CH4 from Incomplete Combustion of Digester Gas. ***The CO2 emissions from burning wood, wood waste and biogas are considered biogenic and are not included as a direct stationary emissions in a standard GHG inventory (CCAR GRP v. 3.1). Therefore, emissions presented here consider only CH4 emissions from the incomplete combustion of digester biogas.***
Estimated net emissions reduction from burning of digester gas instead of natural gas from utility	**65**	**MT CO2e/yr**	calculated
Estimated GHG reduction due to less miles driven by the food waste hauling truck			
CO2 emissions factor for vehicle emissions (default)	1.3E-03	MT CO2 /mi	CO2 emissions factor is the 20-year average for delivery trucks assuming no changes in emissions factors after 2026, retrieved from the SCAQMD Emissions Factors Model, Highest (Most Conservative) EMFAC2007 (version 2.3). http://www.aqmd.gov/ceqa/handbook/onroad/onroadEF07_26.xls
CH4 emissions factor for vehicle emissions (default)	5.1E-03	g CH4 /mi	CH4 and N2O emissions factors are for Diesel Heavy-Duty Vehicles, retrieved from The Climate Registry General Reporting Protocol 3.1, Table C4. January 2009. http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html. CH4 = 0.0051 g/mi, N2O =0.0048 g/mi
N2O emissions factor for vehicle emissions (default)	4.8E-03	g N2O /mi	CH4 and N2O emissions factors are for Diesel Heavy-Duty Vehicles, retrieved from The Climate Registry General Reporting Protocol 3.1, Table C4. January 2009. http://www.climateregistry.org/tools/protocols/general-reporting-protocol.html
conversion factor	1.0E-06	MT/g	--
Global warming potential of CH4	23	MT CO2e/ MT CH4	IPCC 2001
Global warming potential of N2O	296	MT CO2e/MT N2O	IPCC 2001
Distance from transfer station to landfill	20	miles	D.P.
Distance from transfer station to CMSA plant	1	miles	D.P.
Trips per day	1	trip	D.P.
Days per year	365	days per year	D.P.
Estimated emissions avoided from reduced truck hauling mileage	**9**	**MT CO2e/yr**	calculated
Additional estimated GHG due to new equipment that uses electricity			
Energy Usage Increase due to new equipment	447.6	kWh/day	D.P.
Days per year emissions occur	365	days/yr	D.P.
Electric utility emissions	635.7	lbs CO2/MWh delivered (in	2007 PG&E emissions factor, PUP report 2009
conversion factor	0.001	MWh/kWh	--
conversion factor	4.5E-04	Metric tons per pound	--
Reduction in emissions from additional equipment (negative number indicates an increase in emissions)	**47**	**MT CO2e/yr**	calculated
Estimated Reduction in GHG emissions after F2WE proje	**1578**	**MT CO2e/yr**	

Abbreviations:

Ce	carbon equivalent
CH4	methane
CO2	carbon dioxide
CO2e	carbon dioxide equivalent
cu ft	cubic foot
D.P.	from Dan Patten
ft	feet
g	gram
GHG	greenhouse gas
IPCC	intergovernmental panel on climate change
lb	pound
m	meter
mi	mile
MT	metric ton
N2O	nitrous oxide
yr	year

Appendix C: CEQA Initial Study Checklist

10 July 2009

Technical Memorandum No. 4

To: Jason Dow, CMSA

From: Mike Barnes, P.E. Kennedy/Jenks

Review: Joel Faller, P.E., Kennedy/Jenks

Subject: Food Waste to Energy Facilities
CEQA – Initial Study Checklist
Task Order 1A – F2E Predesign Tasks
K/J 0968013*01

General

Attached is the draft completion of the CEQA Appendix G, Environmental Checklist Form (Form) for the proposed Food Waste to Energy Facilities at the CMSA wastewater treatment plant (Project). This checklist is used to complete an Initial Study of a project to determine whether the project has environmental impacts that would either need to be mitigated, or addressed in an Environmental Impact Report (EIR). We completed the Evaluation of Environmental Impacts section of this Form to review whether the project has any environmental impacts that would potentially trigger an EIR.

We also filled in the general agency information section of the Form that was readily available, and highlighted the information that needs to be added to complete the Form. Once this information is added, the Form would be suitable for use in completing the project Initial Study for the CEQA environmental review process.

Evaluation of Environmental Impacts

Based on our initial assessment we checked the "No Impact" box for each of the questions in the 17 categories of Evaluation of Environmental Impacts section of the Form. At the end of each category, we included a brief explanation to support our answer to the questions.

To complete the checklist, we did make some assumptions that we need CMSA to confirm. We assumed that CMSA would be able to readily confirm these assumptions based on previous environmental evaluations for projects on the plant site. These sections are highlighted in yellow.

In summary, we believe the project will not have a significant effect on the environment. Based on this, we believe a negative declaration would be the appropriate determination for the proposed Food Waste to Energy Facilities at the treatment plant.

Proposed FOG Facility and Digester Rehabilitation Projects

Although we did not include these proposed projects in the above evaluation, we believe that these projects would also not have a significant effect on the environment. However, if a new digester cover is installed, it may need to be acknowledged that it would potentially alter the aesthetics of the plant. While the answers to the four questions in the Aesthetics section of the Form would still probably be “No Impact”, the cover may be more noticeable from Anderson Drive than the current covers, and it may be prudent for CMSA to note this.

cc: Ken Katen, CMSA
Chris Finton, CMSA
Rob Cole, CMSA
Joel Faller, K/J
Dan Patten, K/J

Appendix G

Environmental Checklist Form

1. Project title: Food Waste to Energy Project

2. Lead agency name and address: Central Marin Sanitation Agency (CMSA)
1310 Andersen Drive
San Rafael, CA 94901

3. Contact person and phone number: Jason Dow, General Manager
415-459-1455

4. Project location: Central Marin Sanitation Agency Wastewater Treatment Plant site located at 1301 Anderson Drive, San Rafael, CA 94901

5. Project sponsor's name and address: Central Marin Sanitation Agency
1310 Andersen Drive
San Rafael, CA 94901

6. General plan designation: _____ 7. Zoning: _____

8. Description of project:

Construction of facilities on the wastewater treatment plant site of the Central Marin Sanitation Agency to receive and process separated food waste from trucks. After processing of the food waste, the materials will be fed directly to the existing anaerobic digesters which will produce additional methane. The additional methane will be used to displace natural gas as a fuel to produce electricity to power wastewater treatment equipment and facilities.

9. Surrounding land uses and setting:

The Project site is located within the San Rafael city limits in Marin County's eastern urban corridor. This corridor contains most of Marin County's population as well as over 97 percent (23 million square feet) of the County's commercial and industrial floor area. Land uses are predominantly residential uses, intermixed with commercial and industrial uses. State Route 101 is the major link that connects the communities in the eastern urban corridor to other areas in Marin County. Land uses surrounding the WWTP site include industrial, light industry/office, general commercial, and public–quasi-public uses.

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)

The Bay Area Air Quality Management District will need to issue a permit to construct and operate the odor scrubbers to be constructed as a part of the project. The general

air quality permit for the Wastewater Treatment Plant will need to be modified to include the odor scrubbers.

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology/Soils
☐ Hazards & Hazardous Materials	☐ Hydrology/Water Quality	☐ Land Use/Planning
☐ Mineral	☐ Noise	☐ Population/Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities/Service Systems	☐ Mandatory Findings of Significance	

DETERMINATION: (To be completed by the Lead Agency)

On the basis of this initial evaluation:

☒ I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

☐ I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.

☐ I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.

☐ I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.

☐ I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

_____ _____

Signature Date

_____ _____

Printed Name For

EVALUATION OF ENVIRONMENTAL IMPACTS:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS -- Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☒
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☒
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Aesthetics Discussion

The project will not have any noticeable visible impact. The treatment plant contains structures and equipment on the plant site, and the proposed facilities are similar in general appearance to the existing facilities.

II. AGRICULTURE RESOURCES: In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒

Agricultural Resources Discussion

The facilities will be installed on the site of the existing wastewater treatment plant. The plant site is not used for any agricultural resources.

III. AIR QUALITY -- Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☒
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☒
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☒

Air Quality Discussion

The new receiving facilities will be enclosed and the air will be exhausted to a scrubber system for odor removal prior to release to atmosphere. Consequently, the project will not cause the release of criteria pollutants and will have minimal impact on the air quality. CMSA will need to apply to the Bay Area Air Quality Management District for a permit for the new facilities. The facilities would then be added to CMSA's existing BAAQMD permit for the wastewater treatment plant site.

IV. BIOLOGICAL RESOURCES -- Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☐	☒
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or US Fish and Wildlife Service?	☐	☐	☐	☒
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☐	☐	☒
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☐	☐	☒
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Biological Resources Discussion

There are no known biological resources on the project site that would be impacted by the project. There are no known sensitive species as identified by the California Department of Fish and Game or the U.S. Fish and Wildlife Service on the project site. There are no wetlands on the project site as defined by Section 404 of the Clean Water Act.

V. CULTURAL RESOURCES -- Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause a substantial adverse change in the significance of a historical resource as defined in § 15064.5?	☐	☐	☐	☒
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to § 15064.5?	☐	☐	☐	☒
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒
d) Disturb any human remains, including those interred outside of formal cemeteries	☐	☐	☐	☒

Cultural Resources Discussion

Based on previous projects on the plant site, cultural resources are not known to exist on the plant site.

VI. GEOLOGY AND SOILS -- Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☐	☐	☐	☒
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv) Landslides?	☐	☐	☐	☒

b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☒
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☒
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒

Geology and Soils Discussion

The project is planned to be located in an area of the treatment plant site that does not include expansive soil. The project will be designed in accordance with the latest edition of the California Building Code.

VII. HAZARDS AND HAZARDOUS MATERIALS --
Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☐	☒
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒

e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☒

Hazards and Hazardous Materials Discussion

The project will not cause any hazards to the public or environment. The project is located on the site of an operating wastewater treatment plant, and public access to the site is restricted. The project will not pose any hazards to the operations and maintenance staff on the plant site, since the facilities to be constructed and operated are similar to other existing facilities on the plant site. The project facilities will not need chemicals or other hazardous materials for its operation. The project specifications will require the contractor to comply with all applicable hazardous materials regulations during the construction of the project.

VIII. HYDROLOGY AND WATER QUALITY -- Would the project:

	Potentially significant Impact	**Less Than significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☒
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted?	☐	☐	☐	☒

c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☐	☒
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☐	☒
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☒
f) Otherwise substantially degrade water quality?	☐	☐	☐	☒
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☒
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☒
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☒
j) Inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☒

Hydrology and Water Quality Discussion

The project will have no impact on water quality since it will not impact the volume of flow through the wastewater treatment plant, nor will it impact the wastewater treatment capabilities of the plant. The drainage pattern of water on plant site will not be functionally changed by the construction of the project.

IX. LAND USE AND PLANNING - Would the project:

	Potentially significant Impact	**Less Than significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**

a) Physically divide an established community?	☐	☐	☐	☒
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☒
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☒

Land Use and Planning Discussion

The project will be constructed on the wastewater treatment plant site and the work has no impact on land use or planning. The facilities to be constructed are similar to other existing facilities on the plant site, and are consistent with the land use of the plant site.

X. MINERAL RESOURCES -- Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

Mineral Resources Discussion

There are no known mineral resources on the wastewater treatment plant site.

XI. NOISE -- Would the project result in:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact

a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Noise Discussion

The project will not expose the public to additional noise levels since the noise generated by the project will not be noticeable off the plant site. Noise on the plant site may be slightly elevated during the construction of the project due to use of construction equipment. However, since numerous pieces of mechanical equipment operate on a daily basis as part of the wastewater treatment processes, the construction noise impact will be minimal. Operation of the project will have minimal, if any, impact on the noise level on the plant site. The project will require mechanical equipment such as pumps, blowers, and mixers which are similar to existing mechanical equipment on the plant site. Overall, the operating noise level of the equipment will likely not be noticeable compared other equipment on the plant site.

XII. POPULATION AND HOUSING -- Would the project:

	Potentially significant Impact	**Less Than significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**

a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Population and Housing Discussion

The project will have no impact on population since will not change the treatment capacity of the wastewater treatment plant. There is no housing on the plant site, and the project does not involve housing.

XIII. PUBLIC SERVICES

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☒
Fire protection?	☐	☐	☐	☒
Police protection?	☐	☐	☐	☒
Schools?	☐	☐	☐	☒
Parks?	☐	☐	☐	☒
Other public facilities?	☐	☐	☐	☒

Public Services Discussion

The project will have no impact on public services. The project will add minor facilities that will need to be operated and maintained by the existing wastewater treatment plant staff. However, the minor increase in workload will not cause additional staff to be hired. The project will have no impact on other public services.

XIV. RECREATION

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

Recreation Discussion

The wastewater treatment plant site is not used for public, or private recreation, hence the project has no impact on this.

XV. TRANSPORTATION/TRAFFIC -- Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☒
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☒
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
e) Result in inadequate emergency access?	☐	☐	☐	☒

f) Result in inadequate parking capacity?	☐	☐	☐	☒
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☒

Transportation/Traffic Discussion

There will be a temporary, minor increase in traffic to the plant site during construction of the facilities due to construction vehicle traffic. However, this increase may not be noticeable since the project is relatively small, and will not require a large construction staff. Furthermore, the period of active construction will likely be less than 6 months.

Upon completion of the project, there would be one additional truck per day to deliver 15-20 tons of food waste to the CMSA wastewater treatment plant in San Rafael. This is a short trip since the solid waste transfer station is about ½ mile away. This will eliminate one truck load of food waste per day that is presently hauled to Redwood Sanitary Landfill in Novato, which is over 15 miles away from the solid waste transfer station in San Rafael.

The project will likely result in additional biosolids to be disposed of. However, this would be a relatively insignificant increase, and would not result in additional truck trips for disposal.

XVI. UTILITIES AND SERVICE SYSTEMS -- Would the project:

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☒
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☒
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☒

e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☒
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☒
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☒

Utilities and Service Systems Discussion

The project will not increase or decrease the treatment capacity of the wastewater treatment plant. Nor will it have any impact on other utility or services.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

	Potentially significant Impact	Less Than significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☐	☒
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☐	☐	☐	☒
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☒

Mandatory Findings of Significance Discussion

The project consists of a construction of a relatively small concrete tank and appurtenances on the CMSA wastewater treatment plant site. The proposed facilities are similar to other existing concrete tanks and appurtenances on the project site and will have no impact on fish, wildlife, or human beings. The incremental addition of the project will not change the cumulative impact of the overall CMSA wastewater treatment plant on the environment.