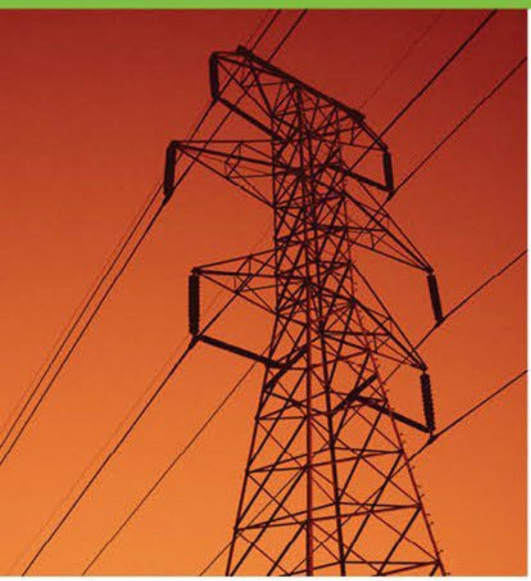
Resource Recovery Project

Feasibility Study Report

City of Brentwood
March 24, 2023



anaergia.com

City of Brentwood
Public Works / Engineering
Brentwood City Hall, Second Floor
150 City Park Way
Brentwood, CA 94513
Attn: Casey Wichert
cwichert@brentwoodca.gov

Dear Casey Wichert,

Anaergia Technologies, LLC ("Anaergia") is pleased to submit this Feasibility Study Report to the City of Brentwood ("City"). Anaergia appreciates the opportunity to partner with the City on evaluating the feasibility of this important organics management and resource recovery endeavor. This report represents a summary of the collaboration between Anaergia and the City on evaluating the feasibility of developing a resource recovery project at the City's solid waste and wastewater treatment facilities. Anaergia is a Delaware limited liability company, whose office is located at 705 Palomar Airport Rd, Ste 200, Carlsbad, CA.

Anaergia is the leading technology and solution provider in the recovery of resources and valuable products from organic waste, including from solid waste and wastewater treatment plants, and converting them into renewable energy and fertilizer. Our technologies and integrated solutions are used to achieve organics recycling and landfill diversion goals, reduce greenhouse gas emissions, leverage existing infrastructure, and minimize costs.

Anaergia is uniquely positioned to deliver a best-value resource recovery project to the City, with the following:

- A turnkey resource recovery project that enables the City to achieve SB1383 compliance.
- Organics recovery from the City's Municipal Solid Waste (MSW) without requiring any change to the City's current solid waste collection operations.
- Generates carbon-negative renewable energy through the anaerobic digestion of the City's recovered organics and biosolids.
- Offers revenue generating opportunities through the sale of renewable energy.
- Leverages Anaergia's experience designing, building, owning, and operating resource recovery project.

We look forward to partnering with the City on this project to enhance the City's resource recovery goals. If you have any further questions, please contact me at 408 – 580 – 6572.

Regards,

S Petkiewicz

Shayne Petkiewicz
Business Development Manager
Shayne.petkiewicz@anaergia.com
408 – 580 – 6572

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1. Executive Summary

Introduction

Anaergia appreciates the opportunity to partner with the City of Brentwood (City) on this Resource Recovery Project (Project). This Project has the opportunity to enable compliance with California Senate Bill 1383 organics diversion mandates, and do so in a manner that brings investment, economic development, and revenue through the beneficial reuse of organic waste into renewable energy and soil amendments.

In preparing this feasibility study, Anaergia has evaluated several pathways to ensure that the City's organics management goals will be realized. The recommended Project utilizes best practices developed through experience gained from numerous Anaergia resource recovery facilities.

Our Understanding of the City's Goals

Anaergia understands that the goal of this initiative is to develop a resource recovery facility capable of beneficially reusing organic waste and production of renewable energy as well as biosolids for further processing into biochar. Anaergia has focused on an integrated approach for this project that offers significant benefits to the City and its residents.

A significant objective for the City involves achieving SB1383's stated goals to divert 75% of organic waste from landfill and transformed into valuable resources such as fertilizer and renewable energy. SB1383 was specifically passed to target the reduction of greenhouse gas emissions associated with the breakdown of organics in landfill and release of methane – a potent short-lived climate pollutant – into the atmosphere.

Anaergia also understands that the City is particularly interested in achieving its SB1383 targets without needing to change the City's current solid waste collection operations. Source separation of organics presents significant challenges and costs, namely: additional trucks, drivers, and collection bins; significant levels of sustained education and enforcement; and changes to the City's existing route service. Anaergia's feasibility study evaluated opportunities to achieve organics diversion through mechanical separation of organics following waste collection.

Opportunity

Implementing a mixed-waste processing solution, along with anerobic digestion (AD), and biogas utilization at the City's municipal solid waste (MSW) transfer station and wastewater treatment plant (WWTP) presents a significant opportunity. One that includes the expansion of the City's existing transfer station and installation of a mixed-waste processing line, construction of a new purpose-built anaerobic digester, installation of a turn-key biogas utilization solution, and ultimate generation of AD biosolids that are complementary with the City's drying and pyrolysis facilities.

Anaergia has reviewed and evaluated the City's available organic waste types – MSW, Yard Waste (YW), wastewater biosolids – as well as available organic waste types and quantities within a 50-mile radius from the plant and feels confident that there is sufficient organic waste to support the co-digestion of organic wastes on-site. This proposed approach is enabled by Anaergia's proprietary technologies, including the

Organics Extrusion (OREX™) Press, Organics Polishing System (OPS™), and Omnivore™ High-Solids Anaerobic Digestion system. Combined, they are capable of recovering organic waste from the City's solid waste and wastewater streams, converting recovered materials into a digestible slurry, and generating biogas and a nutrient rich soil amendment.

Robust Technical Approach

Multiple design options were evaluated, which are conceptually described below, with additional details provided in Section 4.

Status Quo

This solution was developed to explore the possibility of City maintaining current operations at the transfer station and wastewater treatment plant. In this scenario, the City's MSW would be landfilled, while YW and biosolids would continue being disposed of as an Alternate Daily Cover (ADC).

Source Separation

The Source Separation scenario explored the impacts to the City operations by requiring all solid waste customers to separate organic from the garbage and dispose of them in separate carts. In this scenario, the City would offer an expanded collection program to collect source separated organics, transfer at the City's transfer station, and dispose of at an existing compost facility. Biosolids would initially be composted until the City's drying and pyrolysis facility becomes operational (outside of scope of this Project).

Anaergia – 1a

The Anaergia – 1a scenario explored recovering organics from the City's MSW while the City's YW would continue to be transferred directly to compost.

The Organic Fraction of MSW (OFMSW) would be co-digested with the City's biosolids through AD to produce biogas and a soil amendment.

Anaergia – 1a would entail the expansion of the City's transfer station and construction of a new co-digestion AD facility.

Anaergia – 1b

The Anaergia – 1b scenario explored recovering organics from the City's MSW while the YW would continue to be transferred directly to compost.

The OFMSW and biosolids would be co-digested with the City's biosolids through AD, along with additional external organic high strength waste (HSW) that would increase biogas production.

Anaergia – 1b would entail the expansion of the City's transfer station, construction of a new co-digestion anaerobic digestion facility, and high strength waste receiving skid.

Anaergia – 2a

The Anaergia – 2a scenario explored recovering organics from the City's MSW and YW. The OFMSW and Organic Fraction of Yard Waste (OFYW) would both be co-digested with the City's biosolids through anerobic digestion to produce biogas and a soil amendment.

Anaergia – 2a would entail the expansion of the City's transfer station and construction of a new co-digestion anaerobic digestion facility.

Anaergia – 2b

The Anaergia – 2b scenario explored recovering organics from the City's MSW and YW. The OFMSW, OFYW, biosolids, and HSW would be co-digested to produce biogas and a soil amendment.

Anaergia – 2b would entail the expansion of the City's transfer station, construction of a new co-digestion anaerobic digestion facility, and high strength waste receiving skid.

Recommended Design Scenario

To compare the design scenarios presented in this report, Anaergia used an evaluation matrix that considered regulatory alignment, capital costs, operational savings/costs, and revenue generation. From this matrix, it was clear that the scenario Anaergia – 2b was the preferred option.

Lasting Community Impact

The City stands to lead a significant opportunity to demonstrate and showcase an economical, regional approach to organic waste diversion and resource recovery. Doing so would ensure compliance with state organics diversion goals and generate carbon-negative renewable energy and soil amendments that can be utilized within the local community.

Key Value Proposition of Anaergia Solutions

- Compliance with SB1383.
- Mixed-waste processing approach for organics diversion.
- Beneficial reuse of City's biosolids.
- Production of carbon-negative renewable energy and soil amendments through anaerobic digestion.
- Proven solid waste and anaerobic digestion treatment technology.
- Robust partner capable of developing, designing, building, and operating Project.
- Network of HSW haulers capable of delivering feedstock to the Project.
- Revenue generation opportunities to offset compliance costs.
- Enhanced long-term resource recovery infrastructure.

2. Project Motivation & Background

Project Motivation

Anaergia evaluated a variety of the City's solid waste, wastewater, and facility knowledge to explore options that would optimize the current and future regulatory, environmental, and economic benefits of the Project. The feasibility is driven by several factors:

SB1383 Organics Diversion Compliance

SB1383 (Lara, 2016) was signed into law as part of California's statewide effort to reduce emissions of short-lived climate pollutants (SLCP) such as methane by 40% below 2013 levels by 2030. A key contributor to the state's SLCP emissions inventory involves the emissions of methane from landfills arising from the breakdown of organic waste. In an effort to reduce emissions of methane from landfills, the state has set targets to reduce organics waste (i.e., food scraps, biosolids, yard trimmings, paper, cardboard, etc.) disposal by 75% by 2025. Anaergia's proposed Project would ensure that the City achieve its stated organics diversion targets and do so in a way that maximizes environmental, economic, and social benefits to the community.

High Diversion Organic Waste Processing Facility (HDOPF)

CalRecycle SB1383 regulations offer jurisdictions the opportunity to achieve their organic waste diversion targets through a number of waste collection services. Namely, either source separated organics container collection services or through single unsegregated collection service and post-collection organics processing at a HDOPF. Anaergia's proposed Project includes an HDOPF that allows the City to achieve its organics diversion goals while maintaining its unsegregated collection services. This feasibility study identified several benefits that can be achieved by pursuing this approach, including:

- No impact to existing route service
- No need for additional trucks or drivers
- Does not require behavior change by residents and businesses

Carbon-Negative Renewable Energy

The Project's anaerobic digester offers the City the opportunity to recover resources from a multitude of the City's organic wastes, including OFMSW, OFYW, and its wastewater treatment biosolids. Anaergia's AD technologies and solutions enable the co-digestion of these various organic waste streams and recovery of resources such as carbon-negative renewable energy. The biogas generated by the Project can be converted either to power and used for the City's on-site power demands or upgraded to carbon-negative Renewable Natural Gas (RNG) and injected into the grid. Both offer the City significant economic incentives by either reducing power costs or revenue generation from the sale of RNG.

Biosolids Management

The proposed Project would also offer the City significant benefits through improved biosolids management. In addition to enhancing biogas production through AD, anaerobically digesting the City's Waste Activated Sludge (WAS) also would benefit the City's downstream drying and pyrolysis facility. AD increases dewaterability of biosolids and reduces the total solids while recovering highly valuable energy in the form of biogas. This greatly reduces the total energy required for drying, resulting in higher net energy recovery from the incoming WAS. AD also aids in homogenization of the biosolids reducing fluctuations in downstream drying and pyrolysis processing while creating a biosolids with less material handling and odor issues during intermediate storage and beneficial reuse applications.

Regional Organics Outlet

The proposed Project could include additional anaerobic digestion capacity, as well as a receiving station, to allow for receipt of external HSW. Doing so would offer the surrounding area with a viable SB1383 outlet. Increasing organics feedstock to the anerobic digester further increases biogas production, and subsequent renewable energy, and generates direct revenue streams through tip fees.

Study Objectives

This study focuses on the feasibility of developing a resource recovery project at the City's solid waste and wastewater facility for diversion of organics from landfill and generation of renewable energy and fertilizer. The study objectives were to:

- Carry out an assessment of City's existing solid waste and biosolids management.
- Develop a turnkey HDOPF to separate divert organics from the City's landfill-bound waste.
- Establish a design basis to co-digest the City's organic waste and biosolids through anerobic digestion.
- Determine the estimated costs and revenues associated with the Project.

Technology Background

As a technology leader, Anaergia is intimately familiar with a spectrum of possible solutions to achieve the City's goals. Anaergia has deep expertise spans the solid waste, anaerobic digestion, and biogas treatment sectors and offer the City a holistic solution to help it achieve its many objectives.

Organics Extraction & Polishing

Anaergia offers solutions to recover organic materials from any solid waste stream, including source separated organics and comingled MSW. Recovered organics are energy dense and ideal for generating renewable energy within anaerobic digesters, in addition to septage and other high strength waste from local industry. Such solutions produce reliable, clean organic feedstock supply needed to support a bioenergy project, while reducing waste volumes sent to landfill.

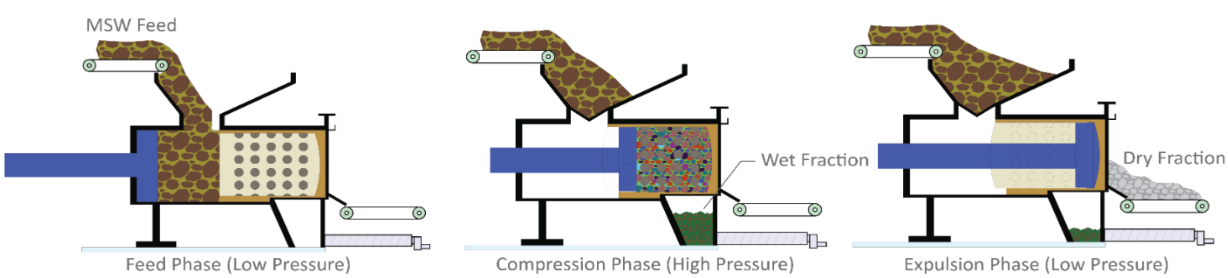

Figure 1: OREX™ Phases of Operations

Organics Extraction: Anaergia's OREX™ extracts over 90% of putrescible organics from the material fed to it and generates a clean and highly digestible wet organic fraction ideal for conversion to biogas and fertilizer through AD. The waste stream is fed into an enclosed extrusion chamber in the OREX™ press where it is compressed with a hydraulic ram under high pressure. As pressure is applied, wet organics squeeze through the compressed comingled material and out through orifices in extrusion plates. The product is an organic fraction cake (25-30% total solids). The dry "reject" fraction that remains in the compartment is removed after each extrusion cycle. The OREX™ is compatible with various current collection program and can leverage existing solid waste infrastructure – through installation at an existing transfer station or MRF – to support organics recovery initiatives.

Organics Polishing: Organics separated from the waste stream require additional polishing prior to digestion to ensure removal of contaminants extruded through the OREX™ press. The organics polishing system (OPS™) includes a dynamic cyclone to remove floatable contaminants such as film plastic and a hydrocyclone to remove grit, followed by grit washing and draining. In the process, the clean organic slurry is diluted to approximately 12-16% TS.

Figure 2: Anaergia's OPS™

The OPS developed by Anaergia is designed to produce a clean organics slurry for wet AD to minimize equipment maintenance, maximize biogas production, and eliminate floating layers and settling of grit in digesters. Polishing also reduces contamination in digestate so that it can be used as a fertilizer material or for land application, meeting state and federal compost quality standards for physical contaminants (drying or other thermal processing may be required).

The OPS may be co-located with an OREX line, or, can be co-located with AD and bioenergy facilities. This approach reduces hauling expense and trucks required for material transport.

Rejects: Materials which cannot be digested, including contaminants such as plastics, wood, grit, and glass will be directed to landfill. As is shown in Figure 3, Anaergia's OPS process ensures that the organics slurry

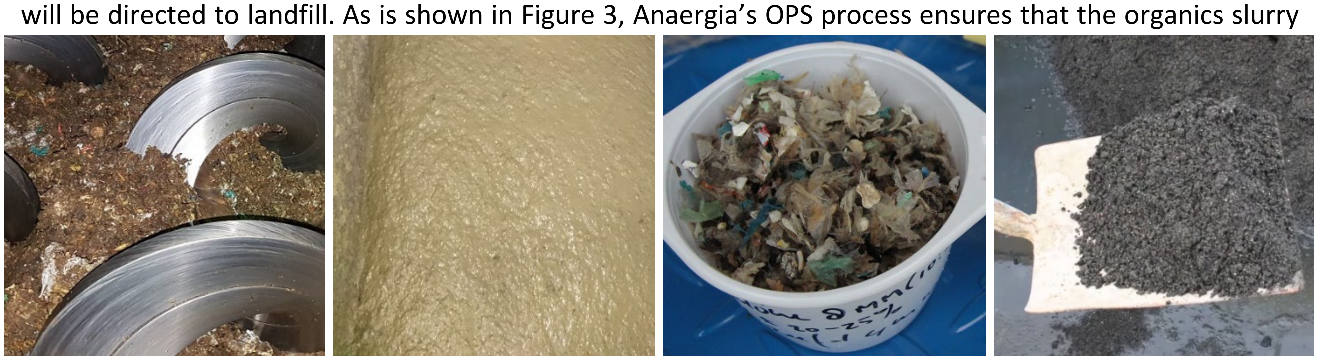

Figure 3: Input and Products from the Organics Polishing System (Left to Right) - Infeed from OREX™, Polished Wet Fraction, Light Rejects, Heavy Rejects

produced for AD is virtually free of foreign materials harmful to downstream equipment, while reject streams can be transported and disposed of with ease.

Omnivore® High Solids Anaerobic Digestion

Once collected, recovered organics and high strength waste can be processed in anaerobic digesters, such as those used for municipal wastewater treatment plants (WWTP). Anaergia's AD technology is specially designed to process such materials via either mono-digestion of organics, or co-digestion with municipal sludge, and can be installed at new facilities or retrofitted to existing digesters at WWTP.

Pre-processed materials are fed to digesters where bacteria convert organic material to biogas. The optimal residence time is typically twenty (20) days, which allows for most of the energy content to be captured. This approach provides economic benefits through the harvesting of biogas (to produce either renewable power or RNG), as well as generation of fertilizer products derived from the clean, nutrient-rich digestate. Environmental benefits include diversion of waste from landfills, prevention of discharge of untreated liquid waste, reduction of greenhouse gas emissions, generation of renewable energy, and reduction in chemical fertilizer for agriculture.

Anaeriga's proprietary Omnivore® is a high solids AD technology that can be operated at three times the organic loading rate of conventional anaerobic digesters. Unlike traditional anaerobic digesters which retain wastewater liquids along with digesting solids, Omnivore® uses thickening to remove unnecessary liquid and increase the solids loading of the feedstock fed to the digester, increasing the working volume available to process organics streams. This provides particular value in co-digesting applications, should clients desire to include municipal sludge in the project scope to support expanded wastewater treatment capacity.

Anaergia's advanced high solids mixing technology is employed to effectively move material within the digesters, even in viscous applications such as organics processing. Effective, thorough mixing is essential to maintaining appropriate conditions for AD and volatile solids reduction (and therefore biogas production). It also reduces O&M by keeping grit suspended.

Figure 4: Camden County WWTP AD and Co-Generation Facility

Anaergia's Omnivore® technology is utilized globally. The platform provides an economical and reliable solution for high solids applications such as this and can be delivered at reduced capital cost and with smaller footprint as compared to both conventional digestion or compost facilities.

Biogas Upgrading (BUG™) & Beneficial Reuse

Biogas has varying concentrations of methane, carbon dioxide, hydrogen sulfide, trace gases, siloxanes, and other VOCs. Appropriate biogas treatment technology is essential to utilizing the resource for renewable energy, and the solution required varies upon the intended biogas beneficial use application. For example, RNG (derived from biogas) must meet stringent standards for pipeline injection. Meanwhile, biogas intended to power cogeneration systems must be conditioned to remove potential pollutants for emissions permitting and to reduce negative impacts on the system. Anaergia offers a variety of biogas treatment systems that are cost-effective and equipped to manage the variability of biogas, both in terms of quality and volume. Anaergia's Biogas Upgrading (BUG™) System meets the most stringent pipeline gas quality standards for RNG using the best available membrane technology while focusing on operability and minimized energy consumption. Biogas is first conditioned to remove unacceptable contaminants such as H2S, NH3, siloxanes, moisture and VOCs to meet pipeline specifications. In the upgrading phase, CO2 is removed from conditioned biogas to produce RNG that meets pipeline specifications along with a methane-lean tail gas. The system contains a compressor skid, a high-pressure conditioning skid, and a membrane skid which can be sized to fit specific needs.

Figure 5: BUG at a California WWTP

Anaergia would work with clients to determine the beneficial use that provides the best value for its needs and priorities, including renewable energy options for local customers. Typically, upgrading to RNG for pipeline injection is the most economically favorable option.

Combined Heat & Power

A Combined Heat and Power (CHP) system would offer clients renewable energy in the form of electricity. Such systems can be designed to self-sufficiently power an AD facility or tie into the grid to generate revenue through a PPA with the local utility. CHP packages typically include a heat recovery system that would provide recoverable heat with rated 42.2% thermal efficiency, available for circulation to the existing sludge heat exchangers to provide heat for the digesters.

Figure 6: Anaergia's 1.6 MW_e Biogas CHP at the Victor Valley Wastewater Reclamation Authority in Victorville, CA

The CHP packages can also include a post combustion treatment system consisting of an Oxidation Catalyst, a Selective Catalytic Reduction system, and an Ammonia Slip Catalyst (ASC).

3. Design Considerations & Approach

Current Organics Management

Solid Waste

Anaergia conducted a review of the City's existing solid waste management practices. The City's Solid Waste Division currently collects MSW, YW, and Recyclables from the City's residential, commercial, and multi-family generators.

The City currently collects MSW on a weekly basis while alternating the collection of its YW and Recyclables streams, resulting in both streams being collected every other week. All three streams are collected and delivered to the City's transfer station – located at 2301 Elkins Way, Brentwood, CA, 94513. Both the MSW and YW are transferred to Republic Services' Keller Canyon Landfill, where the MSW is landfilled and YW is used as ADC. The Recyclables stream is transferred to Republic Services' Newby Island processing facility. The Table below provides a breakdown of the City's total annual tonnages collected by the City in 2021, along with the corresponding collection frequency, and each stream's respective outlets.

Table 1: City Solid Waste Division's Waste Streams

Material Type	Collection Frequency	2021 Tons Per Year (TPY)	Outlet
MSW	Weekly	32,193	Republic Services – Keller Canyon Landfill
YW	Biweekly	10,399	Republic Services – Keller Canyon
Recyclables	Biweekly	7,880	Republic Services – Newby Island

WWTP

Anaergia also reviewed the City's existing biosolids management practices. The City's Sewer (Wastewater) Division and corresponding Wastewater Treatment Plant is a 5.0 million gallon per day (MGD) facility, which currently discharges tertiary treated effluent into Marsh Creek. The WWTP generated an average of 183,185 gpd of Waste Activated Sludge (WAS) in 2021, which resulted in approximately 29.41 TPD of dewatered biosolids (260 run days). The City's biosolids are currently hauled to WM's Altamont Landfill for disposal as ADC. The Table below provides a breakdown of the City's biosolids handling process.

Table 2: City Wastewater Division's Biosolids			
Material Type	WAS Flow (gpd)	2021 Tonnage (TPD)	Outlet
Biosolids	183,185	29.41 (260 Run Days)	WM Altamont Landfill - ADC

Throughout the course of this study, a major design consideration was to ensure the City's compliance with state organics diversion mandates. Given that SB1383 mandates diversion of organics from landfill, including diversion of organic streams currently utilized as ADC, Anaergia examined the City's MSW, YW, and biosolids streams as possible feedstocks for the proposed Project.

External HSW

Design scenarios Anaergia – 1b and Anaergia – 2b below include the co-digestion of City organics with external, pre-processed HSW. Receiving external HSW would enable the City to offer a regional SB1383 organics outlet to adjacent municipalities. Doing so would offer numerous economic benefits to the City, including increased revenue via tip fees and increased biogas production through the digestion of high Biochemical Methane Potential (BMP) feedstocks.

Sourcing external feedstocks for digestion means that reception requirements brought to the plant would need to be considered. Anaergia proposes that any external feedstocks to be pre-processed off-site to produce a clean organic slurry. As a result, any material to be accepted would be in a clean pumpable form when arrived at the plant. A clean organic slurry would arrive at the plant in tanker trucks and offload the slurry at the reception area and transfer into a food waste buffer tank via pumping. Pre-processing of organic waste (if needed) off-site would be required.

Summary of Design Scenarios

Six scenarios were evaluated, which examined different options for recovering resources from the City's waste streams. The detailed description of these scenarios will outline the design basis for each scenario, the key considerations and impacts of implementing these scenarios, and the rationale behind the design decisions made. A summary of the six scenarios is provided below:

Status Quo

The MSW would continue to be landfilled and the YW and biosolids would continue to be used as ADC. In this scenario, the City would not add additional solid waste nor anaerobic digestion infrastructure. This scenario is not compliant with SB1383.

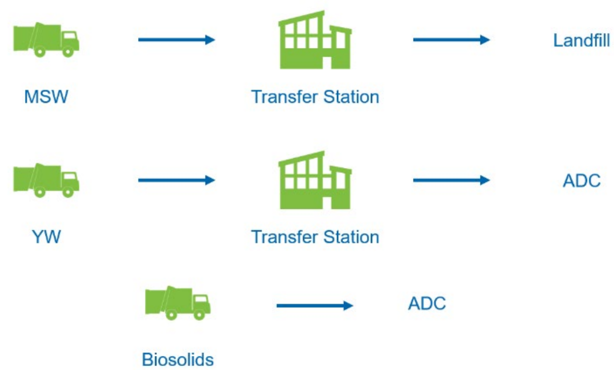

Figure 7: Status Quo

Source Separation

The City would offer source separation collection services to all residential, commercial, and multi-family generators. Doing so would require expanding the City's collection fleet, increasing the number of routes, and hiring staff to conduct route reviews. The source separated organics waste would also need to be transferred and disposed of at a compost facility and would be subject to volatile and increasing compost rates. Biosolids would also need to be composted instead of used as ADC to achieve SB1383 compliance, or eventually dried and pyrolyzed by the City.

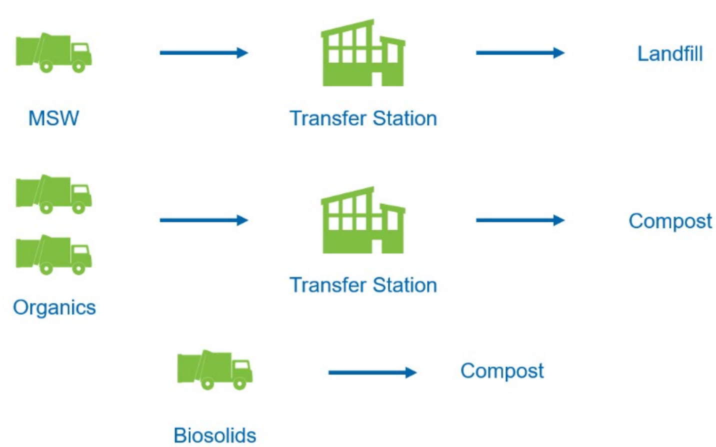

Figure 8: Source Separation

Anaergia – 1a

An OREX processing line would be installed at the City's transfer to recover organics found in the waste. The majority of the OFMSW would be recovered and polished for on-site anaerobic digestion, while recyclables such as OCC would be scavenged from the waste stream and be blended with the City's Recyclables stream for further off-site processing. The OFMSW and biosolids generated by the City's WWTP would be co-digested at a co-located anaerobic digester to produce biogas and a soil amendment. The YW would continue to be transferred directly to compost.

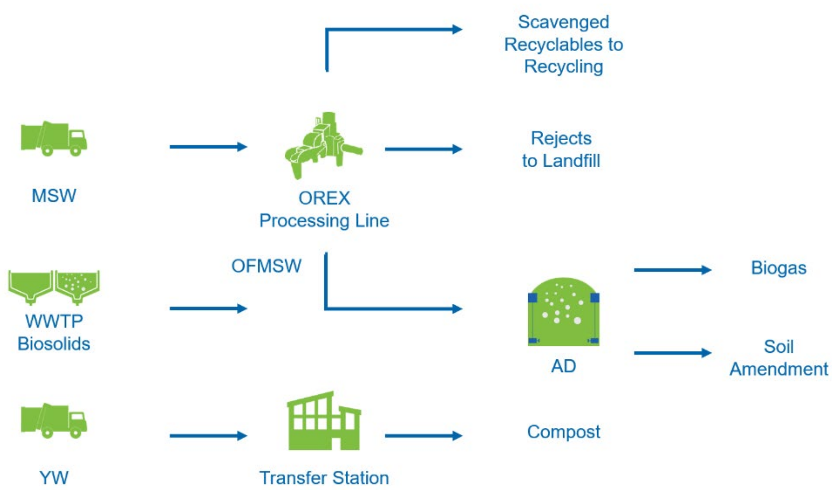

Figure 9: Anaergia – 1a

Anaergia – 1b

Additional out-of-City organic HSW was identified as a possible feedstock to be co-digested with the City's OFMSW and biosolids, which could enable additional biogas and soil amendment production. The impacts of bringing in additional feedstock were explored. The YW would continue to be transferred directly to compost.

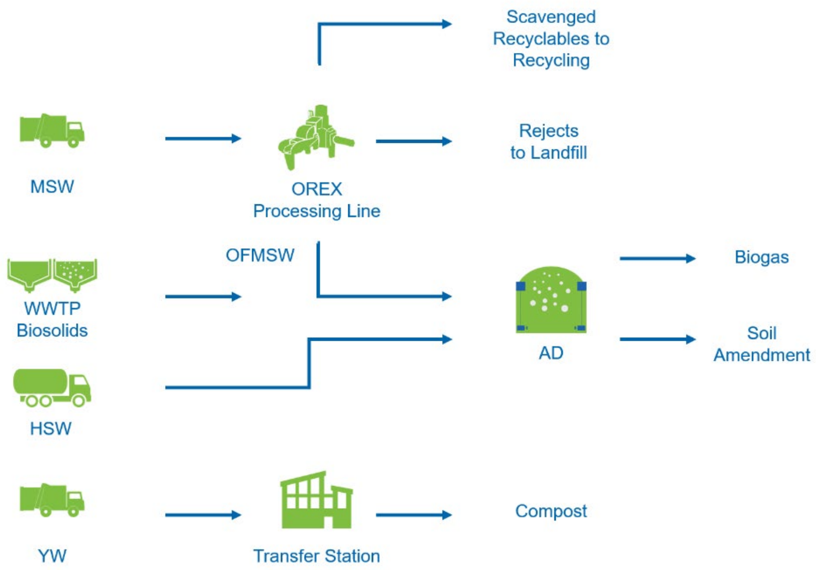

Figure 10: Anaergia – 1b

Anaergia – 2a

Similar to Anaergia – 1a, this scenario explored recovering organics from the City's MSW through the proposed OREX line. In addition, the City's YW would also be processed through the OREX line on a separate shift. The OFMSW and OFYW would then be ultimately co-digested with the City's biosolids at the co-located anaerobic digester. The OFYW rejects would be hauled to compost.

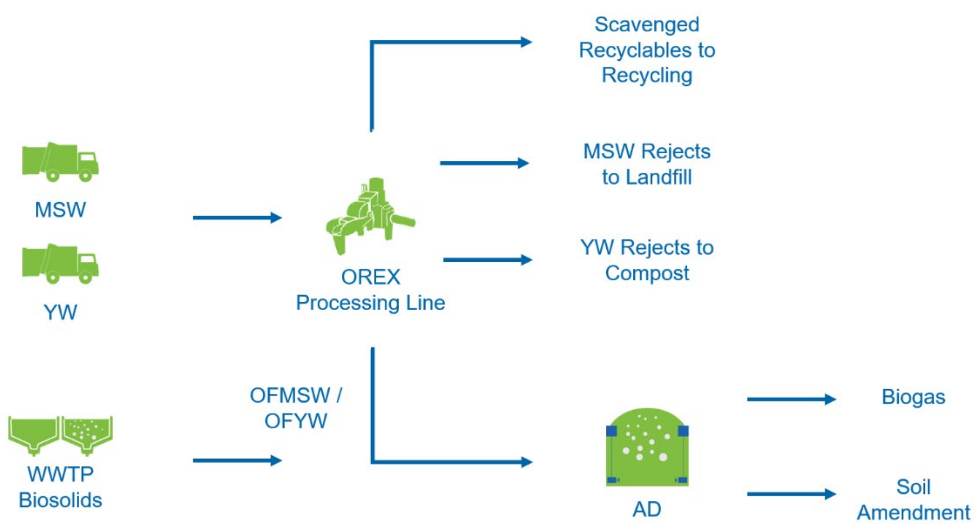

Figure 11: Anaergia – 2a

Anaergia – 2b

This scenario explored maximizing feedstock to the AD facility, through co-digestion of OFMSW, OFYW, biosolids, and HSW, with the intent of maximizing biogas and soil amendment production.

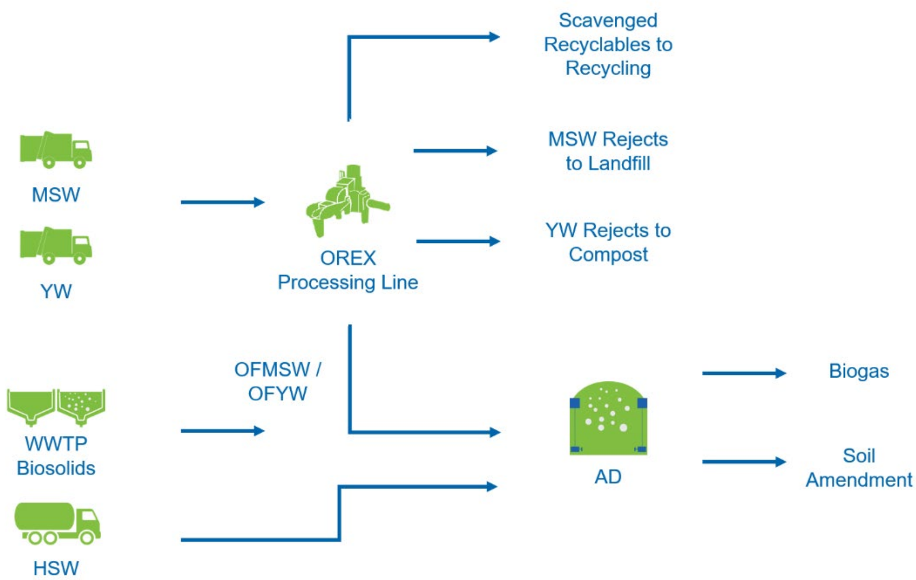

Figure 12: Anaergia – 2b

Proposed Project Integration to Current Site

Utilization of existing infrastructure for the intended Project was identified as a high priority for the City. As such, both Anaergia and the City evaluated how best to deliver the Project at the City's existing solid waste transfer station and WWTP facility. It was paramount to deliver a Project at the City's facility that maximized the City's existing assets while minimizing impact to its existing operations.

Over the course of the evaluation, the location of five key Project components were established, including: 1) OREX processing line, 2) AD facility, 3) WAS interconnection from WWTP, 4) Truck ingress / egress point, and 5) RNG interconnection point.

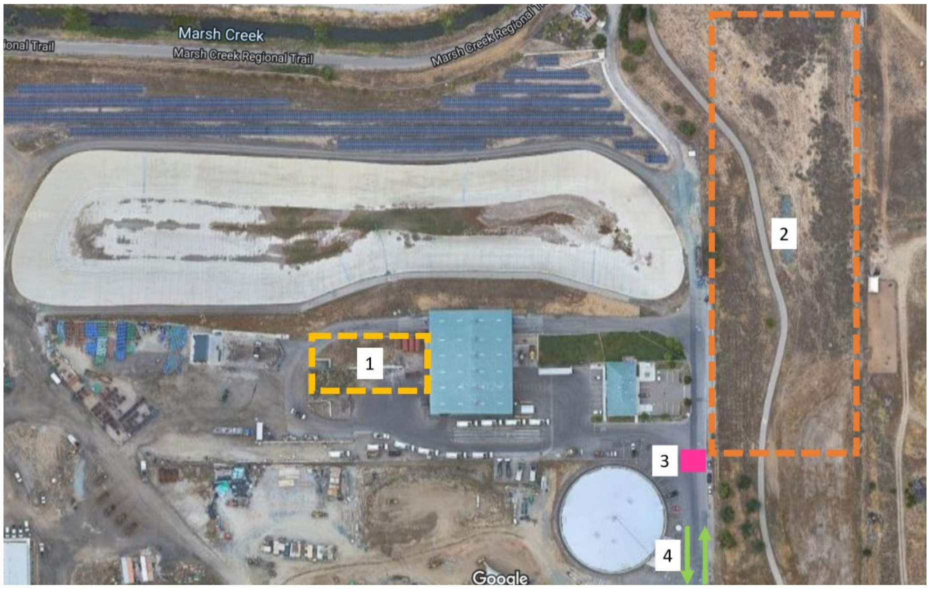

Figure 13: Proposed Project Layout

1. Location of OREX Processing Line

Following discussions between Anaergia and City staff, it was determined that expanding the western portion of the City's transfer station best integrated into existing City operations. The expanded transfer station, amounting to an extra 18,300 sq ft, would house the newly installed OREX processing line.

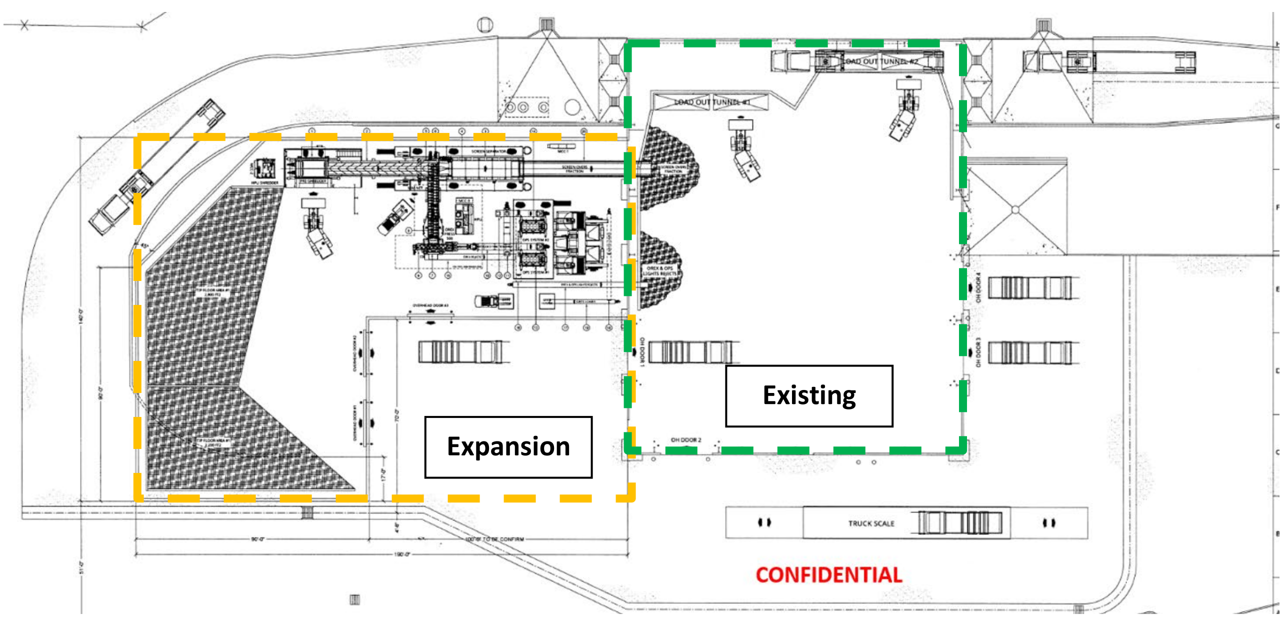

Figure 14: Proposed OREX Processing Line

Locating the OREX line on the western side of the transfer station enables a smooth integration into the City's existing collection truck traffic flow. Collection trucks would proceed directly from the City's scale houses to the expanded transfer station and would tip either MSW or YW onto the expansion's tip floor area. The tip floor would consist of two separate tipping areas, separated by a push wall. Tip floor area #1 would be approximately 2,800 sq ft and would be used to store the City's MSW. Tip floor area #2 would be approximately 2,200 sq ft and would be used to store the City's collected YW.

Front end loaders would maintain the tip floor area and feed MSW or YW to the OREX processing line located within the transfer station's western expansion. The recovered organics would be further polished utilizing Anaergia's OPS; further evaluation is required to determine whether the organic slurry would be pumped or trucked to the AD facility during the follow-on development phase of this Project. Both the screened overs, OREX rejects, and OPS rejects, would be conveyed to the City's existing transfer station and loaded via front end loaders onto transfer trucks.

2. *Location of AD Facility*

The AD facility would be located on approximately 4.5 acres towards the northeast end of the City's parcel, which would include the following:

- Receiving area for external HSW
- Storage tanks for City organic slurry and HSW
- Anaerobic digesters
- Biogas treatment

Following discussions and evaluations with City staff, this area was determined to be best suited for this portion of the Project as it would minimize impacts to existing City solid waste and wastewater operations, offered sufficient space for the various unit processes, best integrated to existing on-site traffic flow, and facilitated transfer of the resulting digestate to the City's anticipated drying and pyrolysis operations.

Additional components involving the beneficial use of biogas will be determined following a more detailed evaluation in the development phase. Anaergia envisions converting the biogas either to heat and power using a CHP system or upgrading to RNG. Anaergia proposes to identify the optimal use of biogas, as well as the precise layout of the AD facility during the development phase.

3. *Location of WAS Interconnection from City WWTP*

During the feasibility study, it was determined that the City would deliver WAS from existing WWTP operations to the AD facility on the parcel's eastern road. The exact interconnection point, as well as digestate interconnection point, would be established during the development phase of this Project.

4. *Truck Ingress / Egress Point*

Reception of external HSW will result in an increase in the truck traffic to and from the site due to delivery of incoming feedstock. In order to minimize the impact on City operations and neighboring residents, it is recommended that trucks enter and leave the facility via Elkins Way on the eastern portion of the parcel. It is recommended that the intended route for traffic be examined during the development phase of this

Project to ensure that it is most appropriate. Delivery of feedstock would be scheduled such that trucks enter and leave the site during regular business hours. The estimated additional traffic resulting from receiving 50,000 GPD to the site five days per week is shown below – the exact volume of HSW delivered to the Project has not yet been established. This does not include the current traffic to the City facility. It was assumed that each feedstock truck would deliver 5,000 gallons per load and deliveries would be received 260 working days/year.

Table 3: Proposed External organic HSW feedstock

Material Type	Feedstock Traffic (# Trucks/Workday)	Daily Volume (Volume / Workday)	Corresponding 7-day Week Volume
External HSW	10	50,000 GPD	35,000 GPD

5. RNG Interconnection Point

As part of this Feasibility Study, PG&E conducted an RNG Interconnection Screening Study. PG&E identified the Distribution – Oakley Brentwood (8 inches) pipeline as a viable interconnection point for the RNG generated by the Project. PG&E proposed interconnecting to the Distribution – Oakley Brentwood pipeline at a point 1,900 ft from the proposed Project – dues south from the facility on Sunset Rd. The proposed pipeline has a Maximum Allowable Operating Pressure (MAOP) of 60 psig and a Normal Operating Pressure of 54 psig. PG&E proposed a follow-on study to determine the anticipated costs of an RNG interconnection.

Figure 15: Potential RNG Interconnection Point

Considerations for Updates to Plant Permits

Based on the scenarios mentioned above, Anaergia anticipates that the Project would require several permits for the expansion of the transfer station and construction of organics receiving, anaerobic digestion, and biogas treatment systems. Anaergia has consistently been responsible for securing relevant permits and regulatory approvals (e.g., CEQA) for its projects, including implementation of Best Available Control Technology (BACT) and other design considerations to reach final approvals. For this reason, Anaergia would engage with relevant permitting agencies and CEQA lead agencies at the beginning of the development phase and throughout project design to proactively identify requirements, confirm compliance, submit relevant documentation, and secure approvals.

Odor Control

Odor control requires significant consideration throughout ongoing design, development, and ultimately operations. Efforts will be made throughout the design phase to mitigate risks associated with these aspects. Anaergia recommends utilizing fully enclosed and fast-acting overhead doors in the expanded transfer station along with appropriate air flow into the building. This along with a bio-filter would control any odors within the transfer station. The anaerobic digesters would also be self-contained and gas-tight, which offers significant mitigation of potential odor risks.

Increased Traffic

It is expected that there will be a manageable increase in traffic at the Project site. The exact amount of traffic increase has not been quantified as it is contingent on the final anaerobic digestion throughput capacity. A traffic study and impact assessment will be completed to quantity the impact and identify mitigation measures as may be needed to minimize possible negative effects from increased traffic. Design would also establish the most appropriate route to/from the plant.

Noise

There are several sources of noise pollution that should be considered during the project, including installation of new equipment during construction phases, expanded solid waste processing operations, and additional truck traffic generated through sourcing external feedstock.

New equipment installed on-site that would generate noise will have the necessary muffling, noise isolation, and signage installed as appropriate and required to ensure the health and safety of operating staff. Significant pieces of equipment would also be placed indoors, which would serve as additional mitigation for any potential noise concerns.

Air

Bay Area Air Quality Management District (BAQMD) air permits are anticipated to be necessary for the Project based on the preliminary scope. Possible permits involve the CHP engine, the RNG upgrader thermal oxidizer, and back up flares. The City would benefit from our success in permitting these systems throughout California, our familiarity with the District’s processes, and understanding of approval system designs.

Anaergia currently has two projects within South Coast Air Quality Management District jurisdiction (Rialto Bioenergy Facility and Sterling Natural Resources Center), as well as permitted projects under San Diego Air Pollution Control District (City of Escondido wastewater biogas cogeneration), and Mojave Air District (VVWRA RNG upgrading and pipeline interconnection). Anaergia was responsible for all permitting associated with each of these projects.

Digestate Management

Following anaerobic digestion, the digestate is intended to be returned to City operations. Anaergia understands that the digestate would be dewatered to produce a cake and filtrate. The cake would ultimately be further dried and pyrolyzed whereas the filtrate would be pumped as a side-stream to the plant headworks. The flow would likely require treatment in order to meet the WWTP's effluent standards, and dependent on the scenario, may cause an increase in loading rates of key constituents to the liquid train such as Ammonia-N. Anaergia proposes to evaluate these treatment considerations throughout the follow-on development phase.

4. Design Scenarios

Conceptual Design

Four Project scenarios (as outlined in Section 3) have been prepared, which examine different options for addressing the City's organics diversion mandates through implementation of solid waste processing, anaerobic digestion, and renewable energy infrastructure. These scenarios were then compared to the City's existing processes as well as one involving source separation of organics. The detailed description of these scenarios will outline the design basis for each scenario, the key considerations and the impacts of implementing the scenarios, and the rationale behind the design decisions made. The Table below provides a summary of the proposed scenarios.

Table 4: Design Scenarios

Scenario	MSW	YW	Biosolids	External HSW
Status Quo	• Landfill	• Landfill – ADC	• Landfill – ADC	• No
Source Separation	• Landfill	• Compost • 3-Cart SSO program • co-mingled yard waste and food waste	• Compost	• No
Anaergia – 1a	• OREX • OFMSW to AD • Rejects to landfill	• Compost	• AD	• No
Anaergia – 1b	• OREX • OFMSW to AD • Rejects to landfill	• Compost	• AD	• Yes
Anaergia – 2a	• OREX • OFMSW to AD • Rejects to landfill	• OREX • Recovered YW to AD • Rejects to compost	• AD	• No
Anaergia – 2b	• OREX	• OREX	• AD	• Yes

	• OFMSW to AD • Rejects to landfill	• Recovered YW to AD • Rejects to compost		

Outline of Major Project Components

Anaergia's project scenarios included three major facilities that comprise the intended Project – the OREX processing line, the Anaerobic Digestion facility, and the Biogas Treatment system.

OREX Processing Line

The OREX processing line is intended to expand the City's solid waste processing capabilities, and comprises the installation of the following main components:

- Shredder / Bag Opener
- Disk Screen
- Magnet
- OREX 500 Press
- Organics Polishing System (OPS™)
- Organic slurry buffer tanks
- Expanded solid waste transfer station
- MSW and YW tip floor areas

Anaerobic Digestion Facility

The Anaerobic Digestion facility focuses on new organics management infrastructure, and comprises the installation of the following main components:

- Buffer tanks
- WAS Pre-Thickening
- Receiving Station(s) for External HSW
- Anaerobic Digester
- Modifications to City piping to receive City's WAS and discharge digestate
    - Digestate management system to be further evaluated in development phase

Biogas Treatment System

The Biogas Treatment system focus on conditioning and beneficially reusing the biogas. A biogas conditioning system is intended to include the following main components:

- Biogas Conditioning
    - H_2S Removal
    - NH_3 Removal
    - Moisture Removal
    - Volatile Organics Compounds (VOCs) Removal

- Siloxane Removal

Additional biogas treatment systems are required and are subject to whether the Project proceeds either to CHP or RNG. A CHP engine would be required in the event that heat and power is pursued, and an Anaergia BUG system would be required if RNG was identified as the best option.

Anaergia proposes the following activities during the development phase to identify the optimal use of the biogas:

CHP: Evaluate the City's utility bills, engage with PG&E to evaluate interconnection / net-metering options, and understand the impacts of the City's solar project on power generation.

RNG: Proceed with a follow-on study with PG&E to determine the anticipated costs of an RNG interconnection.

Design Assumptions

To conduct this study, assumptions were made regarding solid waste processing recovery rates and the total solids and volatile solids content of the recovered organic fractions. These assumptions were based on preliminary characterization of the City's waste streams as well as on operating data from OREX facilities processing similar waste streams. The assumptions included:

MSW

- OFMSW OREX recovery rate
  - 25%
- OFMSW
  - 40% TS, 80% VS
- Recovery rate and characterization based on OREX operational data on similar waste streams.

YW

- YW OREX recovery rate
  - 45%
- OFYW
  - 30% TS, 80% VS
- Recovery rate and characterization subject to seasonal variation.

External HSW

- Eleven (11) organic HSW feedstock sources identified with a cumulative volume of ~680,000 gallons per week (136,000 GPD 5-day week)
- Feedstock sources included food scraps; Fats, Oils, and Grease (FOG); and Industrial, Commercial, & Institutional (ICI) waste
- Assumed Project would receive 50,000 GPD 5-day week (35,000 GPD 7-day week) of external HSW
  - Receiving 50,000 GPD 5-day week was established as feasible based on proximity and volume of particular feedstock sources.

o Assumed average 10% TS, 90% VS

As part of the subsequent development phase of this Project, it is recommended that further characterizations of the anticipated Project feedstocks be completed to define characteristics as they would influence recovery rates, biogas yields, and digestate volumes.

Anaergia – 1a

The Anaergia – 1a scenario examined the recovery of organics from the City's MSW and subsequent co-digestion with the City's WAS, without processing any other feedstocks including the City's YW or external HSW.

In this scenario, the OREX processing line would process 32,300 TPY of the City's MSW. Once delivered to the facility, a disk screen would screen approximately 10,600 TPY of overs that would be blended with the City's Recyclables for off-site processing. The unders would then be fed to the OREX Press, where 10,200 TPY would be OFMSW and the remaining 11,400 TPY of rejects would be sent to landfill. Once recovered, the OFMSW would be processed using Anaergia's OPS, where it would generate 17,600 GPD of slurry (7-days / week).

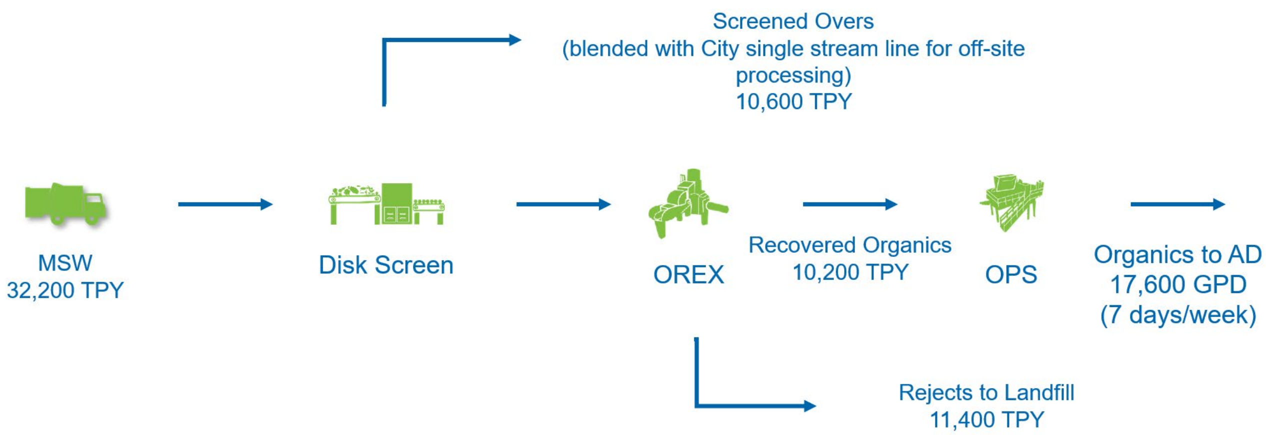

Figure 16: Anticipated OREX MSW Mass Balance

The Anaerobic Digester would then co-digest the organic slurry and the City's WAS. 180,800 GPD of WAS would be delivered to the AD facility, which would initially be thickened using an Anaergia Sludge Screw Thickener (SST) to generate 10,900 GPD of thickened WAS. Both the thickened WAS and organic slurry would be fed to a 0.75 Million Gallon (MG) anaerobic digester. The anaerobic digester is intended to generate 220 SCFM of biogas, which could yield 0.9 MW of power as well as heat. 26,200 GPD of digestate would also be generated, which are intended to be used as feedstock for the City's drying and pyrolysis facility.

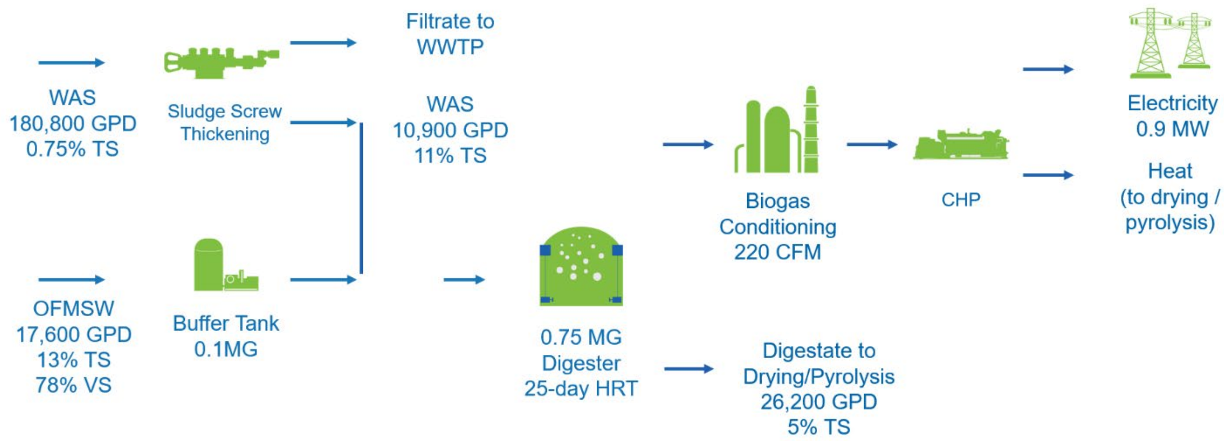

Figure 17: Anticipated Anaergia – 1a AD Mass Balance

Anaergia – 1b

The Anaergia – 1b scenario examined the recovery of organics from the City's MSW and subsequent co-digestion with the City's WAS, and delivery of external HSW for digestion. The City's YW would be transferred directly to compost. It is expected that the Anaergia – 1b scenario would consist of a similar OREX mass balance as Anaergia – 1a, see Figure 16: Anticipated OREX MSW Mass Balance for reference.

In this scenario, the AD facility would consist of a 1.9 MG anaerobic digester that could co-digest 10,900 GPD of thickened WAS, 17,600 GPD of organic slurry, and 35,000 GPD of HSW – all on a 7-day / week basis. The anaerobic digester is intended to generate 420 SCFM of biogas, which could yield 1.7 MW of power as well as heat. 58,300 GPD of digestate would also be generated, which are intended to be used as feedstock for the City's drying and pyrolysis facility.

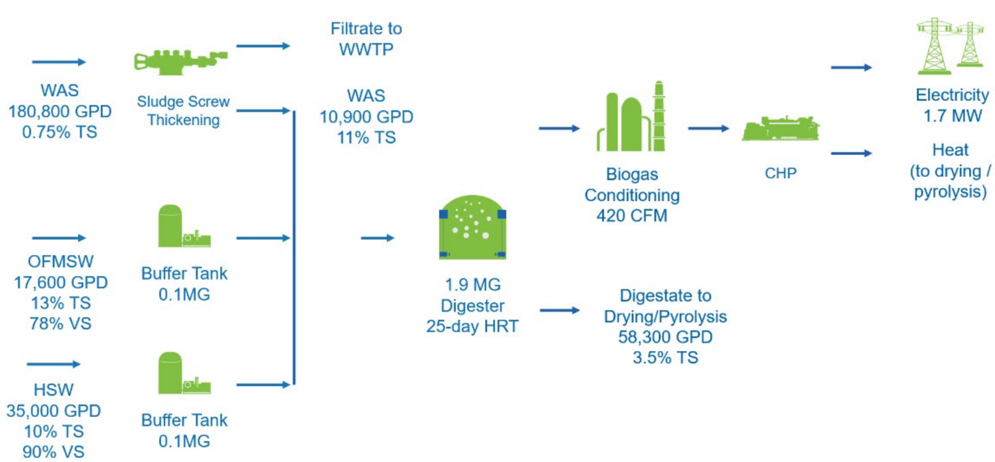

Figure 18: Anticipated Anaergia – 1b AD Mass Balance

Anaergia – 2a

The Anaergia – 2a scenario examined the recovery of organics from the City's MSW and YW and subsequent co-digestion with the City's WAS, without processing any external HSW. It is expected that the Anaergia – 2a scenario would consist of a similar OREX mass balance as Anaergia – 1a, see Figure 16: Anticipated OREX MSW Mass Balance for reference.

It is anticipated that the OREX processing line would process the City's 10,400 TPY YW on a separate shift. Once delivered to the facility, a disk screen would screen approximately 2,000 TPY of overs with 8,200 TPY of screened unders being fed to the OREX Press. The OREX Press is intended to recover 6,100 TPY of OFYW while 2,300 of OREX Press rejects would be blended with the screened overs and ultimately sent to compost. Once recovered, the OFYW would be processed using Anaergia's OPS, where it would generate 9,900 GPD of slurry (7-days / week).

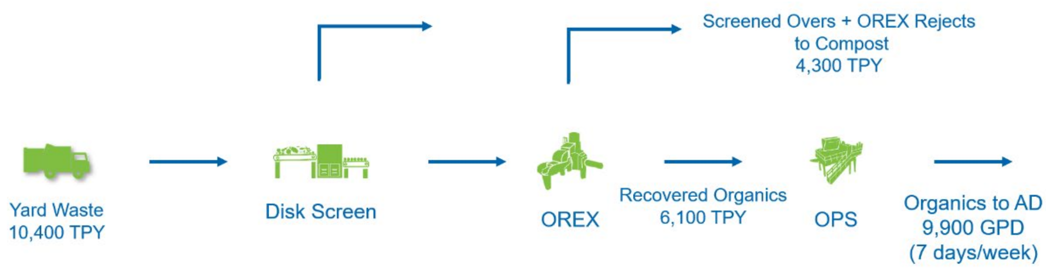

Figure 19: Anticipated OREX YW Mass Balance

The AD facility would consist of a 1.0 MG anaerobic digester that could co-digest 10,900 GPD of thickened WAS and 27,500 GPD of organic slurry derived from both OFMSW and OFYW – all on a 7-day / week basis. The anaerobic digester is intended to generate 250 SCFM of biogas, which could yield 1.0 MW of power as well as heat. 35,800 GPD of digestate would also be generated, which are intended to be used as feedstock for the City's drying and pyrolysis facility.

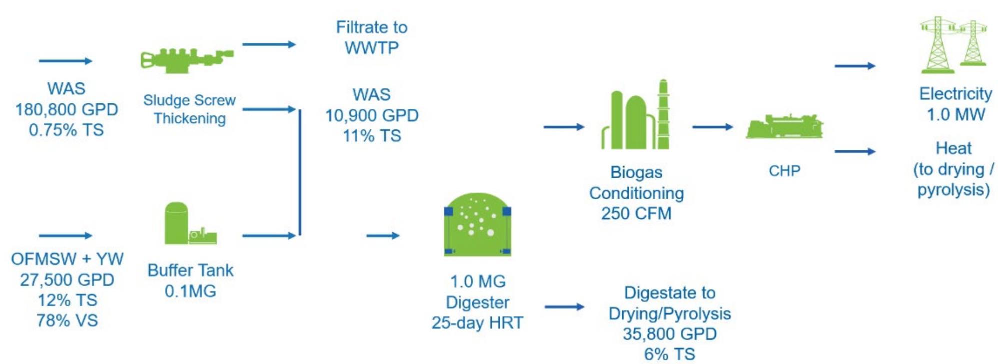

Figure 20: Anticipated Anaergia – 2a AD Mass Balance

Anaergia – 2b

The Anaergia – 2b scenario examined the recovery of organics from the City's MSW and YW and subsequent co-digestion with the City's WAS, as well as delivery of external HSW for digestion. It is expected that the Anaergia – 2b scenario would consist of a similar OREX mass balances described in the previous scenarios, see Figure 16: Anticipated OREX MSW Mass Balance and Figure 19: Anticipated OREX YW Mass Balance for reference.

The AD facility would consist of a 1.9 MG anaerobic digester that could co-digest 10,900 GPD of thickened WAS, 27,500 GPD of organic slurry, and 35,000 GPD of HSW – all on a 7-day / week basis. The anaerobic digester is intended to generate 450 SCFM of biogas, which could yield 1.8 MW of power as well as heat. 67,900 GPD of digestate would also be generated, which are intended to be used as feedstock for the City's drying and pyrolysis facility.

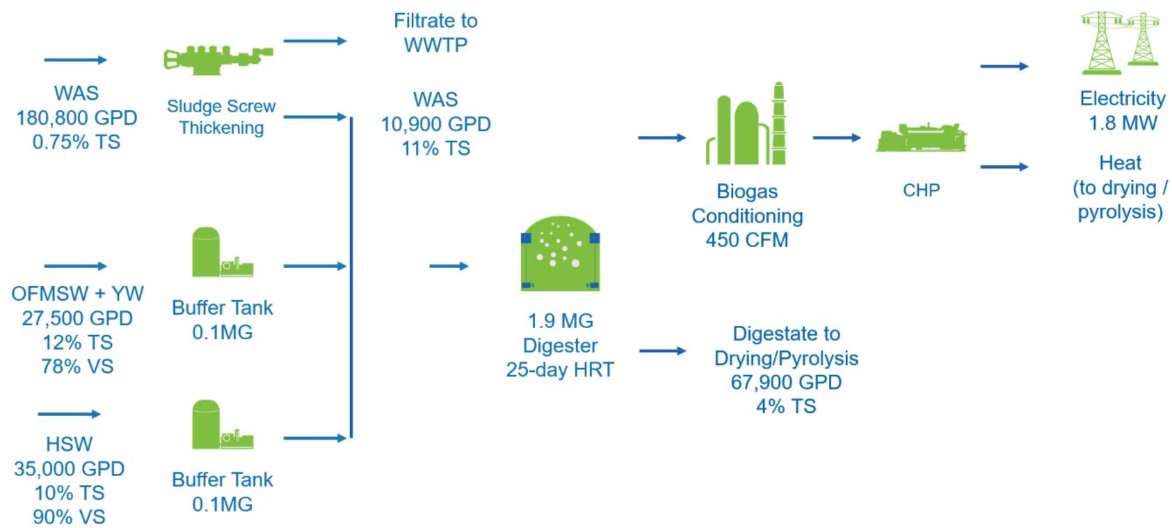

Figure 21: Anticipated Anaergia – 2b AD Mass Balance

The Table below provides a breakdown of the anticipated mass balance and corresponding anaerobic digester volumes for each scenario.

Table 5: AD Mass Balance Scenarios

Scenario	Feedstock	AD Volume (MG)	Biogas / Power	Digestate
Anaergia – 1a	• WAS (180,000 GPD – 0.75% TS) • OFMSW (17,600 GPD – 13% TS)	0.75	220 SCFM (0.9 MWe)	26,200 GPD (5% TS)
Anaergia – 1b	• WAS (180,000 GPD – 0.75% TS) • OFMSW (17,600 GPD – 13% TS) • HSW (35,000 GPD – 10% TS)	1.9	420 SCFM (1.7 MWe)	58,300 GPD (3.5% TS)

Anaergia – 2a	• WAS (180,000 GPD – 0.75% TS) • OFMSW (17,600 GPD – 13% TS) • OYW (9,900 GPD – 10% TS)	1	250 SCFM (1 MWe)	35,800 GPD (6% TS)
Anaergia – 2b	• WAS (180,000 GPD – 0.75% TS) • OFMSW (17,600 GPD – 13% TS) • HSW (35,000 GPD – 10% TS) • OYW (9,900 GPD – 10% TS)	1.9	450 SCFM (1.8 MWe)	67,900 GPD (4% TS)

5. Operations of the Project

Anticipated Project Operations

The Project would require a defined maintenance plan to ensure reliable operations of the facility and to ensure that equipment is maintained in good working order.

Staffing Plan

It is anticipated that three (3) full-time equivalent employees are required to manage and carry out the operations and maintenance activities. This includes one (1) operations manager and two (2) line-operators. Anaergia's California-based operations and service teams could also be made available to supplement or provide Project operations.

Hours of Operation

The Project would accept and process waste during the City transfer station's existing hours of operation.

It is intended that the anaerobic digesters will be operated on a 24/7 basis, while feedstock reception and digestate disposal will be operated 5 days per week. During normal business hours. The Anaerobic Digestion system Supervisory Control and Data Acquisition (SCADA) system will provide the capability for remote monitoring and operations, or auto – operations.

High-Level Summary of Maintenance Activities

Based on the major equipment planned for installation at the facility, a high-level summary of typical maintenance activities has been prepared in the Table below.

Table 6: High Level Maintenance Requirements

Major Equipment	Maintenance Activity
OREX	Maintenance to be completed per OEM Schedule
OPS	Maintenance to be completed per OEM Schedule
Sludge Screw Thickeners	Specialized Service contract with OEM
PSM Mixers	Specialized Service contract with OEM
Organics Reception Skid	Lobe and Grinder Teeth Inspection / Replacement every 6,500 OPH
Heat Exchanger	Decalcination or chemical cleaning once annually
Piping	Flushing on as needed basis
Instruments	Annual Calibration

CHP / BUG	Maintenance to be completed per OEM Schedule
General	Checking functions, flow rates, pump components, oil, and motors on weekly basis
General	Visual and audible checks on daily basis

Anaergia Operations Capabilities

Anaergia has broad experience in the operations and maintenance of organics processing facilities. Anaergia provides a multitude of services to clients including remote technical support, local operational support and staffing, and full facility operations and maintenance services, both for client-owned and self-financed facilities. Anaergia also provides technical support for over a thousand installations globally where Anaergia equipment is utilized for organics processing. With the in-house expertise and lessons learned through the operation of similar facilities, Anaergia can identify and propose optimal design upgrades and operational parameters.

Should the City elect for Anaergia to provide full system operations, Anaergia would leverage the suite of best practices it has developed operating dozens of organics processing facilities globally. Anaergia could support in the operation of the Project by sharing its "lessons learned." Some items include:

Preventative, Predictive, and Corrective Maintenance Activities

Anaergia has established a robust program to track, schedule, and plan all preventative, predictive, and corrective maintenance activities. Staff would use eMAINT, Anaergia's standard Computerized Maintenance Management System (CMMS), to track such activities. Both Original Equipment Manufacturer (OEM) recommended preventative and predictive maintenance activities and identified corrective maintenance tasks would be uploaded and scheduled in eMAINT, each with a corresponding work order and accompanying work schedule. Predictive maintenance activities would be schedule with associated specialty vendors, such as oil sampling labs and equipment vibration analysis specialists.

Quality Assurance and Quality Control Procedures

Anaergia has developed a robust set of Standard Operating Procedures (SOPs) and Maintenance instructions to ensure on-site work practices are conducted in a controlled, efficient, and safe manner. A full suite of Safety Manual Procedures (SMPs) has already been developed by Anaergia and would be refined for this Project. Anaergia would ensure that reoccurring training and testing of the site team would take place to ensure strict adherence to safe work practices.

Computerized Management System

Anaergia utilizes eMAINT as its Computerized Maintenance and Management System (CMMS). eMAINT can receive input from the plant SCADA system to track equipment online hours as well as identify appropriate run time vs calendar periodic maintenance cycles to automatically generate preventative maintenance work orders once equipment reaches operational thresholds. Anaergia would also leverage Velocity EHS cloud-based platform to track environmental and safety statistics within plant operations. The Project would utilize Velocity to conduct its EHS safety training modules, certifications, plant statistics, and audits.

Emergency Management

Anaergia intends to implement several protocols designed to manage emergencies that may arise. This includes training all staff in appropriate OSHA subject matters (i.e., Emergency Response, CPR/First Aid, Hazardous Materials, Hazard Waste, etc.) as well as appropriate site-specific emergency response procedures. The Project would also have an assigned responsible emergency coordinator that would be the main point of contact during an emergency who would call 911 and coordinate activities with the Incident Commander.

Anaergia's General Safety Program

Anaergia is committed to providing a safe and healthful workplace. Our culture of safety-conscious behavior and proactive injury avoidance reflects core company values. As a turn-key service provider of organics processing facilities, we perform a variety of activities, ranging from observation and direction at construction sites to office-based work. Each environment is unique and has different conditions for which we established thirty-three (33) distinct safety programs and policies. Anaergia has also drafted Injury and Illness Prevention Plan (IIPP) and Near Miss Template that describes our safety programs and policies. Key programs for the proposed Project include personal protective equipment (PPE), fall protection, lock-out/tag-out, traffic control, hearing protection, material handling, etc.

Anaergia has also developed a plant operations safety program composed of ten (10) pillars, below:

- Employee Engagement
- Management Leadership
- Continuous Improvement
- Monitoring Leading Indicators
- Contractor Safety Management
- Fit for Duty
- Pre-Work Planning
- Safety Orientation & Training
- Root Cause Analysis
- Recognition & Rewards

Process Hazard Analysis (PHA) studies are also performed for pending projects to identify potential failure points for a given system before construction begins. Facility pre-job meetings are held for non-routine tasks to develop an execution plan that is safe for all personnel and property involved. All facility and field services staff also have access to the company's Near Miss reporting form that also includes general safety suggestions in the spirit of continuous improvement. Weekly Safety inspections are performed by plant management as well as the Environmental Health and Safety (EHS) Manager for Anaergia-owned facilities. A training matrix is maintained by facility management to track annual training requirements for various facility personnel. Contract / subcontract firms receive site-specific orientation and coordinate hot work, lock-out/tag-out, confined space entry, etc., activities in accordance with facility specific requirements and the associated permits obtained through the operations department.

A formally structured employee driven Safety Committee meets at least monthly to discuss any Near Miss incidents, injuries, property damage, and any other safety related concerns from the previous month. Enforcement of safety programs and policies typically proceeds as follows from the first offences: review of training records to verify employee was trained according to site specific procedures and is provided coaching by supervision; documented verbal warning; formal write-up by supervisor that is reviewed with employee and given to HR for inclusion in the employee's file; suspension; termination of employment. Workplace Safety records and documents are available to employees upon request to the extent possible while not violating HIPAA or other applicable laws. Workplace Safety violations are maintained in the employee's HR file. Violations by contractors are tracked internally, addressed with contractor management for resolution, up to and including termination of contractor services. Posters and similar documentation regarding workers' labor rights are posted conspicuously at each facility.

6. Financial Analysis

An economic assessment of the Project was conducted.

Transportation & Disposal Costs

A significant economic driver for the Project involves minimizing exposure to rapidly increasing costs associated with transportation and disposal of the City's various waste streams. This is in part due to the significant increase in landfill-diverted organics waste generated throughout the region combined with a lack of viable outlets to receive and process the newly diverted organic waste. The Table below provides a breakdown of transportation and disposal costs for the year 2022-2023 for the City's various waste streams.

Table 7: City's 2022-2023 Transportation & Economic Data

Waste Stream	2021 Tonnage (TPY)	Hauling Costs ($/truck)*	Disposal Costs ($/ton)
MSW	32,200	382.79	46.23
Mixed Recycling	7,800	700.53	44.14
Yard Waste	10,400	693	72 (yard waste only) 90 (co-mingled food and green)
Biosolids	8,800	485	34 (74.25 – dewatering costs)

*Each truck is assumed to hold 20.52 tons.

By developing this Project and minimizing the amount of waste transported and disposed of off-site, the City significantly reduces its exposure to increasingly volatile tip fees through an on-site organics processing solution. In fact, the proposed Project is anticipated to offer the City **$1.8 – 2.4 MM annually in savings** by reducing the amount of organic waste that needs to be transported and disposed of. In the Status Quo scenario, the cost of transporting and disposing of its MSW, Recyclables, YW, and Biosolids amount to $5.0 MM for 22/23. Source Separation costs amounted to $4.6 MM annually, on account of co-mingling organic waste and yard waste that would result in an increased disposal fee of $90/ton at local compost sites. Further, the tip fee for co-mingled organic and yard waste is expected to continue increasing as jurisdictions roll out their SB1383 programs, thereby increasing the City's T&D costs. The total T&D of Source Separation would actually increase to $5.7 MM annually, in the event that biosolids need to be composted instead of processed through the City's drying and pyrolysis system.

All four Anaergia Project scenarios offer significant annual T&D savings to the City by reducing the total tonnage transported offsite for disposal. Each scenario will reduce the City's MSW T&D costs, due to OREX recovery of organics from MSW. Total T&D costs will further be reduced by Anaergia – 2a and 2b as YW T&D

costs are reduced compared to Status Quo. The Project also eliminates the City's biosolids T&D and dewatering costs due to mass reduction from on-site anaerobic digestion.

It is worth noting that while the Project scenarios do increase T&D costs for the Recyclables on account of blending the MSW's screened overs with the City's Recyclables for off-site processing, they also increase diversion and enable the City to meet its SB1383 mandates.

The Table below provides a breakdown of anticipated T&D costs for each scenario.

Table 8: Anticipated Transportation & Disposal Costs

Scenario	MSW ($MM/yr)	Recyclables ($MM/yr)	YW ($MM/yr)	Biosolids ($MM/yr)	Total ($/MM/yr)
Status Quo	2.1	0.6	1.1	1.2	5.0
Source Separation	1.4	0.6	2.6	0	4.6
Anaergia – 1a	0.7	1.4	1.1	0	3.2
Anaergia – 1b	0.7	1.4	1.1	0	3.2
Anaergia – 2a	0.7	1.4	0.5	0	2.6
Anaergia – 2b	0.7	1.4	0.5	0	2.6

The analysis above assumed that no tip fee would be charged for any City material processed via the OREX processing line, the AD facility, and subsequent drying and pyrolysis project. Given this, it is anticipated that the projected annual savings would increase throughout the lifetime of the Project as third-party landfill and compost tip fees continue increasing whereas the Project maintains a $0/ton tip fee.

Compatibility with City Drying and Pyrolysis

Importantly, the Project also offers the City additional benefits through downstream handling of the digestate. Anaerobically digesting WAS and other organics would benefit the City's downstream drying and pyrolysis as AD increases dewaterability of biosolids and reduces the total solids while recovering highly valuable energy in the form of biogas. This greatly reduces the total energy required for drying, resulting in higher net energy recovery from the incoming WAS. AD also aids in homogenization of biosolids, reducing fluctuations in downstream drying and pyrolysis processing while creating biosolids with less material handling and odor issues during intermediate storage or beneficial reuse applications.

Impact of Biogas on Project Revenues

The generation of renewable energy from the biogas generated by the Project serves an economic benefit to the City. This would translate either to a direct revenue source (in the scenario where biogas were upgraded RNG and injected into the PG&E's gas distribution service area) or as a cost savings (through on-site power generation and usage).

Biogas to Power

In the scenario where biogas is converted to heat and power for on-site usage, the Project is anticipated to **save the City $1.5 – 3.0 MM annually** on power costs ($30 – 60 MM over 20-year lifetime). Exact savings are not guaranteed at this time. Estimated savings were calculated based on the City's average PG&E blended power rate of $0.209/kWh, and assumes a 90% CHP engine uptime. The Table below provides a breakdown of anticipated power generation and annual power savings.

Table 9: Projected Power Savings

Scenario	Projected Biogas Production (SCFM)	Projected Power Generation (MW)	Projected Power Savings ($MM/yr)
Anaergia – 1a	220	0.9	1.5
Anaergia – 1b	420	1.7	2.8
Anaergia – 2a	250	1	1.7
Anaergia – 2b	450	1.8	3.0

Biogas to RNG

In the scenario where biogas is converted to RNG for pipeline injection, conditioned biogas would then be upgraded to RNG on-site using Anaergia's BUG. The RNG would then be injected into the PG&E gas distribution service area through an RNG interconnection. The carbon-negative RNG could then be sold through both the California Low Carbon Fuel Standard and US EPA Renewable Fuel Standard programs and generate revenue to the City. The Project is anticipated to generate **$2.7 – 5.6 MM annually in revenue**. Exact revenue is not guaranteed at this time. The estimate assumes a sale price of $40/MMBtu for the bundled molecules and environmental attributes. The Table below provides a breakdown of anticipated revenue streams.

Table 10: Projected RNG Revenue

Scenario	Projected Biogas Production (SCFM)	Projected RNG Production (MMBtu)	Projected Revenue ($MM/yr)
Anaergia – 1a	220	68,000	2.7
Anaergia – 1b	420	130,000	5.2
Anaergia – 2a	250	78,000	3.1
Anaergia – 2b	450	140,000	5.6

External HSW Tip Fee Revenue

External organic HSW brought to the Project serve an additional revenue source for the scenarios examined, and as such, both the tip fees charged and the volume that can be accepted by the facility have a significant impact on the revenue generated in each scenario – feedstock has not been guaranteed or committed to this project at this time. The City is expected to generate **$1 – 2 MM in annual revenue** from tip fees, subject to actual volumes delivered and agreed upon tip fee. The Table below provides a breakdown of anticipated revenues for various Project scenarios under various tip fees.

Table 11: Projected External HSW Tip Fee Revenue

Scenario	HSW Volume (GPD)	Revenue ($0.08/gal tip)	Revenue ($0.12/gal tip)	Revenue ($0.16/gal tip)
Anaergia – 1a	0	0	0	0

Anaergia – 1b	35,000	$1MM	$1.5MM	$2MM
Anaergia – 2a	0	0	0	0
Anaergia – 2b	35,000	$1MM	$1.5MM	$2MM

Budgetary Capital Expenses

The capital costs have been estimated based on anticipated requirements for new infrastructure, preliminary pricing information from suppliers and vendors, and preliminary assessment of site conditions. These costs are inclusive of construction and installation costs.

It should be noted that these costs are budgetary level estimates. Estimated CAPEX does not constitute an offer of sale and is subject to change based on detailed design and further due diligence.

Table 12: Budgetary Capital Expenses

Scenario	Feedstock	Engineering, Design, Equipment ($MM)	Balance of Plant ($MM)	Transfer Station Expansion* ($MM)	Total ($MM)
Anaergia – 1a	• WAS • OFMSW	23.2 – 24.2	9.2 – 11.9	2.7 – 9.2	35.1 – 46.3
Anaergia – 1b	• WAS • OFMSW HSW	26.8 – 28.0	11.0 – 15.5	2.7 – 9.2	40.5 – 52.7
Anaergia – 2a	• WAS • OFMSW • OYW	23.8 – 24.8	9.5 – 13.4	2.7 – 9.2	36.0 – 47.4
Anaergia – 2b	• WAS • OFMSW • HSW • OYW	27.5 – 28.7	11.3 – 15.8	2.7 – 9.2	41.4 – 53.7

*Transfer Station expansion assumes footprint increase of 18,300 sq ft and $150 – 500/sq ft.

7. Potential Funding Availability & Partnership Models

To aid in funding the project, there are several avenues through which funding can be provided. Through the course of the feasibility study, several grants and initiatives were identified that could be utilized to offset project costs. *Contributions from funding programs were not considered in any financial analysis calculations completed*.

US Inflation Reduction Act

- Contribution Limit: Up to 40% of Project Cost ($13 – 21MM)
- To support investment through spending and tax policies that would spur the expanded production of clean energy (i.e., biogas) facilities and put the US on a path to 40% emissions reductions by 2030.
- Construction of the facility must commence on or before December 31, 2024.

US EPA – Solid Waste Infrastructure for Recycling Grant Program

- Contribution Limit: Up to $4MM.
- To support the US' National Recycling Strategy to improve post-consumer materials management and infrastructure; support improvements to local post-consumer materials management and recycling programs; and assist local waste management authorities in making improvements to local waste management systems.

CalRecycle – Organics Grant Program (ORG7)

- Contribution Limit: Up to $13MM.
- To support lowering California's overall greenhouse gas emissions by expanding existing capacity or establishing new facilities in California to reduce the amount of California-generated green materials, food materials, and/or Alternate Daily Cover being sent to landfills.

8. Evaluation Methodology & Scoring

An evaluation summary for the comparison of the design scenarios is shown below. It utilized the criteria for key performance indicators laid out in the Table below, considering regulatory alignment, exposure to regional organics disposal markets, revenue potential, and capital costs. The scenario with the highest overall score is considered the preferred approach.

Table 13: Evaluation Criteria & Scoring Method

Evaluation Factor	Description and Considerations	Maximum Score	Scoring Criteria
Regulatory Alignment	To what degrees does the proposed scenario address the City's organics diversion mandates?	200	Each option scored for the confidence in achieving regulatory alignment. Low, medium, and high - confidence score 0, 50, 100 out of 200.
Exposure to Organics Disposal Markets	Conceptual level City T&D Costs	100	Lowest T&D cost scores 100. Reduction of 1 point per $50,000 increase in T&D costs.
Revenue Potential	Conceptual level City biogas utilization and HSW tip fee revenues	100	Highest revenue scores 100. Reduction of 1 point per $50,000 reduction in revenue.
Capital Expenses	Budgetary Engineering level cost estimates	100	Lowest cost scores 100.

			Reduction of 1 point per $1MM capital increase in capital.

The scoring method was selected to provide a clear and transparent method of comparing the relative risks and benefits associated with each scenario and to serve as a decision-making tool for the overall feasibility of each project scenario. An assessment based on this scoring tool was carried out for each option examined throughout the duration of the feasibility study and has been summarized in the Table below.

As has been shown by the scoring evaluation, Anaergia – 2b is preferred over the other scenarios in terms of environmental benefits, risk factors, and potential for financial return, despite the higher capital cost associated with these scenarios.

Table 14: Scenario Evaluation Scoring

Evaluation Factor	Status Quo	Source Separation	Anaergia – 1a	Anaergia – 1b	Anaergia – 2a	Anaergia – 2b
Regulatory Alignment	0	100	200	200	200	200
Organics Market Exposure	52	60	88	88	100	100
Revenue Potential	0	0	32	92	50	100
Capital Expense	100	95	60	54	58	52
Total Project Score	**152**	**255**	**380**	**434**	**408**	**452**

Anaergia – 2b Summary

Scenario Anaergia – 2b offers the City a viable pathway towards SB1383 compliance, which also brings positive financial contributions and offer long-term, tangible social and environmental benefits. Under this scenario, the Project would recover organics from both the City's MSW and YW streams, receive external HSW, and co-digest with the City's WAS through anaerobic digestion. The resulting carbon-negative biogas would then be converted either to heat and power or upgraded to RNG. The Table below provides a summary of Anaergia – 2b scope and benefits.

Table 15: Anaergia – 2b Summary

Evaluation Aspect	Summary
Technical Scope	• OREX processing MSW and YW • AD Co-Digestion o WAS o OFMSW

	◦ HSW ◦ OFYW • Biogas Production ◦ Conversion to either heat and power or RNG
Economic Assessment	• CAPEX ◦ $41.4 – 53.7 MM • Possible Funding Availability ◦ US EPA – Up to $4 MM ◦ CalRecycle – Up to $13 MM ◦ IRA - $16.6 – 21.5 MM • Cumulative Benefit – Up to $33.6 – 38.5 MM
Project Benefits	• T&D Savings ◦ $3.1 MM Annually • Alternative Energy Savings ◦ Power - $3.0 MM Savings ◦ RNG - $5.6 MM Revenue • HSW Tip Fee ◦ $1 – 2 MM Annually • Cumulative Benefit - $7.1 – 10.2 MM Annually

Project Delivery Model – Design-Build-Operate

Anaergia has delivered projects that are at the forefront of the industry, including some of the largest and most complex facilities of their kind for both public and private clients. Anaergia has overseen these projects from conceptualization and has led the projects through all stages of project execution including permitting, financing, engineering, construction, and operations / maintenance. Anaergia has executed projects using traditional and alternative project delivery methods including capital equipment and system sale, Design-Build (DB), Design-Build-Operate-Maintain (DBOM), Design-Build-Operate-Maintain-Finance (DBOMF), Design-Build-Own-Operate (DBOO), Design-Build-Own-Operate-Maintain-Finance (DBOOMF) and Operate-Maintain (OM). Anaergia's deep global experience and strong local presence, combined with the flexibility and know-how to offer alternative project delivery methods brings unparalleled experience in the marketplace for a trusted and reliable partner. Discussions between Anaergia and City staff determined that a Design-Build-Operate project delivery model would offer the City and its residents the most regulatory, financial, social, and environmental benefits.

A Desgin-Build-Operate delivery model would leverage Anaergia's project delivery know-how while also ensuring the lowest cost option to its residents. Enabling the City to retain ownership of the Project reduces its overall cost by (1) Offering a lower cost of capital and (2) Accessing additional state and federal economic incentives such as the US EPA, CalRecycle, and the IRA.

A Design-Build-Operate approach also allows the Project to benefit from Anaergia's in-house technology, process design and engineering, and project management capabilities that would facilitate the delivery of the Project in on time and within budget. Anaergia would also be able to coordinate the construction of the facility and installation of the equipment. An effective start-up, testing, and commissioning process would set the stage for a successful operation of the Project. Anaergia's commissioning team would be able to support on-site installation and commissioning, including through (1) initial checks, power up, signal checks, bump motors, preparedness; (2) initial test runs; (3) full load tests and equipment tuning; and (4) island testing and black start testing. Anaergia's performance guarantees would also be verified. Anaergia also could offer its broad experience in operations and maintenance of resource recovery facilities. Anaergia would leverage the suite of best practices it has developed and could support the City with daily operations of the Project.

9. Conclusions

An investigation of current City solid waste and WWTP operations, multiple site visits to the City's transfer station and WWTP, a financial and technical analysis of the proposed solutions developed for the City, a feedstock survey of the region, and an assessment for biogas utilization have been completed to evaluate the feasibility of this Project.

Based on the above assessments (detailed in the report), it can be concluded that a proposed Project is feasible and offers the City many regulatory, financial, social, and environmental benefits. Of the six scenarios evaluated, scenario Anaergia – 2b was found to offer the best option to the City.

This Project would not only improve critical solid waste infrastructure but also provide opportunities for a regional organics management program that drives the regional circular economy and creates opportunities for high-quality green jobs. The Project also represents a unique opportunity to position the City as a statewide leader in organics management, resource recovery, and renewable energy generation. This would also provide the local community with economic stimulus and environmental benefits. The Project's energy generation potential would also increase revenue for many years to come.

Given this, it is recommended that the City execute a development agreement and proceed to the development phase of this Project, with the aim of delivery a Design-Build-Operate resource recovery facility.

It is important to note that the costing and recommendations in this report are based on information that is currently known or made available. Additional engineering and project development work will be required during the development phase.

Further development work such as permitting, feedstock contracts, off take agreements, legal contracts, finalizing performance expectations, etc. will further refine the financial and overall feasibility of the project. It is recommended that a detailed engineering design process should be initiated to further refine capital and operating costs.