AECOM

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Ventura River Watershed Biodigester Feasibility Study

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DRAFT

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Section 1: Executive Summary

Within the 228 square mile Ventura River Watershed, located in the northwestern portion of Ventura County, inefficient organic waste disposal is increasing green house gas emission, odors, and nitrates and phosphates in groundwater and surface water resulting in an escalation of air and water quality concerns. Sources of the organic waste within the watershed include livestock manure, green waste from pruning, fertilizers, food wastes from schools and restaurants, septic tanks if not maintained, and homeless camps. Contaminants may enter water sources via surface runoff and groundwater infiltration.

To combat this contamination, the Waste To Energy Citizen group requested that the Ventura River Watershed Council stakeholder group partner with the Ventura County Watershed Protection District (District) to evaluate the engineering, operational, environmental, and economic feasibility of an organic waste biodigester. The concept of the project is to convert organic wastes generated in the Ventura River Watershed to energy and other useful products, such as livestock bedding and soil amendments. The project, if implemented, is intended to provide multiple benefits, including the following:

- Reduces undesired nutrient and microbe loading into surface and groundwater;
- Reduces generated methane and odor emissions currently released into the atmosphere;
- Reduces the amount of material landfilled preserving landfill capacity;
- Minimizes the cost of hauling the material from the Ventura River Watershed; and
- Increases local production of renewable energy sources, natural fertilizer, and stable compost.

In 2011, the District was awarded a Proposition 84 Planning Grant to conduct a feasibility study of an anaerobic digester (AD) that converts organic wastes to energy and other useful products. A series of four Technical Memorandums (TMs) were developed to incorporate into the overall feasibility study. Over the course of development, three public workshops in the City of Ojai were held to provide information to the public and solicit feedback.

A 2012 horse survey estimates that approximately 1,250 horses live within the Ventura River Watershed and produce approximately 8,400 tons of horse manure and 2,300 annual tons of horse bedding annually. Other organic waste streams in the watershed such as food waste and green waste were estimated to be produced at 544 and 6,890 tons per year, respectively. These four components, collectively called the feedstock, can undergo anaerobic digestion (AD) to produce biogas and subsequently electric energy with an estimated annual market value of $149,000.

Following review and screening of existing AD technology suppliers, 11 firms were identified for initial discussions. Based on findings from the subsequent survey and detailed discussions, three firms were recommended based on experience with similar dry feedstock. With the feedstock and technology understood, the siting of the facility was considered. Key features associated with an optimal project site were developed; these include proximity to the feedstock, adjacent to utilities and potentially a high energy demand (i.e. water or wastewater treatment

plant), industrial zoned area, and near a main transportation arterial. Based on these optimal site characteristics, a project site adjacent to the Ventura Avenue Water Treatment Plant, along North Ventura Avenue, was selected for purposes of developing a tentative facility site plan. Using the identified site, a preliminary Initial Study Checklist was performed under the California Environmental Quality Act and found that either a Mitigated Negative Declaration or Environmental Impact Report would be required for the project.

In coordination with one of the short-listed AD technology providers, Organic Services, a facility site plan was created which requires a footprint of nearly two acres and has an estimated project cost of $8.67M. The total includes a base construction cost of $5.13M. The remaining $3.5M comprises a 25 percent project contingency, design, environmental permitting, land acquisition and other project management and delivery costs. The project is recommended to be delivered using a Design-Build-Operate model which minimizes risk, provides technology flexibility, promotes innovation, and simplifies ongoing operation.

A financial analysis was conducted focusing on two alternatives: private sector ownership, operation and financing versus public-private partnership, with public ownership and financing and private operation. Following review of both alternatives, the public option was deemed the most economically viable as it provides the benefit of low interest financing. However, for the project to deliver a positive internal rate of return, the public option requires a tipping fee of $35/ton. The rate is consistent with the current market and would result in an estimated monthly cost of approximately $25 per horse. This cost is based on conservative estimates and could be reduced by lower than expected construction costs, increased use, grants, creating a revenue stream from the process by-product, and potentially spreading costs over all residents in the watershed by including the cost in the standard solid or liquid waste collection services.

As previously noted, the purpose of this study is to conduct a feasibility study of an anaerobic digester (AD) that converts organic wastes to energy and other useful products. Following completion of this planning-level investigation, several additional studies and more in-depth analysis were identified as beneficial. The following areas are recommended for future analysis, either as supplemental to this study or as independent technical memorandums:

- Feedstock, digestate and carbon credit market study
- Pilot testing/demonstration
- Comparative analysis of this solution versus alternatives for addressing total maximum daily loads (TMDL) for algae, eutrophic conditions and nutrients in the Ventura River.

Section 2: Introduction

2.1 Background

In the Ventura River Watershed air quality and water quality concerns are escalating due to the potentially inefficient and environmentally challenging disposal of organic wastes. The organic materials are the source for green house gases, odors, and cause an increase of nitrates and phosphates in groundwater and surface waters. The sources include livestock manure, green wastes from pruning, fertilizers, food wastes from schools and restaurants, septic tanks if not maintained and homeless camps. Some of these sources have the potential to be converted to energy. Contaminants may also soak into the ground during storms, infiltrate into the water table and eventually reach streams and the river via sub-surface flows.

Taking a proactive approach, the Waste To Energy Citizen group (W2E) requested that the Ventura River Watershed Council (VRWC) stakeholder group partner with the Ventura County Watershed Protection District (District) to evaluate the engineering, operational, environmental and economic feasibility of an innovative solution—an organic waste biodigester. In 2011, the District was awarded a Proposition 84 Planning Grant to conduct a feasibility study regarding this concept. The approved work plan is focused on determining the feasibility of using an anaerobic digester (AD) to convert organic wastes generated in the Ventura River Watershed to energy and other useful products, including livestock bedding, soil amendments and biodegradable planting pots[1]. The project, if constructed, is intended to provide multiple benefits, including the following:

- Reduces nutrient and microbe loading in surface and groundwater;
- Reduces generated methane and odor emissions currently released into the atmosphere;
- Reduces the amount of material land filled;
- Minimizes the cost of hauling the material from the Ventura River Watershed; and
- Increases local production of renewable energy sources, natural fertilizer, and stable compost.

2.2 Report Overview and Objective

To complete the overall feasibility study, a Technical Memorandum (TM) approach was identified by the Project Manager, in consultation with the Project Team, as the most effective means of delivering the overall study. The specific components of the study were separated into the four TM's. Each TM had a specific focus and objective, which are summarized as follows:

- **TM No. 1 – Feedstock Summary and Collection Methods (Section 3):** The focus of this initial TM is to define the potential feedstock and identify possible collection methods. The summary of feedstock quantities and type will be used to estimate potential energy production, and determine feasible technologies in TM No. 2. The summary efforts of this TM will reflect previous efforts by the District, W2E and other stakeholders, culminating in an illustrative GIS map highlighting estimated quantities, location and type of organic waste streams located within the Ventura River Watershed which could serve as potential biodigester feedstocks.

1 www.epa.gov/agstar/anaerobic/ad101/digester-byproducts.html

- **TM No. 2 – Technology and Site Analysis (Section 4):** The focus of this second TM is to identify up to three suitable AD technologies, and develop optimal criteria to be used in selecting a project site for future implementation. The technology summary includes process schematics, conceptual cost summary, operation and maintenance requirements, energy production estimates and footprint requirements. For determing the suitability of potential sites a generic analysis of site access, proximity to feedstock, utilities, potential energy user and environmental concerns are addressed.
- **TM No. 3 – Conceptual Site Plan, Environmental Review and Project Delivery (Section 5):** The focus of this third TM is to develop a conceptual site plan illustrating the general site layout, building size, and access. The optimal site characteristics developed as part of TM No. 2 were utilized to locate a conceptual site and create a conceptual layout of the AD plant for cost estimating purposes. A "fatal flaw" environmental review will be conducted of the proposed project at the identified site and a preliminary California Environmental Quality Act (CEQA) Initial Study checklist will be started. For determining the recommended project business model, a summary and analysis of options is provided.
- **TM No. 4 – Implementation Plan (Section 6):** The focus of this fourth TM is to develop an Implementation Plan which includes an analysis calculating the rate of return and an overall project schedule. The spreadsheet-style financial analysis will be based on value inputs developed in coordination with local utilities, haulers, operators, proposed equipment manufacturer and various Stakeholders. The overall project schedule will include major milestones and identify lead agency responsibilities.

These four technical memoranda were used as the basis for this comprehensive feasibility report. As noted above, each of the following sections represents one of the four individual technical memoranda.

2.3 Public Outreach

Over the course of developing the individual Technical Memoranda, public outreach efforts were conducted to inform the public of the initial findings and solicit feedback. The presentations were attended by the consultant team, W2E, District, Ventura County Resource Conservation District and the public. The following meetings were held:

- Workshop No. 1 – Overview of Project Objective and Approach, February 21, 2012 at Nordhoff High School, Ojai.
- Workshop No. 2 – Presentation of TM No. 1 and 2 Results, September 17, 2012 at Matilija Junior High School, Ojai.
- Workshop No. 3 – Presentation of TM No. 3 and 4 Results, February 27, 2013, at Chaparral Auditorium, Ojai.

Comments received during the public outreach meetings have been incorporated into the combined feasibility report. Questions and comments received, along with corresponding responses, are attached in **Appendix G**.

Section 3: Feedstock Summary and Collection Methods

3.1 Objective

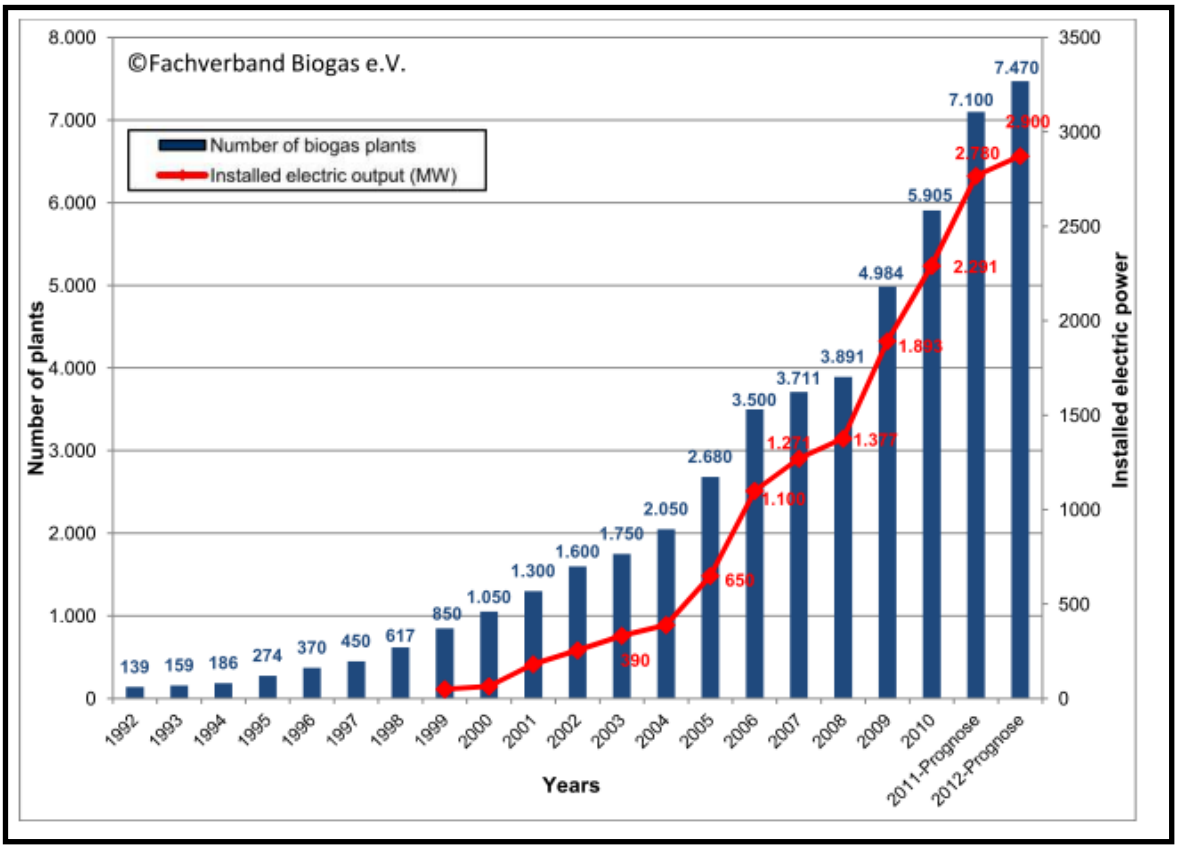
The focus of this section is to define the potential feedstock and identify possible collection methods. The summary of feedstock quantities and type will be used to estimate potential energy production, and determine feasible technologies in Section 4. The summary efforts of this TM will reflect previous efforts by the District, W2E and other stakeholders, culminating in an illustrative GIS map highlighting estimated quantities, location and type of organic waste streams located within the Ventura River Watershed which could serve as potential biodigester feedstock. Section 3 is intended to address the following questions:

- What is the energy potential of horse manure from within the Ventura River Watershed?
- What is the energy potential of all potential biodigester feedstock within the Ventura River Watershed?
- How could the material be collected and what would collection cost?

3.2 Feedstock Summary

Until recently, AD technologies were focused on a single substrate, single purpose treatment (i.e. municipal sludge digestion). However, with a better understanding of the microbiological process and more precise control achievable, these AD technologies have been increasingly used for alternative feedstock, including source-separated organic (SSO) waste and the organic fraction of municipal solid waste (OFMSW). SSO and OFMSW can include yard trimmings, food scraps, wood waste, paper products and other organic waste materials. Over the past couple decades this increase in confidence, combined with new government incentives, has led to a substantial increase in the number of AD installations in Europe. During this period, the installation of AD plants utilizing primarily agricultural feedstocks, such as animal manure and energy crops, has grown dramatically. In Germany alone, the number of facilities has increased from less than 140 plants in the early 90's to over 7,000 installations by the end of 2011 as shown in **Figure 3-1.**

Figure 3-1
AD Development of the Number of Biogas Plants and the Total Installed Electric Output in Megawatt [MW] (As Of 11/2011)



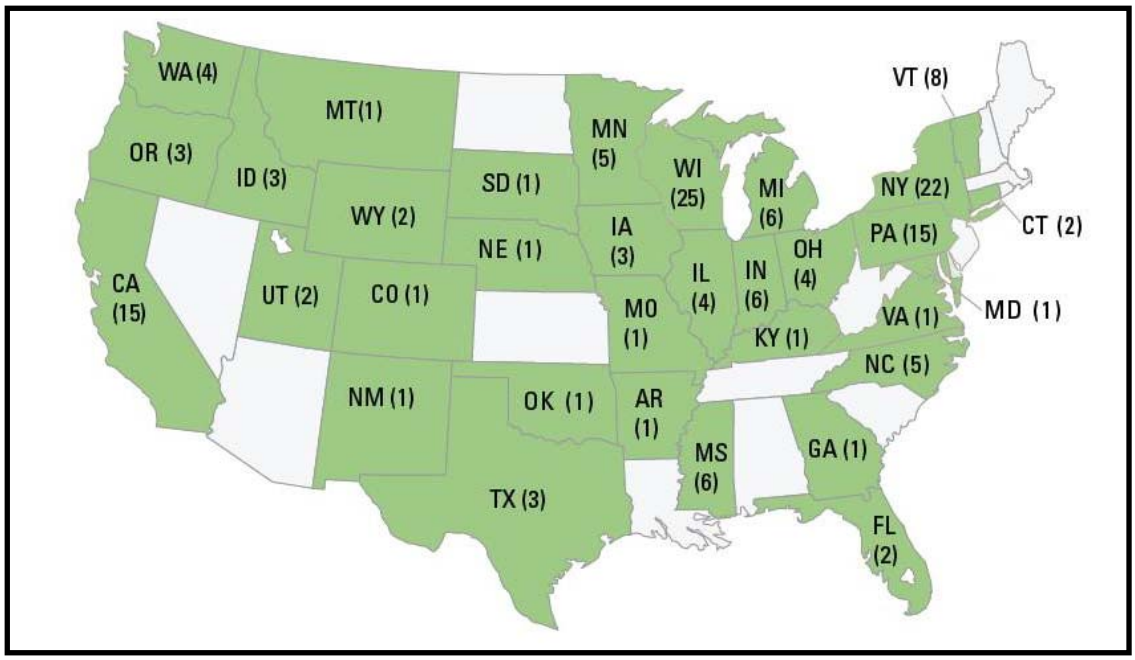
Note: German Biogas Association, 2011

Most of the produced biogas is converted into electricity and heat in a simultaneous process in cogeneration units supplying electricity to more than five million homes, on average. This is nearly equal to 18 percent of the electricity obtained from renewable sources and about 3.5 percent of the total electricity consumption - making Germany the world leader in AD for energy production. The focus on Europe, and specifically Germany, demonstrates that the technology is proven and the practice is well established.

In recent years the United States has begun to invest more heavily in AD technologies. As of July 2010, the Environmental Protection Agency estimates that 157 AD projects are operating on commercial scale livestock facilities nationwide[2]. **Figure 3-2** provides an illustrated breakdown of the number of estimated operating manure AD systems by state.

2 U.S. Anaerobic Digester Status Report, United States Environmental Protection Agency, 2010

Figure 3-2
Operating Manure Digester Systems by State (July 2010)



Note: U.S. Anaerobic Digester Status Report, United States Environmental Protection Agency, 2010

Along with the development of AD technologies to treat municipal and agricultural organic feedstocks, the number of plants that utilize co-digestion has increased. Co-digestion (or "co-fermentation") is the simultaneous digestion of a mixture of two or more substrates, usually a primary substrate (e.g. manure, energy crops or municipal wastewater sludge) together with lesser amounts of one or more secondary substrates. A German monitoring program[3] conducted between 2006 and 2008 surveying 61 agriculture-based AD plants found that most plants digested more than one feedstock with maize silage and cow manure representing the most prominent feedstocks.

For the purposes of the District's biodigester feasibility study, the primary substrate is intended to be horse manure, with a secondary substrate being utilized if an ancillary benefit, such as lower cost or increased operational efficiency, can be provided. Although a wide range of organic feedstocks have been found suitable for co-digestion with promising gas yields, this study will focus on the following substrates: horse waste, food waste, green waste and municipal sludge.

These feedstocks were selected by the District following initial discussions and investigations. It is understood that additional feedstocks may be identified in future investigations. However, to complete a conceptual analysis, these feedstocks will be considered the conservative baseline. To account for this variability, treatment technologies that will allow future phasing and will have the flexibility to process a variety of feedstocks will be considered.

3 Fachagentur Nachwachsende Rohstoffe e.V. (Agency for Renewable Resources): http://mediathek.fnr.de/broschuren/bioenergie/biogas/biogas-messprogramm-ii-61-biogasanlagen-im-vergleich.html; http://mediathek.fnr.de/downloadable/download/sample/sample_id/293/

3.2.1 Data Collection

AECOM utilized data provided by the District and a desktop analysis to estimate feedstock quantities within the Ventura River Watershed, specifically the main Ojai Valley (upper Ojai Valley excluded). The focus of the estimate included the following feedstock sources: horse manure, horse bedding, green waste, food waste and sludge from the Casitas Municipal Water District (CMWD).

In 2009, Hawks & Associates conducted a preliminary survey of horses in the Ventura River Watershed. The initial survey was updated in 2011 following interviews with 22 horse owners within the watershed. The survey was conducted using information from owners, site visits, and drive-by field observations, and was documented in the memorandum, "Updated Preliminary Ojai Valley Horse Survey and Solid Waste Estimate" (2012). The number of horses documented totaled to 1,249. As noted in the memorandum, it is believed that this value may actually be 2,000 to 3,000. However, for purposes of this feasibility study and maintaining a conservative approach to feedstock quantity estimating, the rounded value of 1,250 will be used. **Table 3-1** provides a summary of the potential feedstock derived from the observed horse population.

Table 3-1
Horse Waste Generation in Ventura River Watershed

Type	Assumptions	Number	Horse Waste (tons/yr)
Horse Manure[(a)]	solid manure only	1,250	8,400[(c)]
Bedding[(b)]	50 percent stalled	1,250	2,300[(c)]
	Total		10,700

(a) One horse, defined as a 1000 lb animal, produces 37 lbs (solid) manure and 2.4 gal of urine per day, for a total of 60 lb of waste per day (Romano et al., 2006; Westendorf and Krogmann, 2004; Wheeler and Zajaczkowski, 2002)

(b) A stalled horse requires up to 20 lb of bedding per day (Westendorf and Krogmann, 2004; Wheller and Zajackzkowski, 2002). The Ventura County Resource Conservation District noted that many horses are in confinement and bedding is cleaned daily for sanitary reasons (Marty Melvin, May 1, 2012). Using 50 percent is a conservative value.

(c) Calculation based on manure without urine.

Table 3-1 demonstrates that the total estimated horse waste generated daily is approximately 30 tons per day without urine. Assuming the true number of horses is closer to 2,000 to 3,000, this value could escalate to 47 to 70 tons per day, respectively.

To evaluate food waste sources in the Ventura River Watershed, a list of local schools, hospitals, restaurants and groceries stores was compiled. Although typical residential solid waste has been estimated to consist of 10 to 12 percent food waste by weight[4], typical residential waste generators will not be considered due to the level of effort required for public outreach and education. Targeting larger food waste generators for the initial phase will simplify initial program implementation, streamline the collection operation, and increase the effectiveness of this component of the overall program. **Table 3-2** provides a summary of estimated food waste generation in the City of Ojai area.

4 Human Ecology, P.R. Yadav 2004

Table 3-2
Food Waste Generation in Ojai

Type	Description	Number	Food Waste[a] (tons/yr)
Hospital	Ojai Valley Community	110 beds[b]	69
School	Meiners Oak Elementary UA[e]	345 students (typ)[c]	24
	Mira Monte Elementary UA	411	29
	Topa Topa Elementary	469	33
	San Antonio Elementary UA	170	12
	Summit Elementary UA	-	-
	Matilija Junior High	518	37
	Chaparral High	56	4
	Nordhoff High	952	67
	Happy Valley UA	85	6
	Laurel Spring	1999	142
	Monica Ros UA	126	9
	Montessori School of Ojai UA	88	6
	Oak Grove UA	190	13
	Ojai Christian Academy UA	46	3
	Ojai Valley Ojai & UA	329	23
	The Thacher UA	249	18
	Valley Oak Charter	59	4
	Villanova Preparatory UA	314	22
Restaurants[f]	51 counted	5 Employees each[d]	8
Grocery Store[f]	7 counted	10 Employees each[d]	15
	Total (School)		**452**
	Total		**544**

(a) Massachusetts Department of Environmental Protection (Draper/Lennon, 2002)

(b) Food Waste (ton/yr) = N of beds x 5.7 meals/bed/day x 0.6 lbs food waste/meal x 365 days/yr x 1 ton/2000 lbs

(c) Food Waste (ton/yr) = 0.35 lbs/meal x N of students x 405 meals/students/yr x 1 ton/2000 lbs

(d) Food Waste (ton/yr) = N of employees x 3,000 lbs/employee/yr x 1 ton/2000 lbs; employees for restaurants and grocery stores assumed to be 5 and 10, respectively.

(e) UA = Unincorporated Area

(f) The number of restaurants and grocery stores listed is not comprehensive and represents the results of a concept level desktop study.

Table 3-2 demonstrates that the total estimated food waste generated daily is approximately 1.5 tons. Although the focus of this study is feedstocks within the Ventura River Watershed area, additional food waste from surrounding areas, such as the City of Ventura, may increase the economic viability of the project. Based on a population of 106,000[5] and an estimated per capita food waste stream of 1 lb per day[6] for each resident, the estimated food waste for the City of Ventura could be as high as 50 tons/day. With regards to proximity, the Gold Coast Recycling & Transfer Center, which is the current disposal location of food waste generated in the City of

5 July 2010, U.S. Census Bureau

6 http://www.nytimes.com/2008/05/18/weekinreview/18martin.html?_r=2&oref=slogin

Ventura MSW, is located on Colt Street in the City of Ventura, and is approximately eight miles from the Ojai Valley Sanitary District (OVSD) Wastewater Treatment Plant.

Another potential source of feedstock is the Marion R. Walker Filtration Plant (Plant), which is owned and operated by CMWD. This Plant provides filtration of water from Casitas Lake before entering the distribution system. The Plant is a high-rate, in-line pressure filtration plant. Features include horizontal pressure filters, continuous real-time monitoring and alarm systems, and the application of chlorine. The filter plant clarifies and reduces turbidity in the water. Silt and other natural materials that are removed from the water are placed in drying beds and later hauled off to the landfill. CMWD is currently investigating the percent moisture content and volatile solids of the hauled sludge, which totals approximately 2 tons per year. Based on standard drying bed operation at wastewater treatment plants, the sludge may dry to 25 percent solids after a few weeks in good climates, but normally takes two to three months[7].

Green waste estimates were developed utilizing contract hauler reporting data from the Ventura County Integrated Waste Management Division (IWMD). **Table 3-3** provides a summary of these values.

Table 3-3
Green Waste Generation in Ventura River Watershed

Type	Description	Green Waste (tons/yr)
Ojai UA Residential GW & lumber[(a)]	curbside cart /commercial roll-offs	1,060
VRV UA Residential GW & lumber[(a)]	curbside cart collection	4,120
Ojai Residential GW & lumber[(b)]	curbside cart collection	1,450
Ojai Commercial GW & lumber[(b)]	roll-off container collection	260
	Total	6,890

(a) Integrated Waste Management Department, Q3'10-Q2'11 Hauler Quarterly Reports
(b) Integrated Waste Management Department, SWS Consultants/hauler 2010 Report

Table 3-3 demonstrates that the total estimated green waste generated daily is approximately 19 tons per day.

A summary of identified feedstocks, including horse manure and bedding, food waste, CMWD sludge, and green waste is provided in **Table 3-4**.

7 Handbook of Wastewater Reclamation and Reuse, Rowe,1995

Table 3-4
Feedstock Quantity Summary

Type	Waste (tons/day)
Horse Waste	23.0
Horse Bedding	6.3
Food Waste - School	1.2
Food Waste – Other Sources	0.3
CMWD Sludge	<1[(a)]
Green Waste	19
Total	50

(a) CMWD Sludge is 2 tons/year, which equates to 0.005 tons/day.

In addition to the summary provided in **Table 3-4**, a map is provided as **Figure 3-3** which depicts the general location and estimated quantity of key feedstocks, including horse waste and food waste from schools and hospitals.

Legend

- School
- Hospital
- Horses

Quantity (Tons / Year)

- <50
- >50
- >100
- >500

N
W E
S

0 0.5 1 2 Miles

Ventura County Watershed Protection District	
Feedstock Estimates	
July 2012	Figure 3-3

3.2.2 Feedstock Characteristics

After the quantities of the various feedstocks are estimated, it is necessary to summarize the characteristics of the combined feedstock. This information will be critical for estimating magnitude of energy generation and for determining appropriate technologies.

The moisture content of the selected feedstock will have a significant influence on the selection of the most effective technology. AD technologies are typically classified as a dry or wet digestion (fermentation) process. Dry AD technologies are well suited for feedstock with a total solids (TS) content of above 15-20 percent while wet AD technologies are better suited for a TS of below 15-20 percent. **Table 3-5** provides a summary of TS values for the feedstocks identified in Section 3.2.1.

Table 3-5
Total Solids per Feedstock

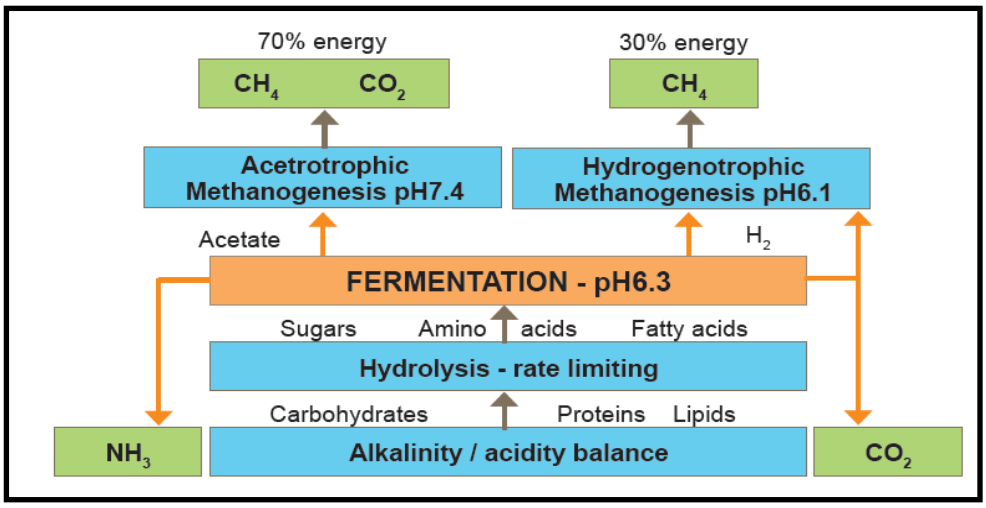
Substrate	TS (%)
Horse Manure[(a)]	20-42
Horse Bedding[(a)]	
- Stall Waste (manure plus bedding)	22-40
- Softwood Bedding (fresh)	91-93
- Softwood Bedding (manually separated)	30-32
- Wood Pet ®	93-94
- Straw	92-94
Food Waste[(b)]	10-26
CMWD Sludge[(c)]	25
Green Waste[(d)]	25-50

(a) Anaerobic Digestion of Equine Waste, Wartell and Fennel, 2009
(b) R. Zhang et al. (2007)
(c) Handbook of Wastewater Reclamation and Reuse, Rowe,1995
(d) Characterization of Food and Green Wastes as Feedstock for Anaerobic Digesters, Zhang et al. (2005)

As demonstrated by **Table 3-5**, feedstocks can vary considerable between different feedstocks. Horse manure, horse bedding, and green waste can be considered dry feedstocks, while food waste can be categorized as wet, in most cases.

Another critical characteristic of the AD feedstock is the volatile solids (VS) content since the VS content can be considered as the amount of solids that can potentially be converted by the bacteria to biogas. Thus, the volatile solids content, in addition to system temperature and conversion efficiency, directly control the amount of biogas that a biodigester can be expected to produce. Biogas generally consists of methane (CH_4) and carbon dioxide (CO_2) and is generated during the AD process. The process includes two steps, which are conducted in the absence of oxygen and with specific microbial populations. During the first step, the VS are converted into fatty acids by acetogens (acid-forming bacteria). In the second step, the acids are converted to biogas by methanogens (methane forming bacteria). **Figure 3-4** illustrates the biochemical AD process.

Figure 3-4
AD Process



Both the VS and biogas production of the VS can vary among feedstock, depending on the balance of sugars, lipids and proteins found in the organic feedstock. **Table 3-6** provides a summary of estimated annual biogas production based on specific VS and biogas production values for the specific feedstocks identified in Section 3.2.1.

Table 3-6
Volatile Solids and Biogas Production Estimates per Feedstock

Substrate	Waste (tons/day)	TS (%)	VS (% TS)	Biogas Production (m^3/kg VS)	Biogas (m^3 per year)
Horse Manure	23.0	20-42	76-92[(a)]	0.30[(d)]	347,000
Horse Bedding	6.3	68 (avg)	79 (low)	0.20[(e)]	231,000
Stall Waste		*22-40*	*79-91*		
Softwood Bedding		*91-93*	*89-99*		
Softwood Bedding		*30-32*	*91-94*		
Wood Pet ®		*93-94*	*90-92*		
Straw		*92-94*	*97-98*		
Food Waste	1.5	10-26	87[(b)]	0.25-0.60[(f)]	11,000
Green Waste	19	25-50	95[(c)]	0.2-0.5[(g)]	297,000
Total	**50**				**886,000**

(a) Anaerobic Digestion of Equine Waste, Wartell and Fennel, 2009
(b) R. Zhang et al. (2007)
(c) European Symposium on Environmental Biotechnology, Verstraete (2004)
(d) Kusch et al. 2008
(e) Energy production potential is noted as approximately 60 percent of horse manure in Anaerobic Digestion of Equine Waste, Wartell and Fennel, 2009.
(f) Seadi, 2001
(g) Future Prospect of Biogas Production, Gaia Consulting (2006).
(h) 1 ton = 907.2 kg

Due to the relatively small quantity of available CMWD Sludge (2 tons/year), this feedstock was not included in the biogas and energy production estimates. To estimate the biogas volumes provided in **Table 3-6**, the waste quantity and TS fraction from **Table 3-4** and **Table 3-5** were applied, respectively. For feedstocks with a range of values for TS, VS and biogas production, the lower end values were utilized, to ensure a conservative final estimate consistent with the level of granularity available. However, for the horse bedding TS an average was used due to the exceptionally wide range of values. Additional investigation is required to develop an accurate understanding of the ratio of horse bedding materials used in the Ventura River Watershed, and most importantly, by those horse owners that are potential users of the proposed AD facility. Using the average value, in lieu of the lower end value, for biogas production, TS and VS, results in an 86 percent increase in estimated annual biogas.

It shall be noted that some of the feedstocks listed in **Table 3-6** above such as horse manure, bedding material (e.g. softwood, straw), and green wastes are not readily digestible due to their more fibrous nature with higher lignin, cellulose and/or hemicellulose content requiring pre-treatment (hydrolysis with possible enzyme addition) to enhance their digestibility. Given their properties, these types of feedstocks are used as a secondary substrate in conventional AD installations.

3.2.3 Energy Potential

The biogas produced by the organic feedstock and AD process will consist of mostly methane and carbon dioxide, with traces of gases such as hydrogen, carbon monoxide and nitrogen. The energy content of the biogas is chemically bound in the methane component. Although the rate of methane can vary from 50 to 80 percent, a percentage of 60 is assumed for this analysis[8]. The calorific energy (as Lower Heating Value) of the biogas, at 60 percent methane, is approximately 6.0 kWh/Nm^3. The conversion efficiency of biogas to electric energy depends on the technology selected, but is assumed to be 35 percent for the purposes of this study. **Table 3-7** provides an estimate of the potential magnitude of energy production for the proposed District facility.

Table 3-7
Project Specific Estimated Energy Potential

Substrate	Biogas w/60% CH_4 (m^3 per year)	Electric Energy Potential (kWh)	Market Value of Electric Energy ($)
Horse Manure	347,000	729,000	58,000
Horse Bedding	231,000	485,000	39,000
Food Waste	11,000	23,000	2,000
Green Waste	297,000	624,000	50,000
Total	**886,000**	**1,861,000**	**149,000**

Table 3-7 notes the potential biogas production for an AD facility, utilizing all identified organic feedstock, is estimated to produce 5,100 kWh/day. This translates to approximately $400/day when applying a typical cost of electricity of 8 cents/kWh. This value will vary depending on the configuration of the facility. Supplying power to a high-demand facility, such as the OVSD

8 http://www.afdc.energy.gov/afdc/fuels/emerging_biogas.html

Wastewater Treatment Plant, will avoid the need to sell energy back into the Southern California Edison grid, where "buy-back" costs can be below standard purchase rates.

Although the organic feedstocks proposed for this facility are relatively unique, existing dry AD facilities can be used to confirm whether the estimated values are consistent with actual operation. In Heppenheim, Germany, a dry AD facility utilizing Strabag's (former Linde) dry plug-flow AD technology co-digests approximately 31,000 tons of SSO, 5,000 tons of garden waste, and 2,000 tons of industrial feedstock a year (38,000 total tons) for an energy generation of 5.7 GWh/yr or 15,600 kWh/day[9].

As estimated in this TM, a potential biodigester could be processing approximately 18,300 tons per year of waste to generate 1.9 GWh/yr. The relative ratio between feedstock quantity and energy production at the existing Heppenheim AD facility compared to the facility proposed in this TM indicates that the assumptions contained herein are conservatively reasonable.

3.3 Feedstock Collection

The following section addresses current and potential collection methods for organic waste, as well as associated costs for current methods.

3.3.1 Current Collection Methods

E.J. Harrison and Sons (Harrison) has been the sole hauler for the City of Ojai since 1965. Currently, Harrison provides Trash, Recycling, Yard Waste and Roll Off services to 2,200 residential, commercial, industrial and multi-family accounts[10]. In addition to serving the City of Ojai, Harrison provides services to approximately 10,000 residential and commercial customers in the County of Ventura, including the unincorporated areas surrounding the City of Ojai. These include the communities of Upper Ojai, Casitas Springs, Oak Park, Oak View and Meiners Oaks.

Harrison currently offers collection services for horse manure in the Ojai area, including options for a 25 or 40 cubic yard container. Due to weight constraints, the 25 cubic yard (Approx. size 22' x 8' x 4') and 40 cubic yard (22' x 8' x 6') can only be filled to a height of 2.5 feet[11]. The manure hauling fee for both the 25 and 40 cubic yard container ranges between approximately $125 and $165. The variation in cost is due to the difference in tipping fees associated with available depositories, which include the OVSD Wastewater Treatment Plant (no charge), Santa Clara Organics ($165 flat fee) and Agromin ($36.55 per ton)[12].

Alternatively, horse owners are utilizing the following methods for disposing of horse manure:

- Local citizens are providing hauling services for approximately $100/month (no quantity provided). The local hauler delivers the horse manure to a composter who pays for the delivery of horse manure.
- Onsite stockpiling/composting
- Onsite spreading and tilling

9 Feasibility of Generating Green Power through Anaerobic Digestion of Garden Refuse from the Sacramento Area, RIS International (April 2005)

10 http://www.ejharrison.com/services/service_areas.html

11 Phone discussion with Harrison staff (April 3, 2012)

12 Email correspondence with Harrison staff (June 26, 2012)

With regards to food waste, Harrison recently began providing separate food waste collection options for several Ventura County communities, including the City of Ventura, and is in the process of expanding these services to other service areas. Once collected, the food waste is brought to a Ventura County soil amendment company, Agromin, for composting. Since the food waste collection service is in the early stages of development, no pricing was made available[13].

3.3.2 Potential Collection Methods

Transport and supply of feedstock(s) play an important role in the operation of a biogas plant. Therefore, it is important to ensure a stable and continuous supply (in both quantity and quality) of feedstock. Due to the varied origins of the horse manure, management of feedstock quality is necessary, in order to check, account and verify the supplied material. Initially, it will be necessary to visually inspect each feedstock load to verify the appropriate material is being provided. Then, the delivery weight and all feedstock data (supplier, date, quantity, type of feedstock, processes of origin and quality) should be recorded. Should the feasibility study's conclusions support the pursuit of the collection of multiple feedstocks, particular attention is needed for feedstock types (such as sewage sludge) classified as wastes, since it may be necessary to follow guidelines or requirements from the appropriate regulatory agency.

For the collection of horse manure, the current service offered by Harrison reflects existing practice already in place in other southern California communities. For example, the Los Angeles Bureau of Sanitation (BOS) provides horse manure collection services for the 1,500 horses licensed to City of Los Angeles residents. To manage the estimated 9.4 tons of manure generated daily, the BOS provides a 60-gallon brown horse manure container to residents for an additional $10.00 per month charge, for a minimum of six months.

Collected horse manure and yard trimmings are delivered to the Lopez Canyon Environmental Center, located in the City of Los Angeles (see example of delivery in **Figure 3-5**). Once at the facility, the horse manure and yard trimmings are decontaminated, ground, mixed (horse manure with yard waste), and laid in windrows for composting (60 days composting time for horse manure).

Figure 3-5
BOS Collection Services

13 Phone discussion with Harrison staff (May 30, 2012)

The Riverside County City of Norco provides a similar service for horse manure, but also provides the opportunity for residents to obtain a self-haul manure permit. This permit includes specific conditions such as specified hauling frequency (24 disposal receipts required per year) and a requirement that manure must be hauled to an approved facility, to maintain the permit. The City's Municipal Code (Chapter 6.45) requires all City residents who keep livestock to participate in the City's manure collection program and pay the associated service fees.

Examples of food waste programs, and their corresponding collection systems, exist throughout North America and Europe. **Figure 3-6** illustrates the method used for collecting food waste, which includes the use of biodegradable bags as liners in small internal containers (left) used for daily collection and a larger, lockable external containers (right) used for curbside collection. The contents of the internal container are transferred to the external container on a frequent basis to reduce odors.

Figure 3-6
Food Waste Collection

Source: City of Dana Point, CRR Food Waste Brochure

3.3.3 Frequency and Cost

The frequency and cost of collecting horse manure for the City of Ojai has already been defined in the Harrison contract, and is presented in Section 3.3.1. Horse manure and food waste would be scheduled for weekly collection, similar to trash and green waste. The current horse manure collection costs reflect the current operation of hauling horse manure to the OVSD Wastewater Treatment Plant (no charge), Santa Clara Organics ($165 flat fee) and Agromin ($36.55 per ton). Should a technology be identified that produces a revenue, such as electricity or soil amendment, from horse manure and/or other feedstock it is assumed that the tipping fee could be reduced and the overall cost of collection could be decreased. However, any reduction or even elimination in tipping fee would impact only a portion of the current hauling rates, since other costs such as labor, vehicle cost and maintenance, and fuel costs may not be significantly affected.

Although an estimate of the potential cost cannot be determined without a firm understanding of the feedstock quantities, AD technology, capital cost, energy production, and byproduct revenue, current operations from similar communities can provide a general range of potential collection costs. The City of Norco provides horse manure collection services, via weekly collection of a 96-gallon wheeled cart, for $23.68 per month, while the City of Rolling Hills Estates provides the same service for $57.44. For the City of Norco, the lower cost is likely due to lower disposal costs; the City currently charges $17.25 per ton and disposes the manure on leased drying fields. These examples demonstrate that the current costs, provided in Section 3.3.1, represent the upper end of potential hauling costs.

Section 4: Technology and Site Analysis

4.1 Objective

The focus of this section is to identify up to three suitable AD technologies, and develop optimal criteria to be used in selecting a project site for future implementation. The technology summary includes process schematics, conceptual cost summary, operation and maintenance requirements, energy production estimates and footprint requirements. For determing the suitability of potential sites a generic analysis of site access, proximity to feedstock, utilities, potential energy user and environmental concerns are addressed. This section is intended to address the following questions:

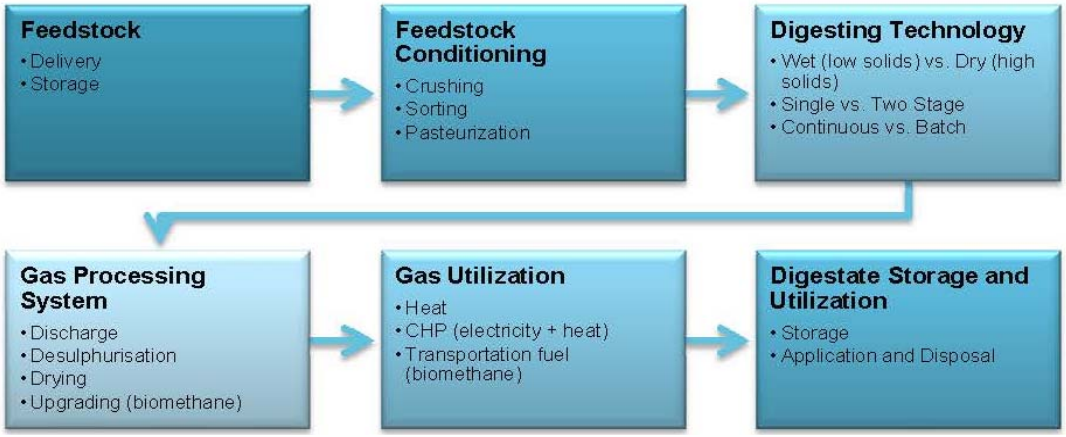
- What criteria should be used to evaluate the technologies for the proposed facility?
- What technologies are suitable for the feedstock identified within the Ventura River Watershed as described in Section 3?
- What are the characteristics of a preferred site?

4.2 Technology Analysis

4.2.1 Overview

The following section provides a general overview of the AD process, identifies technologies suitable for the proposed feedstock and highlights major process characteristics and differences among these technologies. An AD plant is a complex installation, consisting of a variety of elements. The layout of such a plant depends to a large extent on the types and amounts of feedstock supplied. As there are many different feedstock types suitable for digestion in AD plants, there are, correspondingly, various techniques for treating these feedstock types and different digester designs and methods of operation. Furthermore, depending on the type, size and operational conditions of each AD plant, various technologies for conditioning, storage and utilization of biogas are possible to implement. Regardless of the technology variations, the main process steps in a biogas plant are essentially the same; this process is outlined in **Figure 4-1**.[14]

Figure 4-1
Main AD Process Steps



[14] Biogas Handbook, (Al Seadi et al., October 2008); adapted

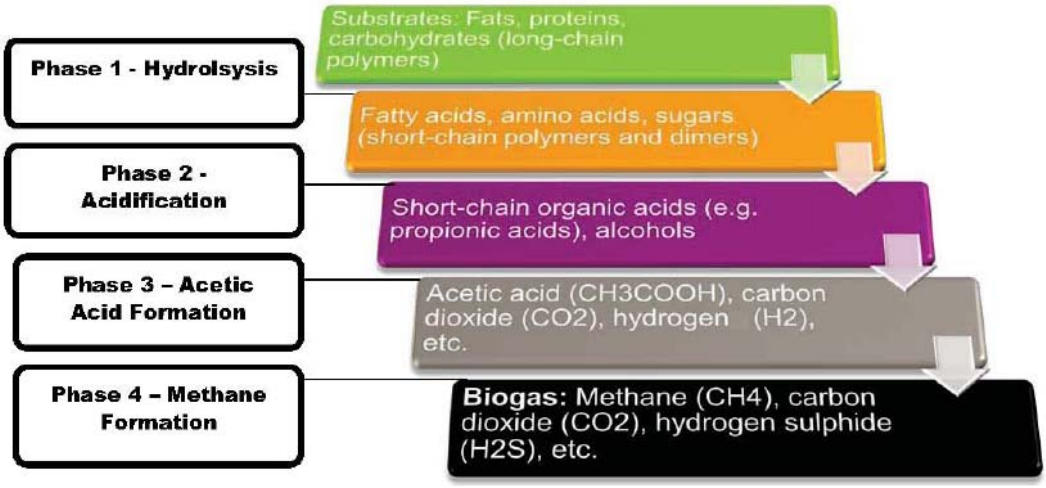
The main component of the process is the digestion technology, or reactor tank, which is accompanied by a number of other components. This process varies by the technology provider but also on the specific application feedstock. AD technologies are typically classified as a dry (high solids) or wet (low solids) digestion (fermentation) process. Dry AD technologies are well suited for feedstock with a total solids (TS) content of above 15-20 percent while wet AD technologies are better suited for a TS content of below 15-20 percent. As determined in Section 3, the majority of feedstock (59 percent) identified for this project is horse manure and bedding which has an expected TS content of 20-42 percent. As such, the focus of the technology evaluation was on dry systems. A general sampling of dry AD technology companies are identified in **Table 4-1**.

Table 4-1
Dry AD Technology Companies

- Agraferm
- Aikan
- Anaergia (w/UTS as part of the group)
- Bekon
- Biocel
- Bioferm (Vissmann Group)
- Biopercolat
- Clean World Partners
- Organic Waste Services (OWS)
- Eisenmann
- Finsterwalder Umwelttechnik
- Gicon Bioenergie
- Kompoferm (Eggersman)
- Novatech
- Organic Services
- Strabag (former Linde-BRV)
- Valorga (Urbaser)

Dry AD system providers have differences in the process approach used with relation to being a single stage or two-stage process. These stages are in reference to the overall methane production process which is illustrated in **Figure 4-2**.

Figure 4-2
Methane Production



In a single stage system, all the biochemical processes illustrated in **Figure 4-2** take place in a single reactor. This approach minimizes the technical design (lower complexity) resulting in less potential points of failure and requires less capital investment. The major drawback of single stage AD systems is that these processes are required to proceed under the same operating conditions despite differences in biological growth rates and optimal pH of the microbial groups involved in each step[15]. Due to this simplistic design, compared to two-

[15] Anaerobic Digestion of Organic Solids Waste for Energy Production, by Nayono, Satoto Endar (December 2009)

stage systems, single stage systems are more prone to upset. This disadvantage is more pronounced where substrates (feedstocks) are limited by methanogenesis (methane formation) rather than by hydrolysis, as is the case with cellulose-poor feedstock such as kitchen wastes. These wastes acidify rapidly, which inhibits methanogenesis when the feedstock is not adequately mixed, buffered and dosed[16].

However, practice has shown that the advantage of having accelerated degradation during the digestion step is usually not enough to compensate for the higher capital cost of the hydrolysis-step for the majority of organic feedstocks. Hence, over 90 percent of the full-scale AD organic solid waste plants operating in Europe utilize single stage systems[17].

Nonetheless, for certain organic feedstocks that have a high fiber and cellulose content such as grasses, straw and horse manure, a two-stage digestion system is a viable approach for producing biogas.

In a two-stage system, separate tanks are provided to ensure optimal conditions (i.e. temperature, pH) for the various phases identified in **Figure 4-2**. The first tank, where feedstock is initially loaded, is best suited for hydrolysis (phase 1) and acidification (phase 2), and is focused on the conditions preferred by hydrolyzing bacteria (with shorter retention time). The second tank is configured for acetic acid formation (phase 3) and methane formation (phase 4), and is tailored specifically for methanizing bacteria (with longer retention time). The benefit of utilizing a two-stage system is the ability to provide separate reactors for each step. Using this approach, reactor conditions can be set to optimize growth for the particular bacteria which allows for better digestion of biomass rich in cellulose and fiber. Given the high percentage of horse manure/bedding and ability of the two-stage system to better process these types of feedstocks, the two-stage process is better suited to meet the needs of the proposed AD project.

Table 4-2 summarizes the key differences between the two major groups of bacteria involved in the AD process.

Table 4-2
Hydrolyzing and Methanizing Bacteria

Description	Hydrolyzing Bacteria	Methanizing Bacteria
Retention Time	Varies: 3 hrs to 3 days	Varies: 6 to 14 days
Optimum Temp.	30 to 65 degree C, varies	37 to 55 degrees C, constant
pH Values	5 to 6, or less in some cases	7 to 8
Characteristics	Robust, can endure disruptions of temperature or pH value	Susceptable to change in pH value and reduction of temperature
Aerobic Sensitivity	Effective, even in an environment with oxygen; e.g. when hydrolysis tanks are fed	Die immediately after acidified crop is loaded
Methane Yield [other gases]	Minor (0 to 30 percent) [mostly carbon dioxide; hydrogen sulfide (depending upon feedstock)]	High (50-70 percent) [carbon dioxide; other trace gases (<1%) e.g. hydrogen sulfide, siloxanes]

Sources: Organic Services, Innovas, AECOM

[16] Vandevivere et al., 2002; Gerardi, 2003
[17] De Baere and Mattheews, 2008

4.2.2 Technology Feasibility

As noted in Table 4-1, over a dozen dry AD technology suppliers are available on the market. To narrow the focus down to three feasible technologies, AECOM utilized a preliminary screening criteria which required the following from the technology provider: a) at least one completed facility in operation using horse manure as a feedstock, b) have at least three facilities in operation for more than three years with similar dry feedstock and c) provide a dry AD technology. Using this preliminary screening criteria and research of available materials, 11 firms were identified with potential to meet the noted criteria and initial contact was made.

Following discussions with firms responding to our initial contact, a questionnaire was provided to seven firms which appeared to meet the minimum screening criteria. The questionnaire, included as **Appendix A**, was developed to determine the feasibility of each technology relative to the feedstock identified in Section 3 and was based on the evaluation criteria developed in coordination with District staff and stakeholders at a workshop on May 24, 2012. These criteria are summarized as follows:

1. Similar Facilities;
2. Feedstock Flexibility;
3. Energy Production;
4. Footprint Requirements;
5. Capital Cost;
6. Air Emissions; and
7. O&M Requirements.

From the six completed questionnaires, AECOM selected three which best fit the unique feedstock of this proposed project and the previously identified criteria. **Table 4-3** provides a summary of the overall process, from initial contact to short-list selection.

Table 4-3
Technology Outreach Summary

Manufacturer	Initial Contact	Conf. Call	Questionnaire Sent	Questionnaire Rec'd	Short List	Reasoning
Agraferm	☑	☑	☑	☑	☑	Horse manure AD experience. Extensive dry AD qualifications.
Anaergia	☑	☑	☑	☑	☑	Horse manure AD *planning* experience. Extensive dry AD qualifications.
Bioferm	☑					Wet Technology proposed. Extensive dry and wet AD qualifications.
BTS	☑					No Response. Extensive dry AD qualifications.
Clean World Partners	☑	☑	☑	☑		Limited (two-stage dry-wet) AD operating facilities, mostly wet feedstock.
Eisenmann	☑	☑	☑	☑		Single-stage, majority of 90 installed systems use *co-digestion* of manure and silage and/or foodwaste substrates.
GICON	☑					No Response. Several two-stage dry-wet AD qualifications.
MT-Energie	☑	☑	☑			No Response. Extensive wet AD qualifications.
Novatech	☑					No Response. One horse manure co-digestion project completed. Both wet and dry AD qualifications.
Organic Services	☑	☑	☑	☑	☑	Horse manure experience. Both wet and dry AD qualifications.
Organic Waste Services	☑		☑	☑		Limited response, single-stage. Extensive dry AD qualifications; only 1 reference project provided.

The following sections provide an overview of the three technologies short-listed which include Agraferm, Organic Services and Anaergia.

4.2.2.1 Technology #1 – Agraferm

Agraferm Technologies AG, which is based in Pfaffenhofen, Germany, designs and builds AD plants. It is one of the few full service providers of turnkey agricultural and industrial biogas plants in Europe, which operates internationally. Agraferm is one of only two firms identified that have completed projects which include horse manure as the primary feedstock. In addition, Agraferm has completed dozens of projects utilizing other dry feedstocks, such as maize silage, grass silage and whole plant silage. A project table, provided by Agraferm, referenced 41 facilities completed between 2005 and present day. **Table 4-4** highlights the details of the recently completed AD facility which is most similar to the proposed AD facility (50 tons/day per Section 3).

Table 4-4
Agraferm Horse Waste Experience

Description	Response
Name	Bioenergiepark Schürsdorf GmbH & Co. KG.
Location	Scharbeutz (Schleswig-Holstein), Germany
Annual Throughput	17,000 tonnes/yr (tonne = metric ton)
Date of Operation	End 2011
El. Energy Output	637 kW_{el}
Feedstocks	Horse Manure; corn silage and grass silage as desired

Per discussions with Agraferm, additional process water is required due to the expected dryness of the horse bedding. To reduce the amount of process water required, facility operators could vary the input to include more wet feedstocks such as food waste. Agraferm provided three scenarios focusing on various feedstock combinations and quantities. **Table 4-5** summarizes the key details and results of the mass and energy balance completed by Agraferm.

Table 4-5
Agraferm Mass and Energy Balance

Alt.	Feedstock	Quantity (tonnes/yr)	Biogas Output	Power Output
1	Horse Manure	7,600	1,400,000 Nm^3/yr	400 kW 3.1 GWh/yr
	Food Waste	500		
	Straw	2,100		
	Process Water	6,000[(a)]		
2	Horse Manure	8,000	4,300,000 Nm^3/yr	1,200 kW 9.6 GWh/yr
	Food Waste	35,000		
3	Horse Manure	14,500	1,500,000 Nm^3/yr	400 kW 3.2 GWh/yr
	Food Waste	500		
	Process Water	2,000[(b)]		

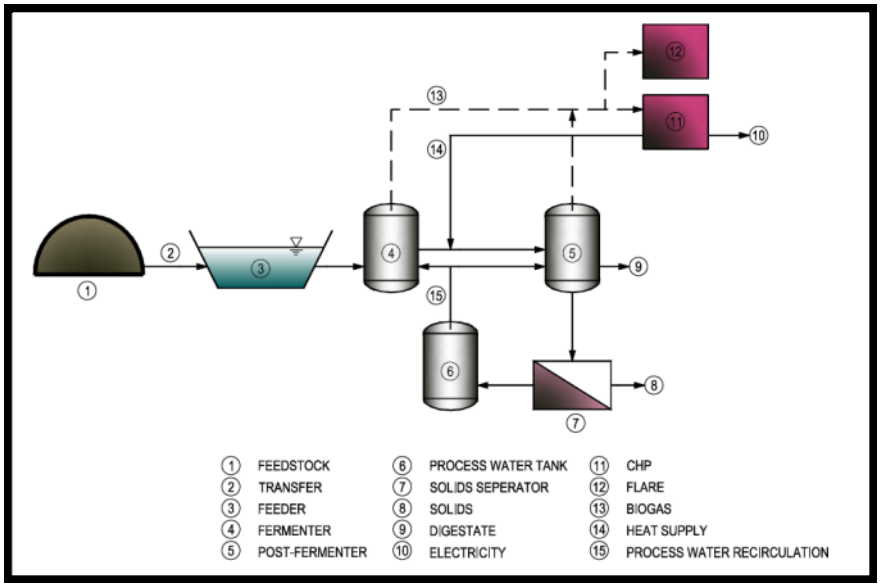
(a) Equates to 1.6 million gallons per year or 4.9 AF. 1 gal = 8.345 lbs, 1 tonne = 2,205 lbs, 1 acre-feet (AF) = 325,851 gal.
(b) Equates to 0.5 million gallons per year or 1.6 AF.

Of the three alternatives described in **Table 4-5**, Alternative 1 reflects the most realistic scenario given the assessed feedstock composition summarized in TM No.1. Alternative 2 requires a significant amount of food waste which could necessitate the inclusion of outside sources of food waste. Both Alternative 2 and 3 would require that horse manure and straw be separated prior to entering the AD process, which could be challenging for horse owners since the two are typically co-mingled when the straw is used for bedding.

The basic Agraferm technology approach consists of a two-stage AD process and is illustrated in **Figure 4-3**. As noted in the process schematic, the by-products of the process are digestate, solids and electricity. Digestate is defined as the solid remnants of the original input material to the digesters that the microbes cannot use. Although not shown, the

process may also require storage for the digestate and, if food waste is included, pre-treatment (grinding and/or contaminant removal) and hygienization may be required.

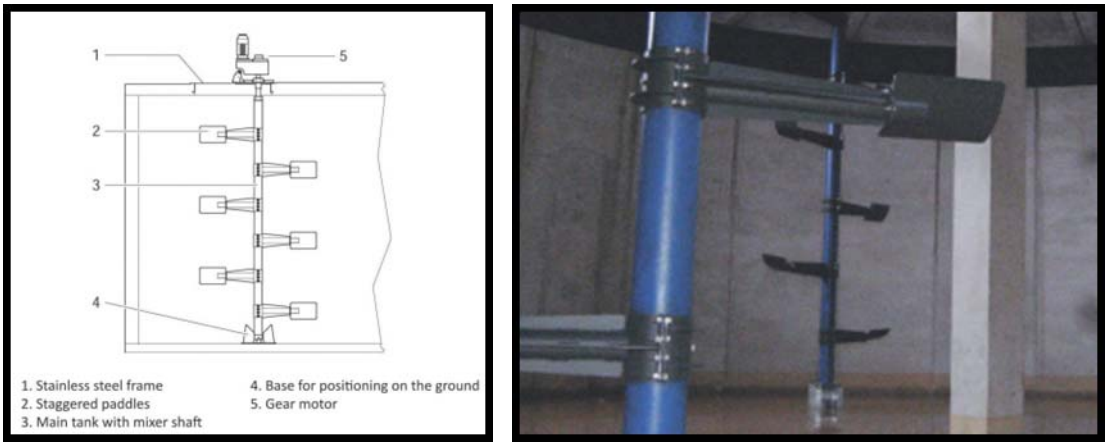
Figure 4-3
Agraferm Process Schematic



Source: Adapted from Agraferm Literature

Dry fermentation requires a particularly robust and technically sophisticated mixer to cope with substrate containing less than 75 percent moisture and the resulting very high viscosity of the fermentation medium. Agraferm utilizes paddle mixers to meet this challenge. A benefit to the Agraferm mixing system is that the electrical components of the paddle mixer are located outside of the fermentation medium to allow for maintenance and repairs without accessing the interior of the fermentation tank. **Figure 4-4** illustrates the Agraferm mixing technology.

Figure 4-4
Agraferm Paddle Mixer



Source: Adapted from Agraferm Literature

4.2.2.2 Technology #2 – Organic Services

Organic Services GmbH is located in Munich, Germany, with several international locations, including an office in Minneapolis, Minnesota. Organic Services has partnered with Snow Leopard Projects GmbH (SLP) to distribute the firm's biogas technology in North America. The founders of SLP have been active in developing biogas plants since 1994 and have implemented over 40 biogas plants in 11 different countries. Organics Services is one of only two firms identified that have completed projects which include horse manure as a feedstock. **Table 4-6** highlights the details of the recently completed AD facility which is most similar to the proposed AD facility. In addition to this project, Organic Services is also in the planning process for a 20,000 tonne/year facility in Germany that is proposed to utilize horse manure for 50 percent of the feedstock.

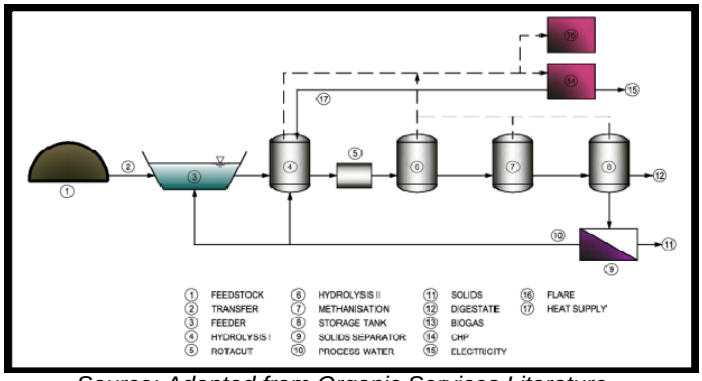
Table 4-6
Organic Services Horse Waste Experience

Description	Response
Name	Bioenergiepark Kolbermoor GmbH
Location	Kolbermoor, Bavaria, Germany
Annual Throughput	17,000 tonnes/yr
Date of Operation	May 2010
El. Energy Output	2 x 720 kW_{el}
Feedstocks	Horse Waste (80%), grass silage, corn silage, landscape material, molasses additive

Unlike the Agraferm facility which utilizes 100 percent horse manure, this facility utilizes other organic material to offset the dryness of the horse waste. As noted by Organic Services, the only technical limitation for the SLP technology is the requirement to limit fibrous material content (i.e. horse manure, straw) to 80 percent of the total feedstock. The other 20 percent would need to include easily digestible feedstocks such as food waste or yard waste.

The process utilized by Organic Services consists of a two-stage system, the first tank is used for hydrolysis (phase 1) and acideogenesis (phase 2) and the second is used for acetogenesis (phase 3) and methanogenesis (phase 4). **Figure 4-5** illustrates the general process offered by Organic Services.

Figure 4-5
Organic Services Process Schematic



Source: Adapted from Organic Services Literature

As demonstrated in **Figure 4-5**, the system includes two hydrolysis tanks which are fed biomass (alternatively) using a conveyor every two to three days. Within the tanks, fluid digestate from the solids separator is added and the slurry is mixed to form a pumpable media with a total solids content of 12-14 percent. At the completion of the hydrolysis process the acidified material is pumped into the fermenter (methanization) to undergo further fermentation.

Similar to the Agraferm mixing system the Kolbermoor AD facility utilizes a paddle mixer with the drive located outside of the fermentation medium to ease access for maintenance. **Figure 4-6** illustrates the Organic Services' special paddle mixers typically used in the pulp and paper industry.

Figure 4-6
Kolbermoor AD Paddle Mixer

Source: Adapted from Organic Services Literature

4.2.2.3 Technology #3 - Anaergia

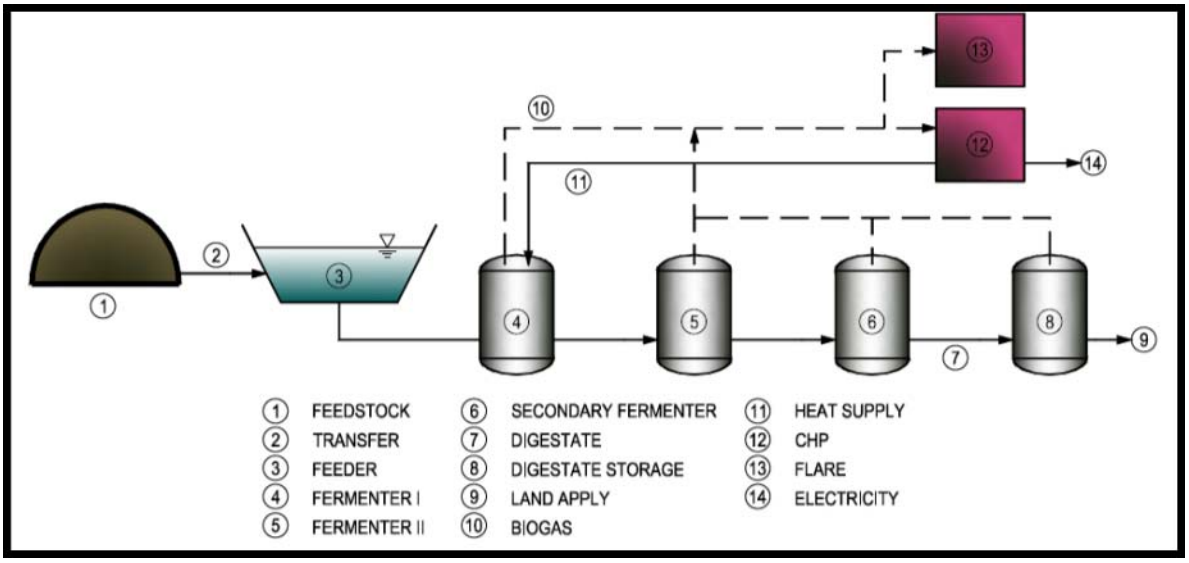
Anaergia (with UTS as part of the Anaergia Group) focuses on high solids anaerobic digestion technology, covering a wide range of applications including municipal, organic municipal solid waste, food waste, and agricultural. The firm provides project delivery options including equipment packages, design-build, and design-build-operate-finance. Anaergia is proclaimed as the world leader in biogas-to-energy plants, with over 1,600 installations listed worldwide (ranging from 100 kW to 10 MW). The firm's global headquarters are located in North America and an office is maintained in Carlsbad, California.

As noted in **Table 4-3**, only two of the six firms which submitted questionnaire responses had completed projects which utilized horse manure as the main feedstock. As such, it was necessary to select a third firm for consideration which did not have said experience. Anaergia was identified due to the location of key design staff in Carlsbad, extensive qualifications related to completed biogas plants, and past experience in planning horse manure facilities[18]. Furthermore, Anaergia has built several full-scale AD plants that co-digest feedstocks high in fiber and cellulose content (e.g. grass silage; sudan grass, whole crop silage). Although the other three firms demonstrated their AD ability, based on the information provided their technologies were not as well suited due to either lack of operational full-scale facilities or less stated experience with dry feedstock.

[18] June 4, 2012 discussion with Anaergia staff (Juan Josse and David Schneider)

The basic Anaergia approach consists of a two-stage AD process and is illustrated in **Figure 4-7**. As noted in the process schematic, the by-products of the process are digestate, solids and electricity.

Figure 4-7
Anaergia Process Schematic



Source: Adapted from Anaergia Literature

Similar to the other two firms, the need for an additional more digestible feedstock, to supplement the horse manure, was noted. In estimates provided by Anaergia, food waste was assumed to be included as approximately 10 percent of the overall feedstock. In addition, Anaergia identified the need for water leaving the process, digestate, to be treated and that co-locating the facility at a wastewater treatment plant could provide this process component.

4.2.3 Technology Analysis and Summary

As noted in Section 4.1, one of the objectives of Section 4 is to identify technologies which are suitable for the proposed AD facility. Although the investigation and analysis completed as part this effort identifies three technologies that are conceptually suitable for the unique feedstock of the proposed AD facility, it is also understood that new technologies are being developed which may be suitable in the near future and other technologies exist but may not have been responsive to AECOM inquiries. As part of AECOM's outreach effort, two such AD technologies were identified that may warrant additional consideration should the project progress to implementation; they are summarized as follows and pictured in **Figure 4-8**:

- **Novatech GmbH** - A 6,700 tonne/yr biogas plant Schrozberg (Germany) has been co-digesting horse manure (9 percent of the total input) since 2009 utilizing a plug-flow technology supplied by the firm Novatech GmbH (included in **Table 4-3**). Despite several attempts to establish communication and obtain information Novatech was unresponsive.
- **Spectrum BioEnergy** - In partnership with Rutgers University and Showplace Farm, Spectrum BioEnergy recently announced the launch of a small-scale horse manure AD demonstration project in Millstone Township, New Jersey. The project will utilize the firm's containerized 'BioBeetle' AD system designed to process 500 to 5,000 pounds per

day of organic feedstocks. In 2011, Spectrum BioEnergy was awarded $44,160, as a Conservation Innovation Grant (CIG), to demonstrate the feasibility of using small-scale AD technology to convert horse manure into energy and soil nutrients. The CIG was established in the 2002 Farm Bill as part of the Environmental Quality Incentives Program (EQIP).

Figure 4-8
Additional Horse Manure AD Projects

Top: Novatech's AD plant Schrozberg (Germany) co-digesting horse manure.
Bottom: Spectrum BioEnergy's 'BioBeetle' demonstration project processing sugarcane waste (filter cake mud) from a sugarcane cooperative in the state of Maharashtra, India.

Table 4-7 is provided to summarize and compare the issues identified for the three selected technology providers.

Table 4-7
Technology Matrix Summary

Criteria	Technology		
	#1 – Agraferm[a]	#2 - Organic Services[b]	#3 – Anaergia[c]
Similar Facilities	Location: Scharbeutz (Schleswig-Holstein), Germany; Size: 17,000 tonnes/yr, Feedstock: Horse Manure	Location: Bavaria, Germany; Size: 17,000 tonnes/yr; Feedstock: Horse Manure, grass silage, corn silage, landscape material, and molasses	Location: Szarvas, Hungary; Size: 122,000 tonnes/yr; Feedstock: sorghum, pig manure and slaughterhouse waste
	Location: Norfolk, United Kingdom; Size: 25,000 tonnes/yr; Feedstock: maize silage and grass silage	Location: Bavaria, Germany; Size: 12,000 tonnes/yr; Feedstock: pig slurry, cow slurry, cow manure, corn silage, green rye whole plant silage, grass silage, and sudan grass	Location: Glenfarg, Scotland; Size: 16,000 tonnes/yr; Feedstock: supermarket food waste
	Location: Merzig, Saarland; Size: 51,000 tonnes/yr; Feedstock: maize silage, grass silage, and whole plant silage	Location: Westfalia, Germany; Size: 20,600 tonnes/yr; Feedstock: corn silage, horse manure, chicken manure	Location: Germany; Size: 12,610 tonnes/yr; Feedstock: corn silage, chicken manure and rye silage
Feedstock Flexibility	Two-stage process. Multiple scenarios provided focusing on horse manure and food waste. Process water required.	Two-stage process. Limit of 80 percent horse manure and straw; remaining 20 percent must be "easily digestible substances" such as food waste, fresh grass, etc. Process water required. Change of feedstock can occur every two days.	Two-stage process. Process can operate "with varying feedstock that change gradually over time". Green waste to be avoided due to wood waste contamination.
Energy Production	400 kW (3.07 MWh/yr) based on horse manure and food waste quantities provided. Alternatives up to 1,200 kW_{el} provided.	716 kW_{el} (4.46 MWh/yr) based on all feedstocks. Horse manure is approximately 50 percent.	480 kW_{el} (no energy equivalent provided) based on horse manure and food waste quantities provided.
Footprint[d]	Area Required: 3,000 m^2 (0.74 Acres) and preliminary layout provided.	Area Required: For a 720 kW_{el} plant, 7,500 m^2 (1.85 Acres) is required.	None provided.
Capital Cost[e]	Capital Cost: 2.9M € ($3.7M) for major equipment only. Additional 20 percent for total project costs, 3.5M € ($4.4M).	Capital Cost: 2.28M € ($2.87M) for equipment only. 3.44M € ($4.33M) for total project costs.	Capital Cost: $1.5M estimated for 200 kW_{el} system with cogeneration unit. Food waste pre-processing not included.
O&M	4 to 8 man hours per day estimated. No O&M costs noted. Contract O&M available from Agraferm.	8 to 16 man hours per day for horse manure expected for operation. Total O&M costs estimated at $290k/yr (7 percent).	O&M costs estimated at 8-12 percent of the invested capital and 3 percent escalation per year.

a) Agraferm Questionnaire (Received June 27, 2012)
b) Organic Services Questionnaire (Received June 20, 2012)
c) Anaergia Questionnaire (Received June 20, 2012)
d) Footprint is conceptual and does not consider potential setback requirements.
e) Capital cost is conceptual and does not consider cost of land.

4.3 Site Analysis

The objective of this analysis is to establish the key features associated with an optimal project site. Although a specific site will not be selected, the criteria established in this analysis will provide the tools to screen numerous potential sites and identify a preferred location, should a decision be made in the future to proceed with the biodigester project.

The criteria outlined below will be addressed in additional detail in the following sections:

- Site Access and Transportation;
- Feedstock Proximity;
- Adjacent Utilities and Energy Demand;
- Zoning and Compatibility with Neighboring Property;
- Aesthetics;
- Environmental; and
- Operation and Maintenance (O&M) Requirements.

4.3.1 Site Access and Transportation

Site access and transportation issues relate to the need for access to the site by garbage hauling trucks, semi-trailers or other large trucks. For this reason, the optimum location for the facility is near a major arterial street. Using the quantities estimated in Section 3, the facility may potentially be loaded with 50 tons/day of organic feedstock. With an assumed density of approximately 63 lb/cubic-feet[19], and using a 25 cubic yard container for collection, the estimated 23 tons/day of horse manure would require approximately 2 truck trips per day. For the bedding, a density of approximately 2.5 lb/cubic-foot[20] for an estimated 6.3 tons/day results in the need for 14 truck trips per day. In practice, the horse manure and bedding will be comingled resulting in an estimated 16 truck trips per day. As such, the selected location should be able to handle this additional traffic loading.

As for site access, the trucks must be able to turnaround on the property. Based on the size of the largest collection container (40 yards, 22 x 8 x 6 feet) the largest delivery truck is assumed to be less than a Large Semitrailer (WB-50), which has an approximate width of 8.5 feet and length of 50 feet. Using this size truck as the worst case scenario, site access providing a minimum turning radius of 45 feet would ensure adequate access for operation[21].

4.3.2 Feedstock Proximity

The optimum location for the proposed facility is near the feedstock source. As illustrated in **Figure 3-3** in Section 3, the largest quantity of potential feedstock suppliers is located in the eastern parts of Ojai, Meiners Oaks, and Oak View. Based on the arrangement of these potential sources, a site in the Mira Monte area would provide a central location to the currently noted key feedstock suppliers. However, it is understood that any site within the Ventura River Watershed would be adequate, as it will remove the need to haul

[19] Horse Stable Manure Management, Wheeler and Zajaczkowski (http://panutrientmgmt.cas.psu.edu/pdf/G97.pdf)
[20] Horse Facilities Handbook. 2005. MidWest Plan Service. Iowa State University. Ames, IA.
[21] A Policy on Geometric Design of Highways and Transportation Officials (AASHTO)

feedstock outside of the general area to disposal facilities located outside of the Ventura River Watershed such as Agromin (Santa Paula) or Toland Landfill (Santa Paula).

4.3.3 Adjacent Utilities and Energy Demand

Based on evaluation of the three technologies identified in Section 4.2, the following utilities will be needed at the selected site for the proposed AD facility:

- Electric interconnection to power utility: Existing Southern California Edison (SCE) meter with a user demand exceeding that of the estimated AD facility output (3-4 MWh/yr). By co-locating the AD facility at an existing facility with similar or higher electric power demand (e.g. at a water or wastewater treatment plant [WWTP]), the produced energy can be used at the facility in lieu of selling the energy to SCE via a connection directly to the energy grid. This will allow for a better value to be received for the produced electricity and minimizes the required coordination with SCE which could slow or complicate the process.
- Water for diluting the incoming feedstock: Depending on the final composition of the selected feedstock, some quantity of water will likely be needed to increase the moisture content of the feedstock prior to entering the AD process. Co-locating the AD plant at a water source such as a WWTP where plant effluent could be used may be a viable approach.
- Sewer for onsite restrooms and wash downs.
- Communications can be made through wired line or, if not available, by wireless connection.

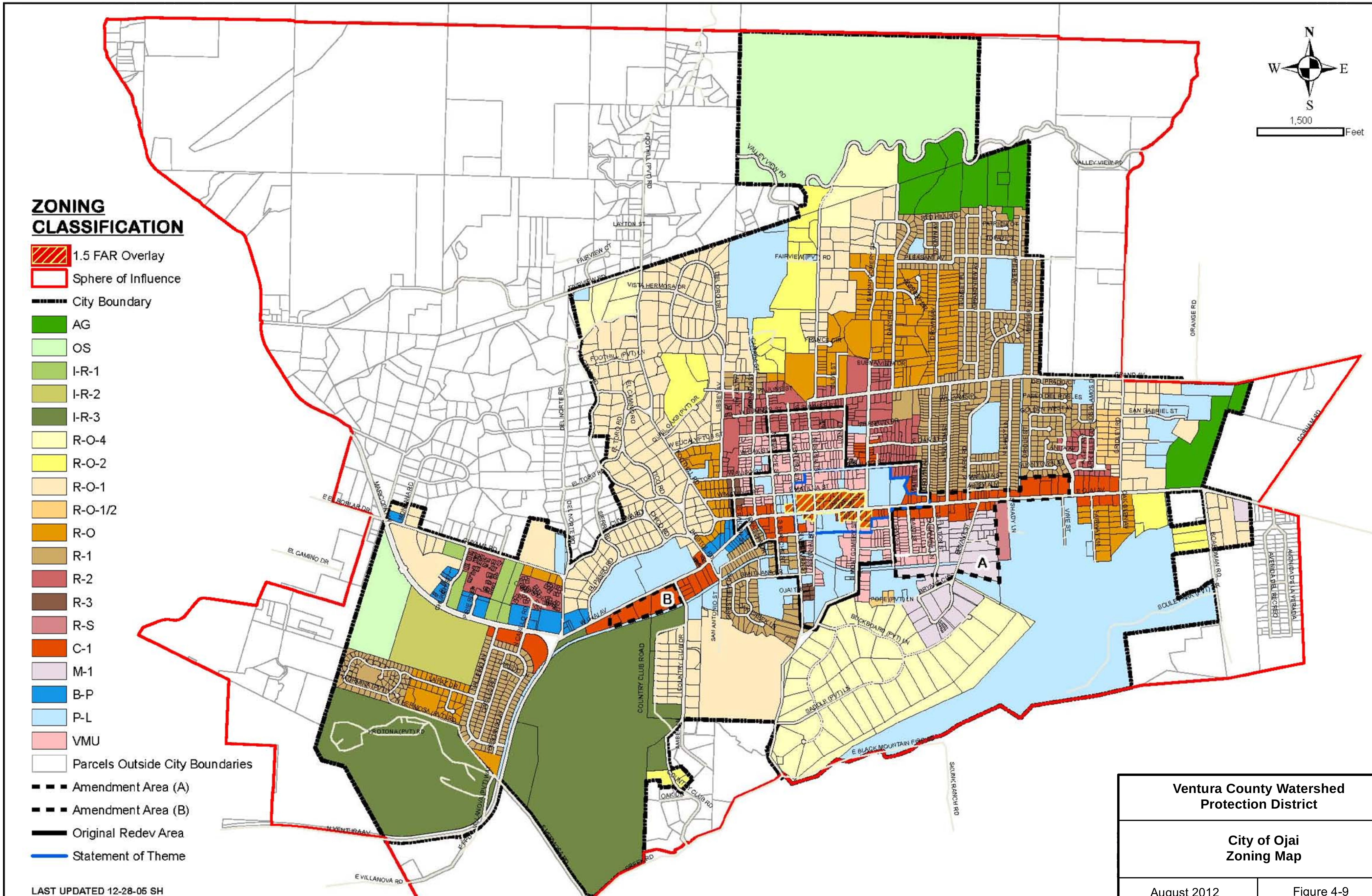
4.3.4 Zoning and Compatibility with Neighboring Property

As noted in Section 4.3.2, the preferred site for the proposed facility is within the Ventura River Watershed, near the identified feedstock. This area includes the City of Ojai, City of Ventura and Ventura County. When evaluating available sites for the AD facility, the preferred site will already be zoned Industrial. This is recommended since it will minimize the effort required to develop the project at the selected site and minimize impacts to adjacent properties. Due to regular truck traffic and the potential for odors from feedstock, the facility would be less compatible with a residential or commercial area. **Figure 4-9** provides an illustration of existing land use designations in the City of Ojai (M-1 represents Industrial) and **Figure 4-10** shows the existing land use designations for a portion of the County of Ventura, in the area surrounding the Ojai Valley Sanitary District Wastewater Treatment Plant (OVSD WWTP) and the City of Ventura Avenue Water Treatment Plant (Avenue WTP). As demonstrated by the land use designation and aerial image provided in **Figure 4-10**, there are several undeveloped lots, with an Industrial zoning, in the vicinity of the OVSD WWTP (6363 N. Ventura Avenue, Ventura) and the Avenue WTP (5895 N. Ventura Avenue, Ventura).

If the selected site is not zoned for Industrial use, a zoning adjustment may be acquired. With regards to sites located in Ventura County, the process for amending or making changes to zoning classifications must be completed through the Ventura County Planning Division. All applications for General Plan and Zoning Ordinance amendments are subject to the approval of the Board of Supervisors, require an analysis by the Planning Division and various County Departments and Agencies, and entail public hearings before the

Planning Commission and the Board of Supervisors. Findings for the approval of these legislative amendments are derived from State Planning and Zoning Laws, Board of Supervisor's General Plan Amendment Screening Guidelines, and the provisions of the respective Zoning Ordinances.[22]

[22] County of Ventura Planning Division, http://www.ventura.org/rma/planning/Zoning/zoning_ord_amend.html



Ventura County Watershed Protection District

City of Ojai
Zoning Map

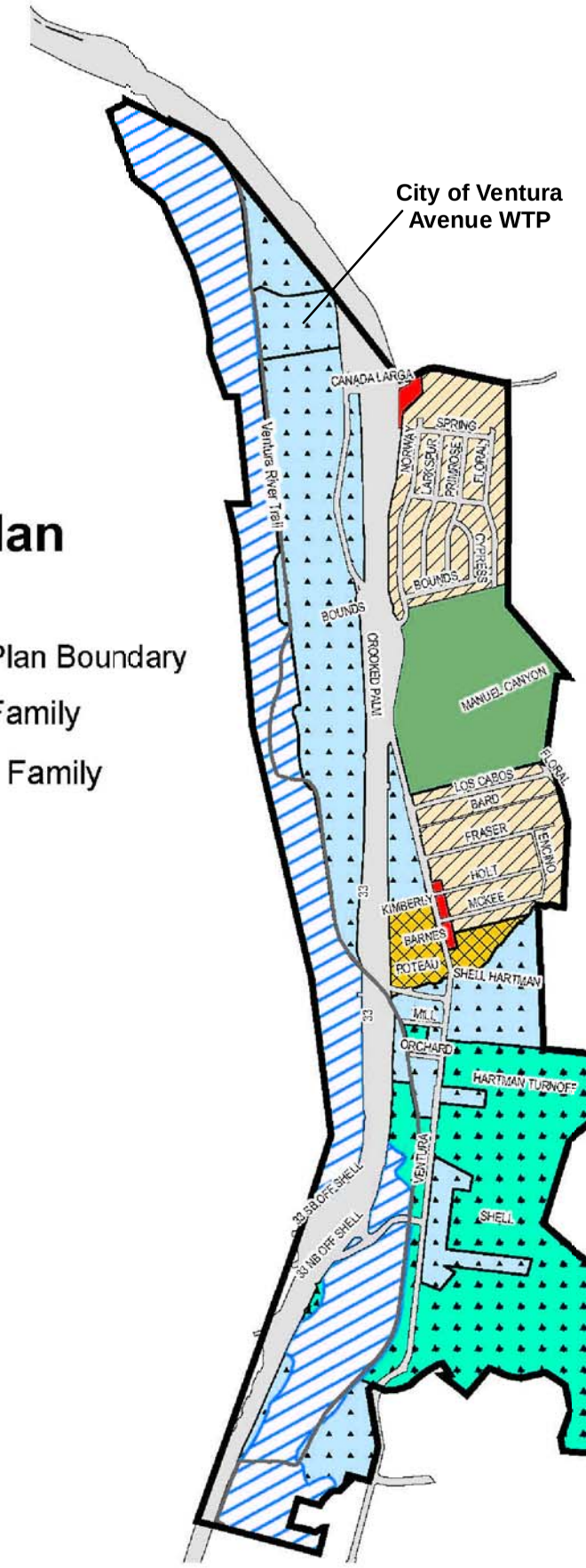
August 2012

Figure 4-9

North Avenue Plan

Land Use Element

- North Avenue Area Plan Boundary
- Residential Single Family
- Residential Multiple Family
- Commercial
- Industrial
- Oil Field Industrial
- Agriculture
- Flood Plain



N 0 800 Feet 400 1,200

0 200 400 Feet

Source:
Ventura County Planning Division, Ventura County General Plan, North Ventura Avenue Area Plan, Last Amended 12-11-90

Ventura County Watershed Protection District	
Ventura County Zoning Map	
August 2012	Figure 4-10

4.3.5 Aesthetics

The three processes identified as feasible alternatives for the proposed AD project, include several key process components. These include tanks, solids collection and storage areas and equipment buildings. As such, the facility will appear industrial, resembling a wastewater treatment plant. **Figure 4-11** provides a sample photo for each of the three short-listed technologies.

Figure 4-11
Technology Images

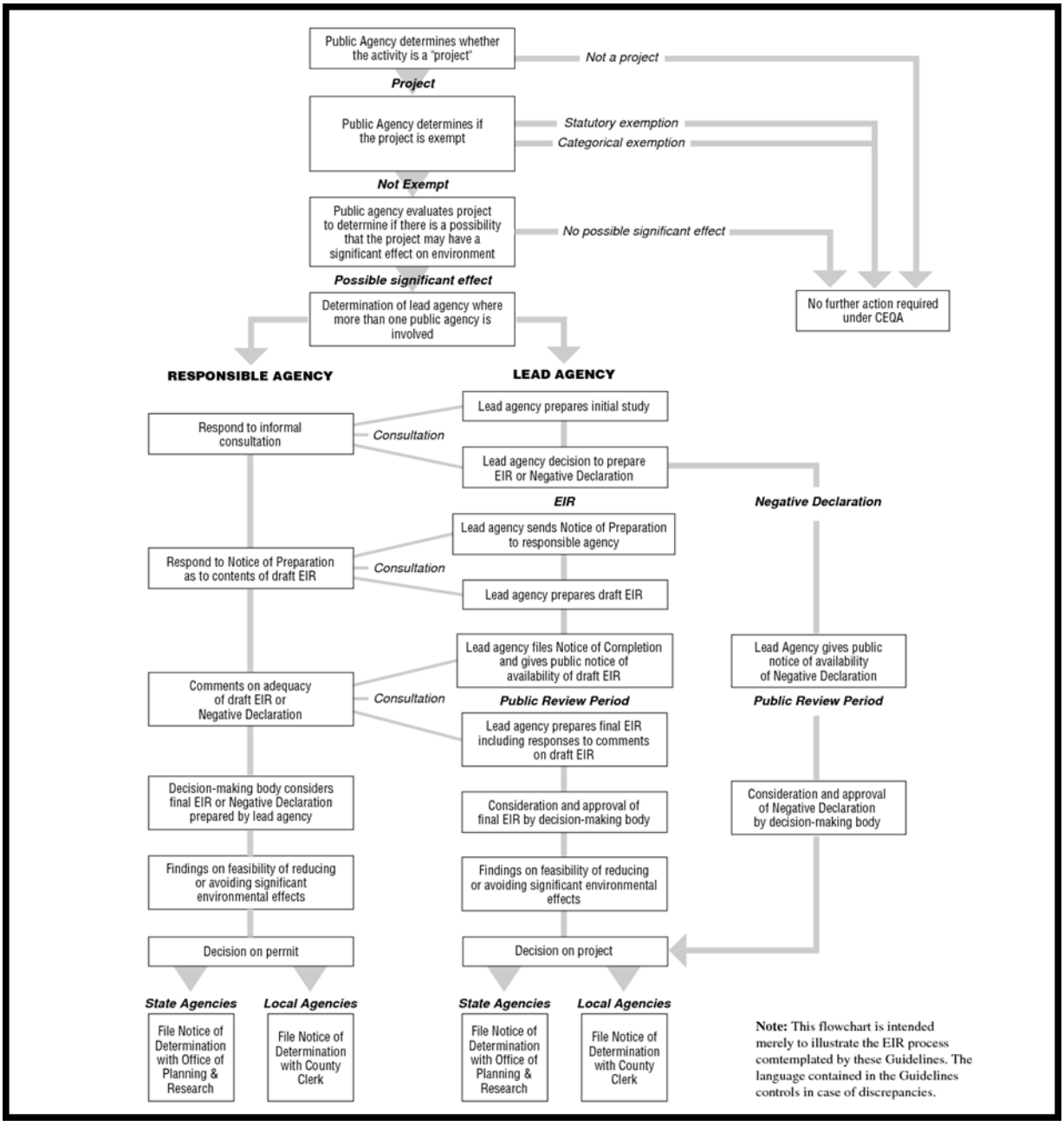
Source: Photos from Agraferm, Organic Services, and Anaergia (left to right)

Due to the appearance of the proposed facility, the preferred site will be surrounded by other industrial appearing facilities, be located in an area that is not easily observable, has a suitable landscape buffer or in an area where an industrial facility does not have a significant impact on the surrounding community.

4.3.6 Environmental

Passed into law in 1970, the California Environmental Quality Act (CEQA) sets statewide policies that require both state and local agencies to consider the environmental consequences of decisions that involve changes to the environment. CEQA is applied to projects which are defined as discretionary proposals which might result in physical changes to the environment. The CEQA process is illustrated in **Figure 4-12**.

Figure 4-12
CEQA Process Flow Chart



Source: California Resources Agency

As noted in **Figure 4-12**, upon determining that the project is not exempt (e.g. existing facility, replacement, minor alterations, etc.) and there is a possible significant effect, the Lead Agency would be required to prepare an Initial Study. The Initial Study provides the Agency with various information including whether the project requires an Environmental Impact Report (signification impact) or adopt a negative declaration (no significant impact). The Initial Study must include the following main components[23]:

- Project description;
- Environmental setting;
- Potential environmental impacts and brief explanations to support findings. Categories include the following:
  - Aesthetics
  - Agriculture and Forestry Resources
  - Air Quality
  - Biological Resources
  - Cultural Resources
  - Geology and Soils
  - Greenhouse Gas Emissions
  - Hazards and Hazardous Materials
  - Hydrology and Water Quality
  - Land Use and Planning
  - Mineral Resources
  - Noise
  - Population
  - Public Services
  - Recreation
  - Transportation/Traffic
  - Utilities and Service Systems
  - Mandatory Findings of Significance
- Mitigation measures for any significant effects;
- Consistency with plans and policies; and
- Names of parties responsible for preparation.

The preferred site for the proposed facility would result in no significant impact, or significant impacts which can be mitigated to a level that is deemed less than significant, for the categories listed above. For such a site, the environmental documentation for the proposed facility would be greatly reduced.

To assist in the completion of the Initial Study and subsequent environmental documents, the California Department of Resources Recycling and Recovery (CalRecycle), in June 2011, adopted the Anaerobic Digestion Initiative (AD Initiative). This comprehensive program is intended to foster the development of AD facilities, similar to that which is described in this Feasibility Study. Adoption of the initiative led to preparation of a statewide Program Environmental Impact Report (EIR) for AD Facilities which was certified by CalRecycle. The Program EIR allows the Lead Agency for the proposed AD project to incorporate references to the general discussions included in the noted Program EIR during preparation of the specific project EIR or negative declaration[24]. This may result in a reduced effort for preparation of the Initial Study.

[23] California Resource Agency, http://ceres.ca.gov/ceqa/flowchart/initial.html
[24] CalRecycle, http://www.calrecycle.ca.gov/swfacilities/Compostables/AnaerobicDig/ReviewGuide.pdf

4.3.7 O&M Requirements

Several of the technology providers contacted, including Agraferm and Anaergia, noted the ability to offer O&M services on a contract basis. Given the complexity of the process and type of equipment utilized, the level of service provided can be compared to that of a wastewater treatment operator. However, the majority of the daily efforts will be in receiving and handling delivered feedstock which requires that staff be onsite and available on a continuous basis. Based on information provided by these companies, annual O&M contract costs were noted to range between 8-12[25] percent of invested capital, with a three percent annual escalation.

In lieu of contracting with the technology company to provide O&M services there are other options that provide potential savings through efficiency. There are several examples of Agencies in Ventura County which utilize contract services for wastewater treatment operations; these include the City of Santa Paula (PERC Water Corporation) and City of Fillmore (American Water Works Service Company). In addition to these two companies which have local operations staff, the Ventura Regional Sanitation District provides similar services at several local wastewater treatment facilities, including the Ventura County Waterworks District No. 16 (Piru) Treatment Facility, Saticoy Sanitary Treatment Facility and The Thacher School Wastewater Treatment Facility. The Thacher School is located in the City of Ojai. Given the locality and current services, the noted companies/agencies provide a viable, local cost-saving alternative to technology supplier provided O&M.

With regards to selecting a site, based on the information provided above, it is possible to provide adequate O&M at most sites in the Ventura River Watershed. However, to minimize O&M costs the recommended site would be co-located at an existing treatment facility (water or wastewater) that had existing full-time staff onsite. This approach to siting provides for the most efficient delivery of shared services between the two facilities.

4.3.8 Siting Analysis and Summary

Table 4-8 summarizes the analysis provided in Section 3. The table is intended to serve as a tool for selecting a future site by providing a means to measure whether a specific site meets the needs of the proposed project.

[25] Correspondence with Anaergia, 28 June 2012.

Table 4-8
Site Analysis Summary

Criteria	Description
Site Access and Transportation	Near main transportation arterial. Available area must provide adequate space for vehicle turning and possible storage of feedstocks.
Feedstock Proximity	Located in Ventura River Watershed; Mira Monte is optimal based on hauling distance.
Adjacent Utilities and Energy Demand	Process requires dilution water, connection to sewer and should be co-located with a facility which has an energy demand greater than 0.5 MW and an existing SCE meter.
Zoning and Compatibility with Neighboring Property	Existing Industrial zone classification; option for land-use modification is available.
Aestethics	Industrial area or not clearly visible.
Environmental	Minimize impacts listed in Section 4.3.6, Initial Study required (e.g. air, water, traffic).
O&M Requirements	Co-locate at an existing Water/Wastewater Treatment Facility which has onsite staff.

Section 5: Conceptual Site Plan, Environmental Review and Project Business Models

5.1 Objective

The focus of this section is to develop a conceptual site plan illustrating the general site layout, building size, and access. The optimal site characteristics developed as part of Section 4 were utilized to locate a conceptual site and create a conceptual layout of the AD plant for cost estimating purposes. A "fatal flaw" environmental review will be conducted of the proposed project at the identified site and a preliminary California Environmental Quality Act (CEQA) Initial Study checklist will be started. For determining the recommended project business model, a summary and analysis of options is provided. This section is intended to address the following questions:

- How much area will the project require and how will the facilities be configured?
- What is the estimated cost of the facility?
- What are the environmental challenges?
- What business models and contracting options are there for this project?

5.2 Site Plan and Construction Cost

5.2.1 Conceptual Site Plan

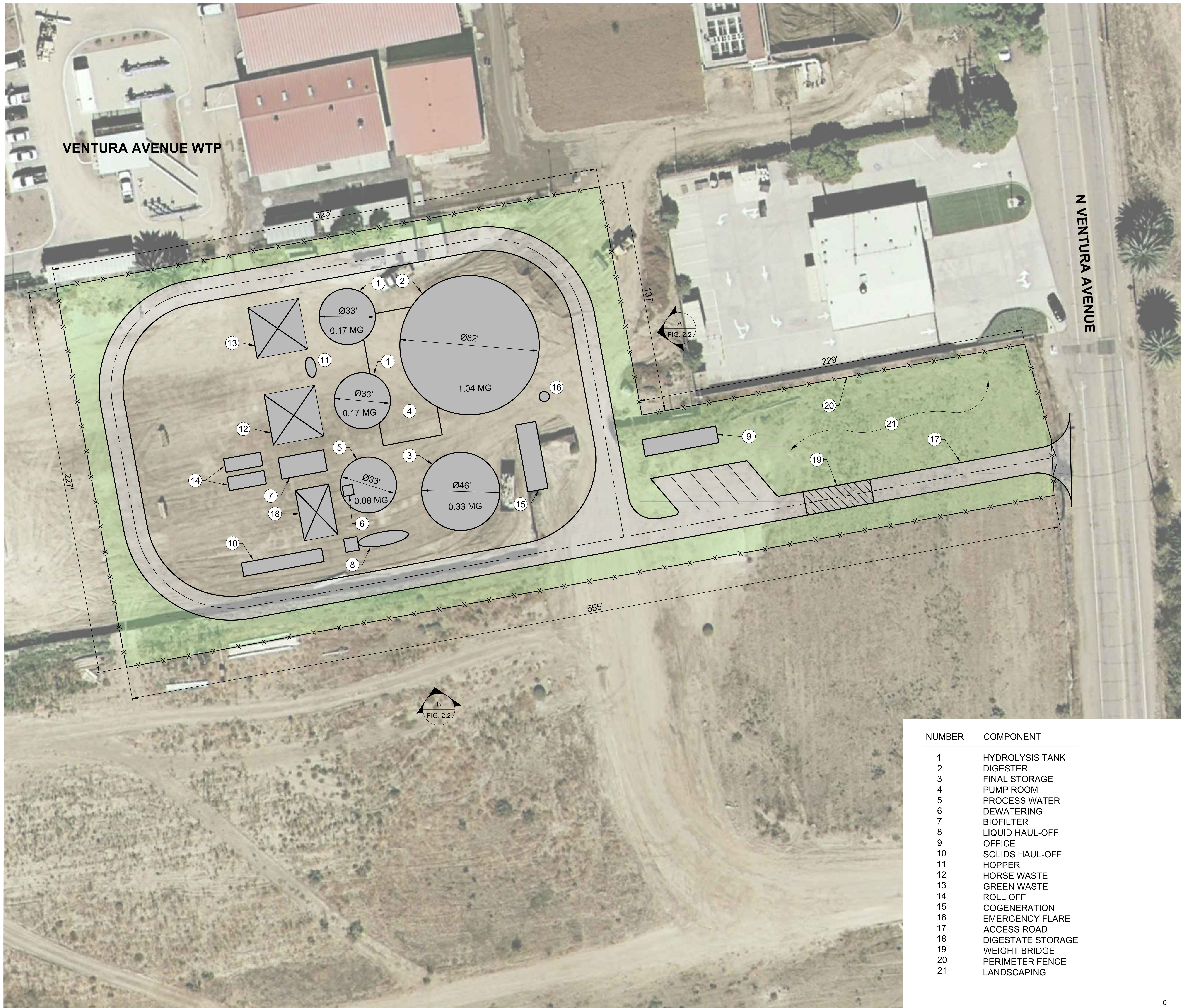
As part of Section 4 a site analysis was performed that detailed the characteristics of an optimal site for the proposed project, based on the feedstock identified in Section 3. Based on the optimal site characteristics, a project site was selected to provide a more focused site plan and environmental review. It is understood that using this site for feasibility analysis purposes does not constitute a commitment by any stakeholder or reflect a final decision for the location of the proposed facility. The selected site is only chosen as a representative of what a probable site would involve. Utilizing a specific site for the site plan and environmental review that best meets the optimal site characteristics is necessary to determine a recommendation of project feasibility.

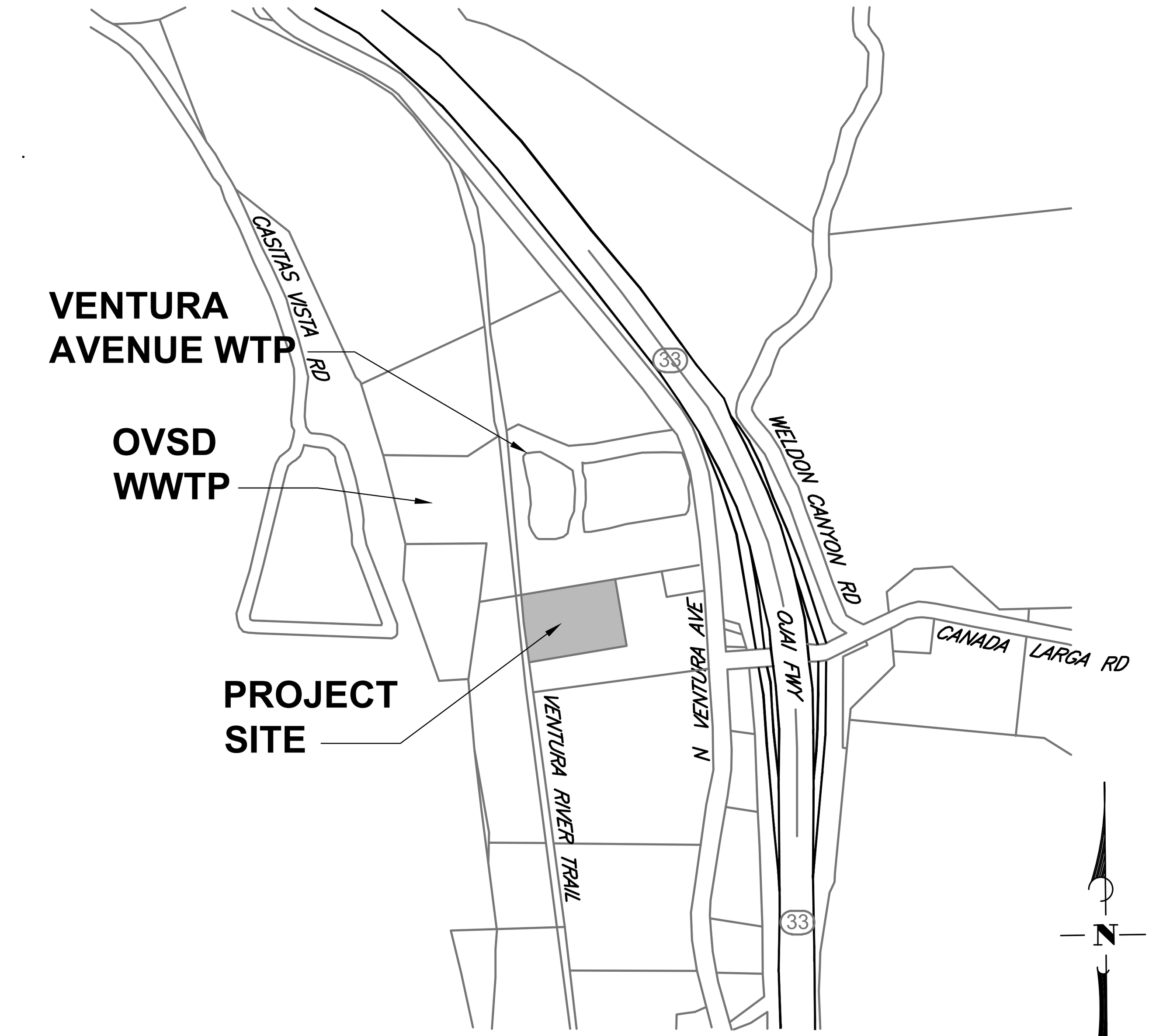
The site selected for the feasibility cost analysis is in an industrial zoned area, in proximity to the Ojai Valley Sanitary District Wastewater Treatment Plant (OVSD WWTP) and the City of Ventura Avenue Water Treatment Plant (Avenue WTP). The selected site is just south of the Avenue WTP and has a total footprint of approximately 21.3 acres. As illustrated in **Figure 5-1** the bio-digester facility comprises of the following main components:

- Weight Bride/Scale ;
- Horse Manure Storage;
- Green Waste Storage;
- Temporary Material Delivery Container/Trailer Staging Area;
- Feeding Hopper;

- Hydrolysis Tank 1 & 2;
- Digester Tank;
- Final Storage Tank (with membrane roof dome for gas storage);
- Process Water Tank;
- Dewatering (Solids-Liquids Separator) with small solids storage area;
- Storage for Dewatered Digestate;
- Temporary Truck Hauling off Staging Area (Liquids and Solids);
- Combined Heat and Power (CHP) Station with Condensate Trap/Cooling Unit;
- Emergency Flare;
- Office; and
- Parking Area.

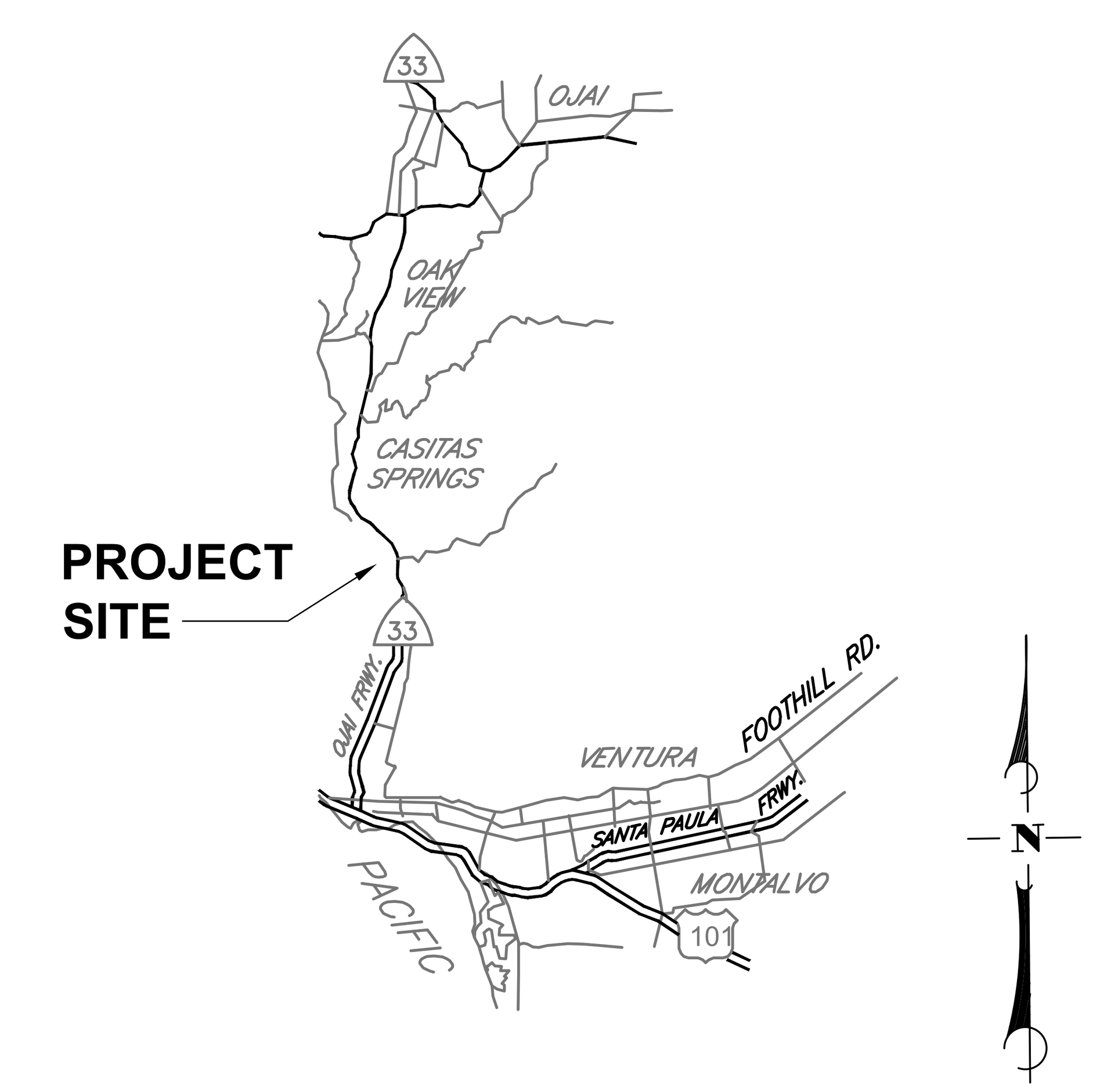
As shown in **Figure 5-1**, an existing building, the County of Ventura Pollution Prevention Center, is located between the proposed facility and the access road, North Ventura Avenue. The existing facility is approximately 15 feet in height. In addition, an existing building, the City of Ventura Avenue Water Treatment Plant, is located directly north of the proposed facility; this building has an approximate height of 30 feet. The features described above for the proposed facility will range in height between 12 feet and 26 feet, approximately. The maximum height is dictated by the estimated tank dimensions, which can be altered by expanding the diameter and reducing the height, if needed. The County of Ventura Pollution Prevention Center and Ventura Avenue Water Treatment plant are shown in **Figure 5-2**, as seen from North Ventura Road.





LOCATION MAP

NTS



VICINITY MAP

NTS

NUMBER	COMPONENT
1	HYDROLYSIS TANK
2	DIGESTER
3	FINAL STORAGE
4	PUMP ROOM
5	PROCESS WATER
6	DEWATERING
7	BIOFILTER
8	LIQUID HAUL-OFF
9	OFFICE
10	SOLIDS HAUL-OFF
11	HOPPER
12	HORSE WASTE
13	GREEN WASTE
14	ROLL OFF
15	COGENERATION
16	EMERGENCY FLARE
17	ACCESS ROAD
18	DIGESTATE STORAGE
19	WEIGHT BRIDGE
20	PERIMETER FENCE
21	LANDSCAPING

N

0 30' 60'

VENTURA COUNTY WATERSHED PROTECTION DISTRICT

CONCEPTUAL SITE PLAN

AECOM | FEBRUARY 2013 | FIGURE 5-1

DWG: F:\VTA_COUNTY\60249063 – Biodigester Feasibility Study\000_CAD\AutoCAD\PlanSet\FIGURE 2-1.dwg USER: pittmanm
DATE: Jan 29, 2013 9:00am XREFS: G-BD IMAGES: 120619_GAH_Organic Services Questionnaire_Page_06.jpg ventura_big_image.jpg ventura_close_image.jpg

Figure 5-2
Buildings Adjacent to Proposed Site

County of Ventura Pollution Prevention Center (left) and Ventura Avenue Water Treatment Plant (right)

Horse manure and green waste delivered to the biodigester facility in truck trailers or containers will be driven over a scale before being unloaded at the Horse Manure and Green Waste Storage areas, respectively. The designated staging area will provide ample space for temporary storage of delivery trailers and containers.

Given the high dry matter content of the delivered feedstocks, process water will be added to the temporarily stored material (horse manure and green waste) for pre-conditioning (increase in moisture content) prior to material processing. The storage area for each organic feedstock is sized for a 14 day storage capacity to provide operational flexibility, will be enclosed to reduce odor impacts and will include concrete slabs or other impermeable surface.

The pre-conditioned organic feedstocks are picked up with a front loader and fed into the top-loaded hopper. It is in the Feeding Hopper where the material is dosed and mixed with process water to achieve a total solids (TS) content between 12 and 14 percent (see **Figure 5-3** below).

Figure 5-3
Examples – Front Loader, Hopper, Dosing, Mixing, and Pumping Units

Source: Organic Services; Liebich, M. (Vogelsang; 2010)

The organic suspension is pumped to one of the two gas-tight concrete hydrolysis tanks, each with a volume of 0.17 Million Gallons (MG) [628 cubic meters], where the material remains for one to three days at a temperature of about 113-122 degrees F [45 to 50 deg C] under anaerobic and acidic conditions (pH between 3.5 to 5.5). Low energy consuming paddle mixers (specifically developed for fibrous material with high dry matter content) assure continuous tank mixing and prevent build-up of a floating blanket (**Figure 5-4**). The hydrolysis tanks operating in batch mode may either be plumbed in series (transferring material from hydrolysis tank 1 to hydrolysis tank 2 before being fed to the digester) or plumbed in parallel.

Figure 5-4
Examples – Paddle Mixer

Source: Organic Services (left: vertical position, right: angled position)

Before the organic material is pumped intermittently into the digester its particle size is reduced via one or two chopping devices (**Figure 5-5**) plumbed in series. The digester is estimated to have a capacity of approximately 1 MG [3,925 cubic meters].

Figure 5-5
Example – Chopping Device

Source: Liebich, M. (Vogelsang; 2010)

The organic material remains in the digester for about 10 days where the volatile content of the organic matter is biologically converted into biogas (see Section 4 for more details

on the biological steps involved). The digester can be designed to operate under mesophilic or thermophilic conditions. The digested residue is pumped to the final storage tank which will provide approximately three months of material storage capacity. The storage tank, with an estimated volume of 0.3 MG [1,231 cubic meters], is equipped with a dome-shaped double-membrane roof to store the biogas produced in the four tanks (**Figure 5-6**).

Figure 5-6
Example – Storage Tanks with Membrane Biogas Holding Roof

Source: Zorg Biogas (www.zorg-biogas.com)

After storage the digested residue (with TS between 6 and 8 percent) is sent to a solid-liquid-separator for dewatering (**Figure 5-7**). The solids with dry matter content between 20 and 35 percent will be stored on site temporarily in the designated storage area, sized for a 14 day storage capacity, before being shipped off site for further composting or direct utilization as a nutrient rich fertilizer. The liquids (with TS content between 1 and 4 percent) along with collected rain water/storm water will be stored in the process water storage tank with an 82,950 gallon [314 cubic meters] capacity. To facilitate gravity discharge of the liquid and solid fractions the separator is installed on an elevated level. It can either be placed on the roof of the hydrolysis tank or at the temporary solids storage area (as depicted in **Figure 5-7**).

Figure 5-7
Example – Solid-Liquid-Separation with Discharged Solids

Source: PlanET (www.planet.biogas.de)

As previously described, process water captured in the process water tank will be used to pre-condition the delivered horse manure (includes straw/fibers) and green waste. The majority of the process water is required for TS adjustment in the hopper mixer before the organic suspension is fed to the hydrolysis tanks. The captured stored biogas is sent to a condensate trap/cooling unit before it is utilized in a containerized combined heat and power (CHP) station. The CHP may either be comprised of one or two reciprocating internal combustion engines (ICE) or two to four microturbines connected to alternator(s) for power generation (see **Figure 5-8**). The electric power can be used to meet the plant's electric power demand. In addition, excess power can be sent to the adjacent Avenue WTP and OVSD WWTP to supplement their power demands. Recovered heat from the CHP station will be used to for process heating (meeting the hydrolysis and digestion tanks' heat requirements). Another option for biogas utilization may be to upgrade the biogas to biomethane for vehicle fuel or injection into the local natural gas grid.

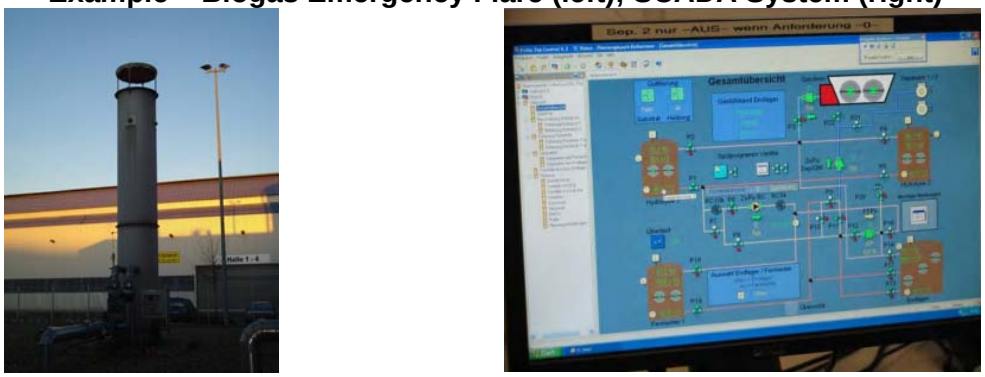
Figure 5-8
Examples - Condensate Trap/Cooling Unit (left); ICE CHP (middle); Microturbine CHP Package (right)

Sources: Organic Services; GE Energy; Capstone Turbine Corporation

An emergency flare (or waste gas burner) on site is sized to flare off part or all of the produced biogas during a power outage, CHP station malfunction or maintenance events (**Figure 5-9**). The use of the flare is expected to be rare, as the noted circumstances are infrequent, and based on discussions with the technology supplier, the value is estimated at less than one percent of total gas production.

The entire process is centrally controlled by a Supervisory Control and Data Acquisition (SCADA) system housed in the containerized office. The entire process is displayed on one monitor allowing easy monitoring and control of the plant's process and its individual components (**Figure 5-9**).

Figure 5-9
Example – Biogas Emergency Flare (left); SCADA System (right)



Sources: AECOM; Organic Services

5.2.2 Magnitude of Probable Construction Cost

The economics for this project are significantly impacted by the construction cost. Since only preliminary information is available with regards to the process, it is only feasible to develop a magnitude of probable construction cost based on the general project concepts developed in Section 5.2.1 and illustrated in **Figure 5-1**. With the project defined using these general concepts, the cost estimates were developed based on discussions with equipment suppliers, past experience and industry standards. **Table 5-1** provides a summary of the magnitude of probable construction costs.

Table 5-1
Magnitude of Probable Capital Costs

Item	Description	Quantity	Unit	Unit Price ($)	Total ($)
1	Mobilization (6% of Construction Cost)	1	LS	290,000	290,000
2	Site Work (grading, piping, etc.)	1	LS	500,000	500,000
3	Hydrolysis Tank (0.17 MG)	2	EA	170,000	340,000
4	Pump Room	1	LS	150,000	150,000
5	Digester (1.04 MG)	1	MG	1,000,000	1,000,000
6	Final Storage w/ Gas Dome Roof (0.3 MG)	0.3	MG	1,000,000	300,000
7	Flare	1	LS	50,000	50,000
8	Process Water Storage (0.08 MG)	0.08	MG	1,000,000	80,000
9	Dewatering	1	LS	100,000	100,000
10	Biofilter and Odor Control	1	LS	250,000	250,000
11	Solids Loading and Canopy	1	LS	150,000	150,000
12	Office Trailer	500	SF	100	50,000
13	Hopper	1	LS	80,000	80,000
14	Feedstock Receiving (enclosure)	2	LS	90,000	180,000
15	250 kW Microturbines[(a)]	2	LS	383,000	766,000
16	Truck Scale	1	LS	50,000	50,000
17	Access Road and Parking	32,000	SF	5	160,000
18	Electrical (15% of Construction Cost)	1	LS	631,000	631,000
	Summary (costs in thousands)				
	Base Construction Subtotal				5,127
	Contingency @ 25%				1,280
	Bonds and Insurance @ 2%				100
	Construction Subtotal				6,507
	Engineering: Design and Construction @15%				1,000
	Owner Engineering and Administration @ 5%				330
	Environmental Permitting, Mitigation @ 5%				330
	Land Acquisition (2 acres)				500
	Total				**8,670**

(a) Microturbine capital costs range from $700/kW for larger units to approximately $1,100/kW for smaller ones. Site preparation and installation costs vary significantly from location to location but generally add 30-70% to the total capital costs.
http://www.energy.ca.gov/distgen/equipment/microturbines/cost.html
(b) LS=Lump Sum, EA=Each, MG=Million Gallons, SF=Square Feet

5.2.2.1 Land Acquisition

Roughly six (6) percent of the estimated project cost is associated with the land acquisition. This value assumes that the selected parcel can be purchased from the current landowners. The noted parcel, APN 063-0-040-160, is located at 5721 North Ventura Avenue, Ventura, CA 93001. The parcel is approximately 21.3 acres in area and is understood to be owned by the Brooks Institute, which operates a campus adjacent to the parcel's south boundary. Based on County Tax Assessor records, the parcel is zoned for M2 – 10,000 square feet and had a 2012-13 property value of $3,759,992. The land value calculated in **Table 5-1** assumes that a portion of the property can be purchased and the value is proportionate and consistent with the overall value of the entire property. In addition, the estimate includes an additional $150,000 for contingency and acquisition costs.

Although the land acquisition estimate is based on a specific site, the costs are consistent with other industrial lots in the region. The Ojai Valley Sanitary District (OVSD) prepared a letter report (12 October 2012) investigating the potential cost of relocating the OVSD Treatment Plant, included as **Appendix B**. The report identified two industrial sites, located outside the floodplain, which provided a conceptual cost per acre of $75,000 and an acquisition cost estimate of $100,000. Based on this separate analysis, the value provided in **Table 5-1** is consistent with the cost range that may be required for acquisition for a separate site in the Ventura River area.

5.2.2.2 CHP Technology

The basis of the construction cost estimate includes the use of microturbines. Based on discussions with the Ventura County Air Pollution Control District (APCD), the project will require a Best Available Control Technology (BACT) analysis that starts with fuel cells, microturbines, and then spark ignited engines. **Table 5-2** provides a basic comparison of the three technologies noted by APCD.

Table 5-2
CHP Comparison

Description	Reciprocating Engine	Microturbine	Fuel Cell
Power Efficiency	22-40%	18-27%	30-63%
Overall Efficiency	80%	65-75%	55-80%
CHP Installed Costs ($/kW)	1,100-2,200	2,400-3,000	5,000-6,500
O&M Costs ($/kWh)	0.009-0.022	0.012-0.025	0.032-0.038
NOx (lb/MMBtu)	0.17 (lean burn)	0.015-0.036	0.0025-0.0040

Source: Catalog of CHP Technologies, US Environmental Protection Agency Combined Heat and Power Partnership (December 2008)

Fuel cells can provide the least impact with regards to emissions, since their primary power generation process does not involve combustion. However, the cost and reliability of fuel cells is of concern. The cost is two to three times more than the two alternatives, and while incentives exist for initial purchase of fuel cells, the ongoing cost can be excessive due to the need for shift catalyst replacement (3 to 5 years), reformer catalyst replacement (5 years) and stack replacement (4 to 8 years).

The least cost alternative, reciprocating engines, would be challenging to implement due to poor emissions. Microturbines provide the appropriate balance of economics and emissions; this will be further reviewed in the subsequent BACT analysis.

5.3 Environmental Review

Environmental impacts and mitigation are a critical component of project feasibility. Avoiding environmental impacts was the driving factor for development of many of the "optimal site characteristics" addressed in Section 4. The site selected for further analysis was based on these criteria and should avoid several major fatal flaws as a result. To confirm this determination, a review of relevant and recent environmental documents was conducted and a preliminary CEQA Initial Study checklist was completed. The results are addressed in this section.

5.3.1 Review of Recent Environmental Documents

In November 2003, the City of Ventura (CEQA Lead Agency) issued an Environmental Impact Report for the Avenue Water Treatment Plant/ Foster Park Facility Improvements Project, which include the property north of the identified biodigester project site. Due to the proximity to the potential project site and the process nature of the Avenue WTP project, several of the potential impacts and associated mitigation measures present relevant similarities.

The 2003 EIR included identification of two significant, unavoidable (Class I) impacts and several mitigable impacts (Class II), which are summarized in **Table 5-3.** Since the analysis included both the relevant Avenue WTP site as well as the Foster Park Wellfield site, only impacts at the Avenue WTP site were included in the table.

Table 5-3
EIR Impact Summary (Avenue WTP)

Description	Class	Proposed Site Relevance
Loss of Mature Willow Trees at the WTP Site	Class I	None
Construction Related Noise Impacts	Class I	Same
Potential Decrease in Groundwater Levels	Class II	None
Adverse effects on the Historic Properties of WTP site	Class II	None

The information summarized in **Table 5-3** provides insights into the potential challenges for the proposed biodigester site. As noted in the table, the only impact identified for this adjacent project that has relevance to the biodigester project is the noise related to construction activities. The biodigester facility also faces unique challenges that are specific to the proposed process. For example, odors would not be expected to be a concern for the Avenue WTP but could arise for the biodigester facility. These unique issues justify a more focused analysis.

As noted in Section 4, the California Department of Resources Recycling and Recovery (CalRecycle), in June 2011, adopted the Anaerobic Digestion Initiative (AD Initiative) which led to preparation of a statewide Program Environmental Impact Report (EIR) for AD Facilities which was subsequently certified by CalRecycle. Although the Program EIR does not include horse manure as a feedstock, the mitigation measures developed as part of the effort will be useful in addressing challenges unique to biodigester facilities, such as odor. The Program EIR Mitigation Measures are included as **Appendix C**.

5.3.2 CEQA Initial Study Checklist

The CEQA process is often required for projects that require a discretionary approval and might result in physical changes to the environment. It is up to the lead agency to determine whether CEQA applies to a given project and as well as the level of CEQA review required. *Depending on the ultimate site location chosen, the lead agency for this potential biodigester project would likely be the Planning Department of the general purpose government whose geographic jurisdiction encompasses the project location [i.e. County of Ventura for a site located in the unincorporated portions of the Ventura River Watershed, or one of the two cities (i.e. Ojai or San Buenaventura) for a project site located within their respective city boundaries].*

The first step of the CEQA process includes development of an Initial Study to determine the appropriate environmental document process for the project. For this evaluation, AECOM has reviewed available related environmental documents, including the EIR prepared for the adjacent Avenue WTP and the CalRecycle Program EIR for AD projects. Using these documents, AECOM has prepared a preliminary CEQA Initial Study checklist (included as **Appendix D**) to assist in identifying potential significant impacts and recommend the appropriate next steps. The Ventura County Initial Study Assessment Guidelines (July 2010) were also used in the preparation of this document.

This environmental analysis contained in the preliminary Initial Study checklist is not intended to constitute a complete and comprehensive CEQA Initial Study checklist, but instead, to determine project feasibility related to environmental constraints. As such, the "Project Impact Degree of Effect" in Section B of this Initial Study should not be considered final, as a more refined project description and additional analysis will be required to determine the significance of impacts. However, based on this preliminary information it is evident that either a Mitigated Negative Declaration or Environmental Impact Report would be required. In addition, based on the current information available there does not appear to be any potentially significant impacts that cannot be mitigated.

5.4 Business Models

The scope of this study does not address the optimal configuration of the proposed project Owner. The following summary is intended to outline alternatives and provide an analysis on the advantages and disadvantages of various options for both Owners and methods of project delivery. Should this project be implemented, there are various entities which could serve as the Owner, including an existing public agency, a new public agency formed under a joint powers authority or other contract mechanism, a private company or a community cooperative. Generally, private companies and community cooperatives could pursue a project using any of the methods described and more, since public contract code does not apply. However, for public agencies, project delivery methods are limited to only a select few methods which are summarized in the following section. The following sections are included to discuss community cooperatives and public agency implementation alternatives.

5.4.1 Community Cooperatives

A community cooperative (Co-op) is a business or organization owned by and operated for the benefit of those using its services, and are common in the healthcare, retail, agriculture, art and restaurant industries. In California, more than 10 million people are purported to belong to co-ops[26].

Unlike a for-profit business or corporation, the purpose of a co-op is to serve its members interests, rather than make a profit. Section 12201 of the Consumer Cooperative Corporation Law succinctly states that co-ops "are democratically controlled and are not organized to make a profit for themselves, as such, or for their members, as such, but primarily for their members as patrons." For this reason, surplus revenues (income over expenses and investment) generated by the co-op is returned to members proportionate to their use of the cooperative, not proportionate to their "investment" or ownership share. These members pay taxes on this income, while the co-op is required to pay taxes on any income kept for investment or reserves.

Prospective members join the co-op and become members by purchasing shares, though the amount of shares they hold does not affect the weight of their vote. Members are permitted voting power to control the direction of the co-op but an elected board of directors and officers typically runs the co-op. The board of directors are elected from within the membership.

To form a co-op, a group of potential members must first agree on a common need and a strategy on how to meet that need. An organizing committee then conducts exploratory meetings, surveys, and cost and feasibility analyses before every member agrees with the business plan[27]. Formation of a co-op requires completion of the following general steps:

- Determine legal form of organization
  - Unincorporated associations
  - For-profit corporation

[26] http://www.californiagreensolutions.com/cgi-bin/gt/tpl.h,content=1379
[27] National Cooperative Business Association, http://www.ncba.coop/ncba/about-co-ops

  - Limited liability company and general partnership
  - Nonprofit “public benefit” or “mutual benefit” corporation
  - Cooperative corporation
- Create Bylaws.
- Create a Membership Application.
- Conduct a Charter Member Meeting and Elect Directors.
- Obtain Licenses and Permits.
- Hiring Employees.

Not all cooperatives are incorporated, though many choose to do so. For those seeking to incorporate, specifically for this project which is located in California, the *Legal Sourcebook for California Cooperatives: Start-up and Administration* (Baldwin, January 2009) is a useful tool. The *Sourcebook* is written primarily as a resource for groups considering forming a cooperative and for members and management of existing cooperatives. The document provides both background information and sample documents for the organization of a new co-op and also provides existing co-ops with useful information, particularly related to administrative matters.

Table 5-4
Overview of Cooperatives

Advantages	Disadvantages
• Less Taxation – Similar to an LLC, co-ops that are incorporated normally are not taxed on surplus earnings (or patronage dividends) refunded to members. • Funding Opportunities - Government-sponsored grant programs • Community involvement Opportunity – with a “one member-one vote” organization, smaller investors can have as much say as larger investors. • Schedule – Not limited by public contracting code.	• Obtaining capital through investors • Lack of membership and participation can impact future facility operation • Formation and organization of the co-op may be a lengthy and contentious process

Source: U.S. Small Business Administration http://www.sba.gov/content/cooperative

5.4.2 Summary of Public Agency Alternatives

A more traditional approach would utilize a public agency to develop, implement and support the project. This approach allows for various Owner configurations, including the following:

- A single agency takes the lead.
- New agency is formed.

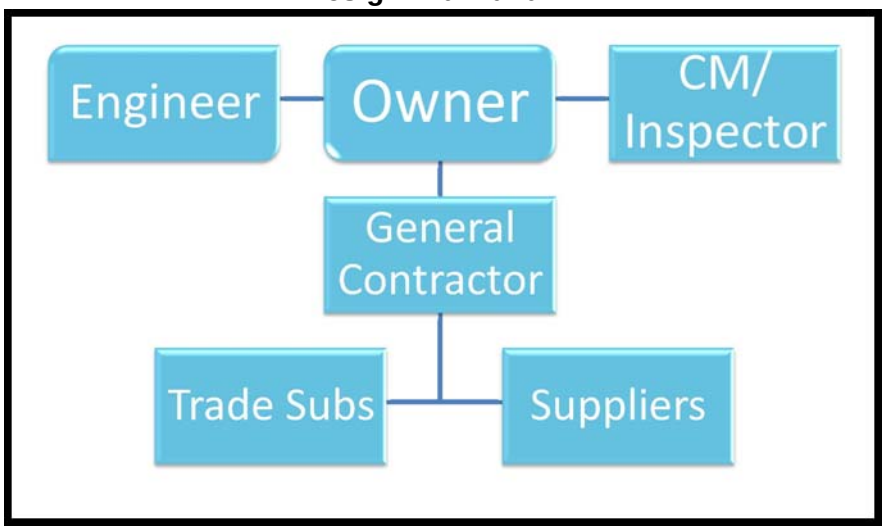
- Project is completed by multiple agencies under a Memorandum of Understanding (MOU).
- Project is completed by multiple agencies under a Joint Power Authority (JPA).

With any of these options, the project would be lead by a public agency. Although the majority of public works projects are implemented using a standard approach, there have been relatively recent updates to public code that allow for alternative delivery methods. The standard approach and alternative delivery methods are described in general in this section, along with relevant public code. In addition, a summary of local Ventura County projects, which used alternative delivery methods, are provided for reference.

5.4.2.1 Design-Bid-Build

"Design-Bid-Build" (DBB) represents the typical approach to implementing public works projects. The process includes two separate and distinct phases requiring separate contracts, the phases include design and construction. The design phase can be completed in-house or using consultants which are selected based on a qualifications based selection (QBS) process. Federal, state and local public agencies are required by federal and California state law (Government Code 4525-4529) to use QBS to select engineering, land surveying and architectural services[28]. Following completion of the design work, final construction documents are issued for public bid, of which the lowest responsive, responsible bidder is awarded the project. Following award, the public infrastructure is constructed. **Figure 5-10** illustrates the DBB relationship between the various entities.

Figure 5-10
Design-Bid-Build



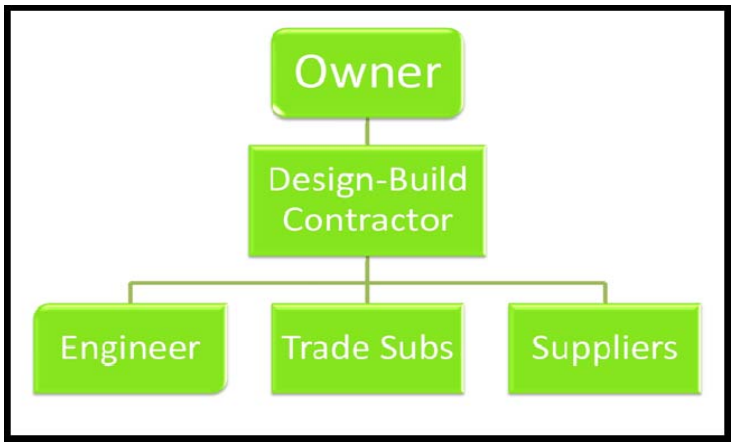
5.4.2.2 Design-Build

The "Design-Build" (DB) process is a method of project delivery in which a single entity works under one contract with the project Owner to provide both design and construction services. Recent changes to public code provide the ability for public agencies to utilize this process under select conditions. Depending on the applicable public code, various

[28] QBS Supporting Materials: http://www.acec-ca.org/doc.asp?id=1532

limitations to the selection process are included. These statutes typically provide the opportunity to select based on “best value” which includes cost but can also include qualifications, life-cycle costs, safety and other factors. Based on the complexity of the project, the Owner may decide to select an “Owner’s Representative” to assist in developing the project concept, for inclusion in the procurement documents, and also provide construction phase services to ensure project design criteria and other requirements are met by the selected design-build team. **Figure 5-11** illustrates the DB relationship between the various entities.

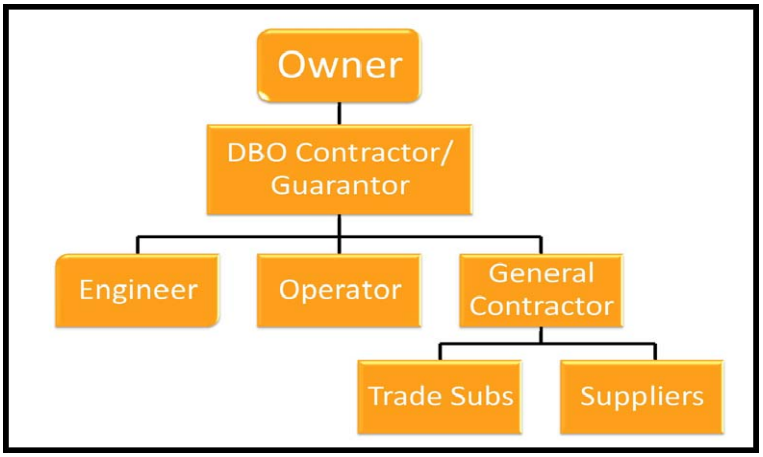
Figure 5-11
Design-Build



5.4.2.3 Design-Build-Operate

The “Design-Build-Operate” (DBO) model is an integrated partnership that combines the design and construction responsibilities of a DB process with long-term operations and maintenance services. Similar to DB and DBB, financing is provided by the public agency. The public agency continues to carry risk associated with changed conditions, including costs associated with energy, chemicals, hauling and other factors outside the control of the operating company. **Figure 5-12** illustrates the DBO relationship between the various entities.

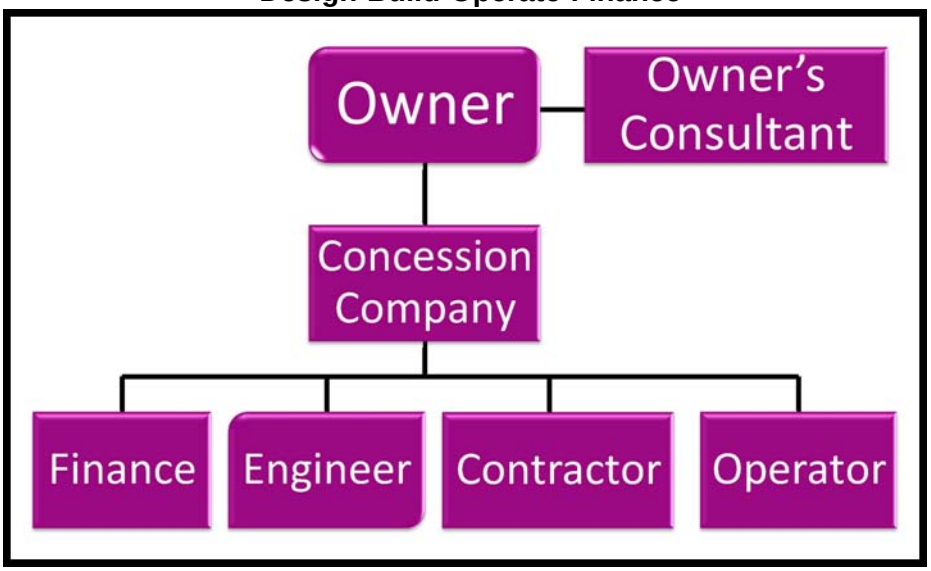
Figure 5-12
Design-Build-Operate



5.4.2.4 Design-Build-Operate-Finance

The "Design-Build-Operate-Finance" (DBOF) process combines all the responsibilities for designing, building, operating and financing the project and assigns them to a single entity under one contract. Although there are multiple variations to the DBOF process, a common feature includes the use of revenue generated by the project to finance the debt. For example, photovoltaic systems are often delivered using a form of the DBOF process, referred to as a Power Purchase Agreement (PPA). Using this approach, public agencies are not required to expend any capital, design, operate and participate in the construction of the facility. Typically, agencies must only provide the land and agree to pay a set amount for the produced energy, which includes an agreed upon annual escalation. **Figure 5-13** illustrates the DBOF relationship between the various entities.

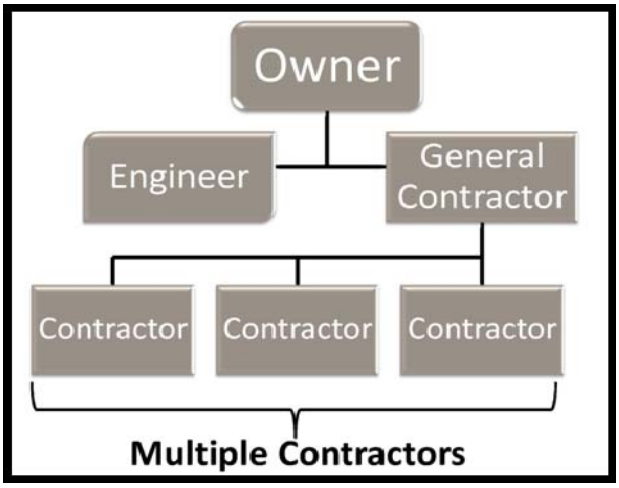
Figure 5-13
Design-Build-Operate-Finance



5.4.2.5 Construction Manager at Risk

The construction manager at risk (CM at risk) and construction manager and general contractor (CM/GC) process involves an Owner completing a design process and then selecting a construction management firm to take responsibility for project construction. The CM is typically selected on "best value" and agrees to deliver the project to the Owner for a not to exceed guaranteed maximum price. The CM completes the project through award of contracts to individual trade contractors to complete specific portions of the work, with selection based on criteria determined by the CM (i.e. lowest bidder, relationship, qualifications, etc). The CM manages construction of the work by the trade contractors. The CM may also complete portions of the work, in which case the CM is serving in a CM/GC capacity. Due to public contract code, utilizing the CM/GC approach is limited and typically requires specific statutory authority or use of a modified CM/GC approach that includes awarding trade contractors using only lowest bid as the selection criteria. This approach is commonly used in the private sector and could be utilized should a private entity or cooperative serve in the Owner role. **Figure 5-14** illustrates the CM/GC relationship between the various entities.

Figure 5-14
CM/CG



5.4.2.6 Relevant Legal Statutes

Table 5-5 provides a selection of statutes, considered relevant to the proposed biodigester project, for future reference and review should the project by implemented.

Table 5-5
Alternative Delivery Legal Statutes

Project Delivery Method	Public Agencies Covered	Statute
Design/Build	All Cities	PCC 20175.2, AB 642[(a)]
Design/Build	Counties	PCC 20133
Design/Build	"Qualified Entity" considered to include cities, counties, and special districts	PCC 20193[(b)]
Public Private Partnership (i.e. DB, DBO, DBOF)	"Public Agency" considered to include cities, counties, special districts, joint power authorities, etc.	GC 4217.10-4117.18 "Energy Conservation Contracts"[(c)]
Public Private Partnership (i.e. DB, DBO, DBOF)	"Local Government Agency" considered to include cities, counties, special districts, joint power authorities, etc.	GC 5956-5956.10 "Infrastructure Financing Act"[(d)]

(a) Applies to projects over $1 million.
(b) Limited to 20 projects in these categories: (1) regional and local wastewater treatment facilities, (2) regional and local solid waste facilities, and (3) regional and local water recycling facilities.
(c) Allows agencies to enter into ground lease with private contractor who constructs energy conservation facility and sells discounted energy to the agency for a period of years (20-30), before the agency takes possession of the facility.
(d) Authorizes any combination of: study, plan, design, construct, develop, finance, maintain, rebuild, improve, repair or operate. Can only be applied to revenue generating projects.
(e) Source: "Alternative Project Delivery Methods for Public Works Projects in California", Gehrig (2009)

5.4.3 Local Examples of Alternative Business Models

Alternative delivery methods are not new within Ventura County, but have actually been increasing in use, specifically for large scale projects. **Table 5-6** provides a partial list of known alternative delivery projects completed within Ventura County. The noted public agencies utilized varying statutes from **Table 5-7** to complete their respective alternative delivery methods. The use of said statutes depended on the type of project, review of relevant statutes by legal counsel and the type of public agency which was serving as the Owner (i.e. city, county, etc.).

Table 5-6
Alternative Delivery in Ventura County

Owner	Project	Delivery Method	Year Complete
Thousand Oaks	600 kW Photovoltaic System	DBOF[(a)]	2007
City of Fillmore	Wastewater Treatment Plant	DBO	2009
City of Santa Paula	Wastewater Treatment Plant	DBOF	2010
County of Ventura	Wastewater Treatment Plant	DB	2010
Ventura Regional Sanitation District	Toland Road Drying Facility	DB	2010
County of Ventura	1 MW Photovoltaic System – Moorpark	DB	2012
County of Ventura	1 MW Photovoltaic System – Todd Road Jail	DB	Est. 2013
County of Ventura	Medical Facility	DB	Est. 2016

(a) Power Purchase Agreement (20 year).

5.4.4 Summary of Alternative Delivery

Table 5-7 provides a summary of the various project delivery methods identified in Section 5.4.2 and includes the benefits and challenges presented by each approach.

Table 5-7
Alternative Delivery Method Comparison

Method	Benefits	Challenge
DBB	• Provides transparency • Established and well understood by public agencies • Provides more control over design features, including aesthetics	• Cannot award based on experience, financial capacity, references, safety record, etc. • Extended schedule • Requires complete design focused on a single technology (reduced competitiveness)
DB	• Faster delivery • Reduced risk, minimize litigation • Single responsibility • Provide technology flexibility and innovation • Designer and Contractor working together can provide efficiencies	• Less control over design features • Limited access for small contractors • Limited assurance of quality control • Owner's intent must be completely defined

Method	Benefits	Challenge
DBO	• Same benefits as DB • Less exposure to risk during operation • Potentially reduced O&M cost through efficiency • Get plant operation skill sets and time to train local workers	• Same challenges as DB • Less operational flexibility
DBOF	• Same benefits as DBO, with initial costs amortized over the project life. • Less Owner risk • Expedited schedule • Get plant operation skill sets and time to train local workers	• Same challenges as DBO • Overall project cost increasing due to increased cost of money and inclusion of company profits.
CM/GC	• Owner has input • Optimize schedule, reduce cost • Equipment selection flexibility • Contractor selected on qualifications	• Owner has two contracts to coordinate • Schedule longer than DB • Change order risk • No process guarantee

5.4.5 Recommendation

Due to the level of sophistication and opportunities for innovation within the overall treatment process, a DB delivery approach is well suited for this project. In addition, due to the opportunities to limit risk and potentially reduce O&M costs, including continued facility operation, a DBO option should be considered. The decision to utilize private financing, via a DBOF, should be considered but will ultimately be decided based on the final project Owner and their respective financial condition. As such, two public Owner alternatives are recommended as feasible, a DBO using public financing (public-public) and a DBOF (public-private) that is funded by future facility revenues (i.e. tipping fees, energy production, etc).

In addition, due to the level of community engagement and potential interest by those utilizing the services provided by the facility, a co-op could also be viable option. Although this approach faces obstacles related to financing and organization, there is significant benefit provided by incentivizing those producing the feedstock to utilize the facility.

Table 5-8 provides a brief comparison of the three options (public-public, public-private and co-op) with relation to several key factors.

Table 5-8
Project Delivery Method Comparison

Category	Public-Public	Public-Private	Co-op
Delivery Complexity	-	+	-
Flexibility	-	-	+
Investment and Grant Funding	-	+	+
Startup Schedule	-	+	-
Community Involvement	0	0	+
Stability	+	+	-
Risk Exposure	-	+	-

+ Advantage, - disadvantage, and 0 is neutral

Section 6: Implementation Plan

6.1 Objective

The focus of this section is to develop an Implementation Plan which includes an analysis calculating the rate of return and an overall project schedule. The spreadsheet-style financial analysis will be based on value inputs developed in coordination with local utilities, haulers, operators, proposed equipment manufacturer and various Stakeholders. The overall project schedule will include major milestones and identify lead agency responsibilities. As agreed upon with VRWC and W2E, this section is intended to address the following questions:

- What is the economic feasibility of the project?
- What is the financial impact of the preferred delivery methods?
- How long will this project take to implement?
- What are the key next steps?

6.2 Business Model

This section provides a summary of the approach used in developing a business model for use in calculating the estimated rate of return for the proposed project.

6.2.1 Key Assumptions

The outcome of the financial analysis is mainly driven by the assumptions used as inputs to the model (see also Section 5 for reference). Table 6-1 provides a summary of key assumptions, and a description of the source or validation.

Table 6-1
Key Assumptions

Input	Justification
Capital Cost	$8.67M per TM No. 3 (Table 2-1)
Rate of Return	8%, this is specific to the private-public alternative.
Private Financing	6.89% average of all banks for loans over $100k, range of 6.00% to 8.19% is noted based on data from Federal Reserve.[29]

[29] Small Business Rate Report. *Businessweek*. Retrieved February 19, 2013, from http://www.businessweek.com.

Input	Justification
Public Financing	4%, State of California Recycling Market Development Zone Loan Program ($2M limit, can be used for real estate purchase). Interest rates for this program are set equal to the State's Surplus Money Investment Fund (SMIF) rate, but no less than 4%. This value is used as it represents a conservative approach. The Energy Conservation Assistance Act (ECAA) created low interest loans through the California Energy Commission. The program provides 1% interest loans, up to $3M, for public agencies, including counties and special districts; non-profit institutions are not eligible for these funds. Eligible projects include "energy generation including renewable energy and combined heat and power projects". Projects must be repaid from savings within 15 years, including principal and interest. This results in an approximate 13-year simple payback. [30] Alternatively, a public agency with sufficient internal funds could consider self-financing the project which avoids the need to pay interest and transaction costs. The County of Ventura used this approach for the recently completed $5M 1-MW photovoltaic system at the Moorpark Water Reclamation Facility.
Discount Rate	1.1% Real interest rate forecast for 30-year Treasury Notes and Bonds; these real rates are recommended to be used for discounting constant-dollar flows, as is required in cost-effectiveness analysis.[31]
Throughput	Varies between 5,000 tons/year (year 0-1) to 21,000 (year 5-30). See Section 6.2.1.2 for details.
Generation	Varies between 607,000 kW-hrs/year (year 0-1) to 2,289,000 kW-hrs/year (year 5-30). See Section 6.2.1.2 for details.
O&M Escalation	3.5%
Tipping Fee	Range of $22/ton to $35/ton[(a)], former is assumed for Alternative 1 and 2; latter is used for Alternative 2A. 3.5% annual escalation.
O&M	$33/ton-yr. See Section 6.2.1.1.
Digestate/Fertilizer	Although this byproduct can be used within the agricultural market, the value is unknown in Ventura County. To provide a conservative financial evaluation, no revenue is applied to this material. A market analysis will be required based on final technology selection, inputs, and product quality.
Power Purchase[(b)]	$0.09274/kW-hr. Based on 25-Year agreement with Southern California Edison (SCE), California Renewable Energy Small Tariff (CREST). 4.5% Annual escalation.

[30] Energy Efficiency Financing. *The California Energy Commission*. Retrieved February 19, 2013 from http://www.energy.ca.gov/efficiency/financing/#eligibility

[31] Memorandum for the Heads of Departments and Agencies (2013, January 24). 2013 Discount Rates for OMB Circular No. A-94. *Executive Office of the President, Office of Management and Budget*.

Input	Justification
Incentive	$0.50/W for microturbines; 50% paid up front and 50% paid over the following 5 years. The Self-Generation Program is a rebate offered by the State of California for CHP/Cogeneration projects. Incentive is capped at 3 MW. Started in 2001 and expires in 2016.
Incentive	$0.022/kW-hr for 10 year term, per Renewable Electricity Production Tax Credit (PTC). Federal program applies only to Corporations. This credit became effective in January 2013 and requires that construction is started by December 31, 2013. For purposes of this analysis, this tax credit (or one similar) is assumed to be extended beyond 2013.

(a) As noted in Section 3, Harrison currently provides containers, which can be filled to 2.5 feet, which is estimated at approximately 16 cubic yards. Based on a ratio of 50 percent horse manure and 50 percent bedding and density of 63 lb/cubic-feet and 2.5 lb/cubic-feet, respectively, each container provides approximately seven tons of comingled horse waste and bedding. Currently, this waste is delivered to either Ojai Valley Organics at $165/container (same price for green waste), equating to $23.57/ton, or Agromin at $36.55/ton (same price for green waste).

(b) Upgrading the generated biogas to biomethane (BioCNG) for vehicle fuel or pipeline injection was not studied further due to high associated capital costs (upgrading equipment, fueling station, CNG vehicle purchase or conversion). In order to meet Air Resources Board clean air requirements, upgrades may be necessary before gas can be utilized for power generation.

6.2.1.1 Operation and Maintenance

Table 6-2 provides a detailed summary of the ongoing costs associated with operation and maintenance of the proposed facility.

Table 6-2
Detailed O&M Estimate

Description	Annual Cost
Annual Fees	$23,000
Repair and Maintenance	$100,000
Personnel	$84,000
Consumables	$120,000
Leasing (Machinery)	$27,000
Cost per Year	**$354,000**

Source: Based on estimate provided by Organic Services (2012). Reduced repair and maintenance, and consumables by 50 percent to adjust from 800 kW to 400 kW.

Based on the estimated annual O&M cost of $354,000/yr from **Table 6-2** and the associated throughput of 10,700 ton/year, a per unit cost of $33/ton-yr is calculated for the financial analysis, and is reflected in **Table 6-1**.

6.2.1.2 Annual Throughput and Generation

The economic feasibility of the proposed project is dependent on a positive cash flow which is solely dependent on two values, tipping fees from delivered feedstock and energy

generation. Since the feedstock is reliant on delivery from potentially hundreds of individual horse owners, a ramping up period is expected and is estimated in **Table 6-3**.

Table 6-3
Annual Throughput/Generation Estimate

Year	Quantity (tons)	Generation (kW-hrs)[(a)]	Notes
0-1	5,000	607,000	50 percent of identified horse manure/bedding.
1-2	10,700	1,214,000	100 percent of identified horse manure/bedding. Based on 1,250 horses per Section 3.
2-5	16,000	1,682,000	100 percent of identified horse manure/bedding and 75 percent of identified green waste (assumes not all green waste will be or can be routed to facility).
5-30	21,000	2,289,000	150 percent of identified horse manure/bedding and 75 percent of identified green waste. Section 3 noted that actual horse count for the entire Ventura River area may be up to 240 percent of the original horse count (estimated 2,000 to 3,000).

(a) Generation based on energy potential calculations provided in **Table 3-7** of Section 3.

6.2.2 Financial Analysis

Using the data developed in Section 6.2.1, a spreadsheet model was developed using Quantrix software. This software was selected as it provides the ability to manipulate various inputs and easy viewing of financial modeling and projections. The results generated from this exercise are intended to provide a general understanding of the potential payback period for the proposed project. To provide an analysis representing the range of potential project delivery scenarios that the project may take, two main alternatives were identified and are summarized below.

1. **Alternative 1: Private** – Private sector ownership, operation and financing.

2. **Alternative 2A: Public** – Public-Private partnership, with public ownership and financing and private operation.

Using the Quantix software and the two scenarios summarized above, a year-by-year cash flow analysis was developed and is included in **Appendix E**. The results of the analysis were used to determine the economic viability of the project, which was based on a presence of positive net cash flow, a positive net present value (NPV) on net cash flow and a positive internal rate of return (IRR) on net cash flow in excess of the desired threshold level. Based on this analysis, Alternative 1 provides a negative NPV of $9.9M and Alternative 2A provides a negative NPV of $5.4M. With regards to net cash flow, Alternative 2A does provide some positive but the IRR is negative at 19.9%. As such, neither option is determined to be economically viable based on the stated criteria.

In comparing the two alternatives, it is noted that the low interest financing provided by the public alternative does present a significant benefit, but it is not enough to push the project into economic viability. Another significant factor identified in the analysis is the tipping fee

associated with the feedstock. To determine the impact of modifying this value, Alternative 2B was created that applies a tipping fee of *$35/ton*, which is at the high end of the current market price for the area as noted in **Table 6-1**. In addition, the feedstock is assumed to ramp up to full horse manure/bedding capacity in the first year, as opposed to in Year 2 as was assumed in both original alternatives. With this modification the NPV becomes positive at $6M and significant positive net cash flow results in a positive IRR of 11.7%. Based on this result, Alternative 2B represents an economically viable project.

The economic analysis included in **Appendix E** is summarized in **Table 6-4**.

Table 6-4
Summary of Economic Analysis

Scenario	IRR	NPV
Alternative 1 - Private	0[(a)]	-$9.9M
Alternative 2A – Public	-19.9%	-$5.4M
Alternative 2B – Public[(b)]	11.7%	$6.0M

(a) Alt1 provides no positive net cash flow, which results in no IRR.
(b) As noted in Section 6.2.2, the difference between Alt 2A and 2B is the value used for the tipping fee; $22/ton and $35/ton, respectively. In addition, the feedstock is assumed to ramp up to full horse manure/bedding capacity in the first year for Alt 2B, as opposed to in Year 2 as is the case for Alt 1 and Alt 2A.

6.2.3 Project Schedule

Using best management practices, a facility development project schedule outline was developed that encompasses potential public and public-private (co-op) facility ownership, financing and operating business models.

The schedule includes the following five major facility development tasks: Owner Formation, Project Development, Environmental Impact Report, Procurement, and Construction. For completion of all five major tasks, the estimated duration is nearly a 1,070 working days or 49 months. For purposes of this Feasibility Study, CEQA preparation, review and certification are estimated to take up to one-full year. Approximately a third of the project duration is required for construction and start-up, which is estimated at 15 months.

Assuming that facility-site acquisition is secured without controversy, there exist opportunities to expedite the project including: streamlining and optimizing the competitive selection process by contracting directly with the technology provider and creatively-utilizing the design-build-operate-finance model. However, implementation of such facility development process optimization options requires that the facility Owner (i.e. private co-op) not be bound by a legally-proscribed qualifications-based selection process [such as the case with public-entity facility owners]. If successful, such optimization processes could reduce project delivery by up to six months.

The project development timelines shown, included as **Appendix F**, are assumed to represent a realistic, though conservative project development duration period for each schedule.

Appendix A
Questionnaire

AECOM

Bio-Digester Feasibility Study - Technology Questionnaire

Criteria 1 - Similar Facilities	
Facility #1	Name:
	Location:
	Capital and O&M Costs:
	Annual Throughput (TPY) per Feedstock:
	Date of Operation:
	Output (biogas, solids, liquids, etc.):
	Solids Utilization (i.e. land applied):
	Biogas Utilization (i.e. electricity gross and net):
	Feedstocks:
Facility #2	Name:
	Location:
	Capital and O&M Costs:
	Annual Throughput (TPY) per Feedstock:
	Date of Operation:
	Output (biogas, solids, liquids, etc.):
	Solids Utilization (i.e. land applied):
	Biogas Utilization (i.e. electricity gross and net):
	Feedstocks:
Facility #3	Name:
	Location:
	Capital and O&M Costs:
	Annual Throughput (TPY) per Feedstock:
	Date of Operation:
	Output (biogas, solids, liquids, etc.):
	Solids Utilization (i.e. land applied):
	Biogas Utilization (i.e. electricity gross and net):
	Feedstocks:

PLEASE ATTACH ANY MARKETING MATERIALS OR PHOTOS ILLUSTRATING A SIMILAR EXISTING PLANT - WE WILL BE PREPARING A MOCK UP FOR THE CLIENT.

If other similar facilities exist, please include projects on separate attachment.

Criteria 2 - Feedstock Flexibility

Confirm the expected optimum blend of feedstocks noted in the cover letter. For example, will your technology perform better with a higher percentage of food waste, horse manure, etc.? Explain the flexibility and limitations your technology provides in operating with varying feedstock ratios.

Criteria 3 - Biogas Production

Based on the optimum feedstock blend determined in Criteria 2, please provide a conceptual estimate for biogas production. How does this compare with the biogas production of the currently stated feedstocks?

AECOM

Criteria 4 - Footprint Requirements

What are the footprint requirements for your technology, materials storage, composting, pre-treatment, digestion or other required support systems? What type of access is required? Can you provide a simplified process flow diagram and sample layout?

Criteria 5 - Capital Cost

For the optimum system described in Criteria 3, summarize the conceptual level total project cost. If possible, can a cost breakdown be provided. Please list any assumptions used in the cost estimate.

Criteria 6 - Air Emissions

Describe what air emissions are expected? Are air scrubbing units required, flares or other emission systems?

Criteria 7 - O&M Requirements

What are the expected annual O&M costs, man hours, and level of expertise? Can you provide an annual O&M contract for the provided system?

Appendix B
Land Acquisition

OJAI VALLEY SANITARY DISTRICT
A Public Agency
1072 Tico Road, Ojai, California 93023
(805) 646-5548 • FAX (805) 640-0842
www.ojaisan.org

October 12, 2012

Board of Directors
Ojai Valley Sanitary District
Ojai, California 93023

TREATMENT PLANT PROPERTY LEASE AND LOCATION

The lease on the property the OVSD Treatment Plant is located on is between OVSD and the City of Ventura, signed on March 18, 1963. It was for a term of 99 years at a rate of $1.00 per year. The lease is for the portion of the plant including the Operations Building and all of the plant facilities. The drying beds are located on a parcel that is owned by OVSD.

Over the years, there have been a number of discussions and inquiries regarding the site, adjacency to the river, floodplains, masterplans, recreation corridors and future improvements to the plant. The plant location and related issues are included and reviewed as part of the Strategic Planning process for OVSD. The Treatment Plant is not currently located in a 100-year floodplain, the drying beds are. However, the Plant is adjacent to the river so flood protection is an important part of our operations.

One of the questions that have come up is should and if the Treatment Plant is relocated, where would it go? Due to the slope and topography of the valley and the gravity sewer mains, there are limited number of sites the plant could be located on without significant improvements to pump the flows. There are also complex geotechnical, engineering, environmental, regulatory and numerous other issues that would need to be studied in greater detail before any site selection could be made, if at all.

Attached is an exhibit and spreadsheet outlining parcels from the San Antonio Creek area down to Petrochem along the river corridor. Basic information such as zoning, floodplains, adjacent development and such were reviewed. Parcels at least 6 acres in size, on up, were listed for comparison. Costs were estimated, in today's dollars, to come up with a very conceptual budgetary figure for comparison only.

The results show that there are only 2 parcels that are not in a floodplain and are vacant. Each of these sites has other issues that would need to be factored into any decision. The conceptual cost only of purchasing a site and relocation is in the $100,000,000 range. A lengthy siting, environmental and engineering process would be included in any relocation.

If you have any questions or need additional information please call me at 646-5548.

Jeff Palmer
General Manager

Item 15-1


Casitas Springs, CA
SANTA ANA RD
VENTURA RIVER
HWY 33
MOUNTAIN
ROAD
CREEK RD
SULPHUR
12
36
GIRL SCOUT CAMP
1" = 800'
11
123
33
LEGEND
INDUSTRIAL ZONED
FLOODPLAIN BOUNDARY
1
1
NUMBER
ACRES
SLUDGE BEDS
OVSD PLANT
10
50
9
11
VENTURA WATER TREATMENT PLANT
CANADA LARGA RD
6
7
7
22
BROOKS INSTITUTE
6
8
PETROCHEM
5
11
PETROCHEM
4
18
PETROCHEM
3
17
TRAIL
2
7
PEPSI
1
8
OILFIELD STORAGE
Image U.S. Geological Survey
2012 Google
Image 2012 GeoEye
Google Earth Eye alt 50154 ft
VERIFY SCALES
BAR IS ONE INCH ON ORIGINAL DRAWING
IF NOT ONE INCH ON THIS SHEET,
ADJUST SCALES ACCORDINGLY
EXHIBIT -1
10-3-12

15-2

Ojai Valley Sanitary District
WWTP Plant Relocation Considerations
Budgetary Estimate

Site	Size (AC)	Zoned	Floodplain	Acquisition Cost	Design Cost 12%	Environmental Cost	Construction	Collection Sys. Offsite Costs 12%	Floodplain Mitigation 10%	Const. Mgmt. 8%	Contingency 20%	Total	Description/Use
1	6 to 10	Industrial	no	$700,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$0	$5,200,000	$17,350,000	$104,100,000	oilfield storage, next to MH park
2	6 to 10	Industrial	no	$700,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$0	$5,200,000	$17,350,000	$104,100,000	pepsi
3	6 to 10	Industrial	yes	$700,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,650,000	$111,900,000	petrochem, vacant w/ barranca
4	6 to 10	Industrial	yes	$700,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,650,000	$111,900,000	petrochem
5	6 to 10	Industrial	yes	$700,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,650,000	$111,900,000	petrochem
6	>10	Industrial	yes	$850,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,680,000	$112,080,000	brooks
7	>10	Industrial	yes	$850,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,680,000	$112,080,000	undeveloped
8	>10	Industrial	yes	$850,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,680,000	$112,080,000	row crops
9	>10	Industrial	yes	$1,000,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,710,000	$112,260,000	grazing, next to fwy
10	>10	Open Space	no	$1,000,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$0	$5,200,000	$17,410,000	$104,460,000	grazing
11	>10	Rural	yes	$1,000,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,710,000	$112,260,000	rdk land
12	>10	Open Space	yes	$1,000,000	$7,800,000	$250,000	$65,000,000	$7,800,000	$6,500,000	$5,200,000	$18,710,000	$112,260,000	girl scout camp

Notes:

1 Acquisition costs are estimated to be $75,000/acre and includes $100,000 for acquistion costs. Tenacres was used as an average for calculation purposes on the parcels that are greater than 10 acres. Eight acres was used for the parcels that are between 6 and 10 acres. Parcels that are not zoned industrial acquisition costs include $150,000 for County Planning/LAFCO costs associated with zone changes.

2 Design costs include survey and geotechnical and the percentage is of construction costs.

3 Construction costs are based on recently constructed tertiary treatment plant costs (MBR filters and UV disinfection) in Ventura County of similar size (3.0 MGD).

4 Construction management percentage costs are based on construction costs for a 3.0 MGD treatment plant. Contingency costs are based on the total cost of the project.

5 only 2 properties that are vacant and are not in the floodplain

6 Significant Issue - may include additional costs due to remediation or site costs

7 the monthy service charge increase is estimated at $43 per month to cover the above cost estimates

8 the above estimates do not include costs to abandon existing site and/or revegetation

15-3

Appendix C
Mitigation Measures

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
5. Air Quality and Greenhouse Gas			
Impact 5.1: Construction and operations of AD facilities within California would result in emissions of criteria air pollutants at levels that could substantially contribute to a potential violation of applicable air quality standards or to nonattainment conditions.	**Measure 5.1a:** Applicants shall prepare and submit an Air Quality Technical Report as part of the environmental assessments for the development of future AD facilities on a specific project-by-project basis. The technical report shall include an analysis of potential air quality impacts for all steps of the project (including a screening level analysis to determine if construction and operation [for all on-site processes, including any end-use and disposal methods] related criteria air pollutant emissions would exceed applicable air district thresholds, as well as greenhouse gas (GHG) emissions and any health risk associated with toxic air contaminants (TACs) from all AD facility sources) and reduction measures. Preparation of the technical report should be coordinated with the appropriate air district and shall identify compliance with all applicable New Source Review and Best Available Control Technology (BACT) requirements. The technical report shall identify all project emissions from permitted (stationary) and non-permitted (mobile and area) sources and mitigation measures (as appropriate) designed to reduce significant emissions to below the applicable air district thresholds of significance, and if these thresholds cannot be met with mitigation, then the individual AD facility project could require additional CEQA review or additional mitigation measures. **Measure 5.1b:** Applicants shall require construction contractors and system operators to implement the following Best Management Practices (BMPs) as applicable during construction and operations: • Facilities shall be required to comply with the rules and regulations from the applicable Air Quality Management District (AQMD) or Air Pollution Control District (APCD). • Facilities shall require substrate unloading and pre-processing activities to occur indoors within enclosed, negative pressure buildings. Collected foul air (including volatile organic compounds (VOCs) off-gassed from undigested substrates) should be treated via biofilter or air scrubbing system. • Use equipment meeting, at a minimum, Tier II emission standards. • Minimize idling time either by shutting equipment off when not in use or reducing the time of idling to 5 minutes (as required by the state airborne toxics control measure [Title 13, §2485 of the California Code of Regulations]). Provide clear signage that posts this requirement for workers at the entrances to the site. • Maintain all equipment in proper working condition according to manufacturer's specifications. • Use electric equipment when possible. For projects that are unable to use internal combustion engines due to air district regulations (i.e., NOx emission limits), other options for generating renewable energy from biogas should be considered. Other options that should be evaluated for using biogas or biomethane as an energy source include: use as a transportation fuel (compressed biomethane), use in fuel cells to generate clean electricity, use for on-site heating, or injection of biomethane into the utility gas pipeline system. If there are other lower NOx alternative technologies available at the time of AD facility development, these should be considered as well during the facility design process.	S	LSM

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
Impact 5.2: Operation of AD facilities in California could create objectionable odors affecting a substantial number of people.	**Measure 5.2a:** Applicants for the development of AD facilities shall comply with appropriate local land use plans, policies, and regulations, including applicable setbacks and buffer areas from sensitive land uses for potentially odoriferous processes. **Measure 5.2b:** If an AD facility handles compostable material and is classified as a compostable material handling facility, the facility must develop an Odor Impact Minimization Plan (OIMP) pursuant to 14 CCR 17863.4. Otherwise, applicants shall develop and implement an Odor Management Plan (OMP) that incorporates equivalent odor reduction controls for digester operations and is consistent with local air district odor management requirements. These plans shall identify and describe potential odor sources, as well as identify the potential, intensity, and frequency of odor from these likely sources. In addition, the plans will specify odor control technologies and management practices that if implemented, would mitigate odors associated with the majority of facilities to less than significant. However, less or more control measures may be required for individual projects. Odor control strategies and management practices that can be incorporated into these plans include, but are not limited to, the following: - Require substrate haulage to the AD facility within covered, liquid leak-proof containers. - Establish time limit for on-site retention of undigested substrates (i.e., feedstocks should be processed and placed into the portion of the system where liquid discharge and air emissions can be controlled within 24 or 48 hours of receipt). - Provide enclosed, negative pressure buildings for indoor receiving and pre-processing. Treat collected foul air in a biofilter or air scrubbing system. - Establish contingency plans for operating downtime (e.g., equipment malfunction, power outage). - Manage delivery schedule to facilitate prompt handling of odorous substrates. - Handle fresh unstable digestate within enclosed building, or mix with green waste and incorporate into a composting operation within the same business day, and/or directly pump to covered, liquid leak-proof containers for transportation. - Protocol for monitoring and recording odor events. - Protocol for reporting and responding to odor events.	S	LSM
Impact 5.3: Construction and operation of AD facilities in California could lead to increases in chronic exposure of sensitive receptors in the vicinity to certain toxic air contaminants from stationary and mobile sources.	**Measure 5.3a:** Implement Mitigation Measures 5.1a and 5.1b. **Measure 5.3b:** Based on the Air Quality Technical Report (specified in Measure 5.1a), if the health risk is determined to be significant on a project-by-project basis with diesel particulate matter (DPM) as a major contributor, then the applicants shall implement control measures such that the AD facility health risk would be below the applicable air district threshold, which may include implementation of one or more of the following requirements, where feasible and appropriate: • Use either new diesel engines that are designed to minimize DPM emissions (usually through the use of catalyzed particulate filters in the exhaust) or retrofit older engines with catalyzed	S	LSM

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
	particulate filters (which will reduce DPM emissions by 85%); • Use electric equipment to be powered from the grid, which would eliminate local combustion emissions; • Use alternative fuels, such as compressed natural gas (CNG) or liquefied natural gas (LNG). **Measure 5.3c:** Hydrogen sulfide (H2S) contained in the biogas shall be scrubbed (i.e., via iron sponge or other technology) before emission to air can occur.		
Impact 5.4: Development of AD facilities in California could increase GHG emissions.	**Measure 5.4:** Implement Mitigation Measure 5.1a.	NI	NI
Impact 5.5: Development of AD facilities in California, together with anticipated cumulative development in the area, would contribute to regional criteria pollutants.	**Measure 5.5:** Implement Mitigation Measures 5.1a and 5.1b.	S	LSM
6. Hydrology			
Impact 6.1: Construction of AD Facilities could generate loose, erodible soils and other water quality pollutants that may impair water quality.	None required.	LS	LS
Impact 6.2: The operation of AD facilities could adversely affect surface and groundwater quality.	**Measure 6.2a:** During pre-processing, all water that contacts digester feedstock, including stormwater from feedstock handling and storage facilities and water from equipment washdown and feedstock wetting, shall be contained until appropriately disposed or utilized. Best Management Practices (BMPs) may be used to reduce loading of sediment, nutrients, trash, organic matter, and other pollutants. These BMPs may include, but are not limited to, trash grates and filters, oil-water separators, mechanical filters such as sand filters, vegetated swales, engineered wastewater treatment wetlands, settling ponds, and other facilities to reduce the potential loading of pollutants into surface waters or groundwater. All discharges of stormwater are prohibited unless covered under the General Industrial Stormwater Permit, other National Pollutant Discharge Elimination System (NPDES) permit, or are exempted from NPDES permitting requirements. The NPDES permits will generally require implementation of management measures to achieve a performance standard of best available technology economically achievable (BAT) and best conventional pollutant control technology (BCT), as appropriate. The General Industrial Stormwater Permit also requires the development of a storm water pollution prevention plan (SWPPP) and a monitoring plan, in compliance with permit requirements.[1] Other liquid and solid wastes may only be discharged pursuant to an NPDES permit or waste discharge requirement (WDR) order. **Measure 6.2b**: In order to minimize the amount of fugitive trash or feedstock released to surface waters, the following measures shall be implemented. When feasible, the project proponent shall preferentially select feedstocks that contain minimal amounts of trash that could become entrained in surface water, either via direct contact with stormwater flows or via other accidental release, such as due to wind. Processing of such feedstocks may, however, be unavoidable, such as in support of an AD facility that processes MSW. Therefore, the project applicant shall ensure that (1) drainage from all feedstock loading, unloading,	S	LSM

1 For more information, please refer to: http://www.swrcb.ca.gov/water_issues/programs/stormwater/industrial.shtml

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance: Before Mitigation	Impact Significance: After Mitigation
	and storage areas is contained onsite or treated to remove trash and stray feedstock, and sediment prior to release as permitted; (2) in all feedstock loading and unloading areas, and all areas where feedstock is moved by front loaders or other uncovered or uncontained transport machinery, the applicant shall ensure that mechanical sweeping and/or equivalent trash control operational procedures are performed at least daily, during operations; and (3) the facility operator shall train all employees involved in feedstock handling so as to discourage, avoid, and minimize the release of feedstock or trash during operations. **Measure 6.2c**: In order to minimize water quality degradation associated with accidental spills at AD facilities, the applicant for individual projects that would be implemented under the Program EIR shall require project proponents to complete and adhere to the requirements of a Spill Prevention, Control, and Countermeasure (SPCC) Plan, which is based on the federal SPCC rule. Notification of the SPCC Plan shall be provided to the local Certified Unified Program Agency (CUPA). The SPCC Plan shall contain measures to prevent, contain, and otherwise minimize potential spills of pollutants during facility operation, in accordance with U.S. EPA requirements. For individual projects that would utilize wet digestion systems, in which processing and holding tanks would contain the (aqueous) digestion reaction and liquid digestate containing fats and oils, the SPCC Plan shall provide for installation and monitoring of secondary containment and/or leak detection systems to ensure that AD liquids are not accidentally discharged to navigable waters or adjoining shorelines. Monitoring of these systems shall be in accordance with SPCC Plan requirements. **Measure 6.2d:** Any proposed discharge to a pond for an individual project would require the project applicant to acquire WDRs from the appropriate regional board. The project applicant shall ensure that all ponds and discharges to such ponds adhere to all requirements under applicable WDRs. The need for pond liners in order to protect groundwater quality would be assessed during the regional board's review of the project, and requirements for pond liners would be included in the WDRs, as warranted. If appropriate, the WDRs would impose requirements for Class II surface impoundments as presented in Title 27 of the California Code of Regulations. Requirements include, but are not limited to, groundwater monitoring, double liner systems with leachate collection, water balance, a preliminary closure plan for clean closure, seismic analysis, and financial assurances. Compliance with WDRs may require the installation of facilities such as tanks and containers to store and process the digestate, the use of filter presses, and implementation of other water quality protection practices. **Measure 6.2e**: This measure would reduce potential for the movement of nutrients and other pollutants to groundwater and surface water for individual projects that would employ land application for liquid digestate or residual solids. The operators of individual projects implemented under this Program EIR shall ensure that land application of liquid digestate and/or residual solids adheres to all requirements of applicable WDRs. WDR requirements include but are not limited to, groundwater monitoring, completion of an anti-degradation analysis, and in some cases best practicable treatment and control to achieve salinity reduction in materials prior to discharge to land. WDRs would be issued by the appropriate regional board, and would consider site-specific conditions and waste characteristics, in order to determine applicable control measures and procedures that protect water quality.		

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
	Measure 6.2f: This measure would reduce the potential for water quality degradation from projects that include discharge of liquid digestate to surface waters. The applicant for individual projects implemented under this Program EIR shall ensure that the discharge of liquid digestate to surface waters adheres to all NPDES permitting recommendations and requirements, as established by the appropriate regional board. Specific measures may include, but are not limited to, limitations on discharge volumes, seasonal discharge restrictions, limitations on loading rates and/or concentrations of specific constituents, and other facility-specific water quality control measures designed to protect receiving water quality and preserve beneficial uses identified in Basin Plans.		
Impact 6.3: AD facilities could be exposed to flooding hazards.	**Measure 6.3:** Individual applicants seeking coverage under this Program EIR shall ensure that, for their proposed AD facilities including pre-processing areas, feedstock storage areas, and digestate handling facilities, are protected from FEMA-defined 100-year flood events. Design measures may include, but are not limited to: facility siting, access placement, grading, elevated foundations, and site protection such as installation of levees or other protective features.	S	LSM
Impact 6.4: Construction of AD facilities could change drainage and flooding patterns	**Measure 6.4:** In order to ensure that the AD facilities would not result in detrimental increases in stormwater flow or flooding on site or downstream, the Applicant for each AD facility project shall prepare a comprehensive drainage plan (prior to construction) and implement the plan during construction. The comprehensive drainage plan shall include engineered stormwater retention facility designs, such as retention basins, flood control channels, storm drainage facilities, and other features as needed to ensure that, at a minimum, no net increase in stormwater discharge would occur during a 10-year, 24-hour storm event, as a result of project implementation. Project related increases in stormwater flows shall be assessed based on proposed changes in impervious surface coverage on site, as well as proposed grading and related changes in site topography.	S	LSM
Impact 6.5: AD facilities could require additional water supplies resulting in depletion of available water supplies.	None required.	LS	LS
Impact 6.6: AD facilities could become inundated as a result of seiche, tsunami, or mudflow.	**Measure 6.6:** To ensure that proposed AD facilities would not incur impacts associated with seiche, tsunami, or mudflow, the applicant for each individual project shall ensure that all facilities are located outside of potential risk areas for seiche, tsunami, and mudflow. In the event that a proposed facility would be sited within a potential risk area for one of these hazards, the facility shall be raised above projected maximum base inundation elevations, or shall be protected from inundation by the installation of berms, levees, or other protective facilities.	S	LSM
Impact 6.7: AD facilities could contribute to cumulative impacts to water quality.	**Measure 6.7:** Implement Mitigation Measures 6.2 (a-f) and 6.3.	S	LSM

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
7. Noise			
Impact 7.1: Construction of AD facilities could temporarily increase noise levels at nearby sensitive receptor locations or result in noise levels in excess of standards in local general plans, noise ordinances, or other applicable standards.	**Measure 7.1a:** Construction activities shall be limited to the hours between 7 a.m. and 7 p.m., Monday through Saturday, or an alternative schedule established by the local jurisdiction, or other limits to construction hours normally enforced by the local jurisdiction (see Measure 7.1d below). **Measure 7.1b:** Construction equipment noise shall be minimized by muffling and shielding intakes and exhaust on construction equipment to a level no less effective than the manufacture's specifications, and by shrouding or shielding impact tools. **Measure 7.1c:** Construction contractors within 750 feet of sensitive receptors shall locate fixed construction equipment, such as compressors and generators, and construction staging areas as far as possible from nearby sensitive receptors. **Measure 7.1d**: Construction contractors shall comply with all local noise ordinances and regulations and other measures deemed necessary by the Lead Agency.	S	LSM
Impact 7.2: Noise from operation of AD facilities could substantially increase ambient noise levels at nearby land uses or result in noise levels in excess of standards in local general plans, local noise ordinances, or other applicable standards.	**Measure 7.2:** AD facilities located within 2,000 feet of a sensitive receptor shall conduct a site specific noise study. If operational sound levels would exceed local regulations, or 45 dBA at a sensitive receptor (if no regulations are available), additional sound-proofing such as enclosures, muffling, shielding, or other attenuation measures shall be installed to meet the required sound level.	S	LSM
Impact 7.3: AD facility operational activities associated with transportation would not increase ambient noise levels at nearby land uses.	None required.	LS	LS
Impact 7.4: Development of AD facilities could result in a cumulative increase in noise levels.	**Measure 7.4:** Implement Mitigation Measures 7.1a through 7.1d and Measure 7.2.	S	LSM
8. Public Services and Utilities			
Impact 8.1: The project could substantially increase demands on fire protection services.	**Measure 8.1:** Implement Mitigation Measures 10.1b, 10.3c, and 11.4a.	S	LSM
Impact 8.2: The project could potentially exceed wastewater treatment requirements of the Regional Water Quality Control Board (RWQCB).	**Measure 8.2a:** Implement Mitigation Measure 8.3b if the operator does not have an existing agreement, such as for co-located facilities. **Measure 8.2b:** In addition to an agreement for service, coordination with the wastewater treatment provider would be needed to determine if pre-treatment would be required to meet the RWQCB requirements for the existing wastewater treatment facility.	S	LSM

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
Impact 8.3: The project could result in significant environmental effects from the construction and operation of new water and wastewater treatment facilities or expansion of existing facilities.	**Measure 8.3a:** If the project proposes to obtain water from a water supplier (municipal system or other public water entity), the developer would enter into an agreement for service with the supplier. **Measure 8.3b**: If the project proposes to obtain wastewater service from a wastewater treatment provider (municipal or other public entity), the developer would enter into an agreement for service with the provider. **Measure 8.3c:** Alternate water sources, such as non-potable and recycled water, shall be used during the pre-processing and AD process phases where needed and as available.	S	LSM
Impact 8.4: The project would not result in significant environmental effects from the construction of new stormwater treatment facilities or expansion of existing facilities.	None required.	LS	LS
Impact 8.5: The project would not require significant levels of new or expanded water supply resources or entitlements.	None required.	LS	LS
Impact 8.6: The project could result in exceeding the capacity of a wastewater treatment provider.	**Measure 8.6:** If the project proposes to obtain wastewater service from a wastewater treatment provider (municipal or other public entity), implement Mitigation Measure 8.3b.	S	LSM
Impact 8.7: The project could result in the construction of new energy supplies and could require additional energy infrastructure.	**Measure 8.7:** Projects requiring off-site energy infrastructure must complete CEQA review for the proposed energy improvements as a separate project. Infrastructure improvements may qualify as a categorical exemption pursuant to CEQA.	S	LSM
Impact 8.8: Development of AD facilities would not contribute to cumulative impacts to public services and utilities.	None required.	LS	LS
9. Transportation			
Impact 9.1: Construction of AD facilities would intermittently and temporarily increase traffic congestion due to vehicle trips generated by construction workers and construction vehicles on area roadways.	**Measure 9.1:** The contractor(s) will obtain any necessary road encroachment permits prior to installation of pipelines within the existing roadway right-of-way. As part of the road encroachment permit process, the contractor(s) will submit a traffic safety / traffic management plan (for work in the public right-of-way) to the agencies having jurisdiction over the affected roads. Elements of the plan will likely include, but are not necessarily limited to, the following: • Develop circulation and detour plans to minimize impacts to local street circulation. Use haul routes minimizing truck traffic on local roadways to the extent possible. Use flaggers and/or signage to guide vehicles through and/or around the construction zone. • To the extent feasible, and as needed to avoid adverse impacts on traffic flow, schedule truck trips outside of peak morning and evening commute hours. • Limit lane closures during peak traffic hours to the extent possible. Restore roads and streets to normal operation by covering trenches with steel plates outside of allowed working hours or when work is not in progress. • Limit, where possible, the pipeline construction work zone to a width that, at a minimum, maintains alternate one-way traffic flow past the construction zone. • Install traffic control devices as specified in Caltrans' Manual of Traffic Controls for Construction and Maintenance Work Zones where needed to maintain safe driving conditions. Use flaggers	S	LSM

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
	and/or signage to safely direct traffic through construction work zones. • Coordinate with facility owners or administrators of sensitive land uses such as police and fire stations, hospitals, and schools. Provide advance notification to the facility owner or operator of the timing, location, and duration of construction activities. • Coordinate with the local public transit providers so that bus routes or bus stops in work zones can be temporarily relocated as the service provider deems necessary.		
Impact 9.2: AD facility operations would not substantially increase on-going (operational) traffic volumes on roadways serving the facilities.	**Measure 9.2:** Measures will be imposed by applicable local agencies, as needed, to address site-specific significant traffic impacts identified during subsequent facility-specific analyses, implementation of which would reduce those impacts to a less-than-significant level.	S	LSM
Impact 9.3: AD facilities could potentially cause traffic safety hazards for vehicles, bicyclists, and pedestrians on public roadways, and could increase traffic hazards due to possible road wear or to accidental spills of digestate (liquids and solids).	**Measure 9.3a:** Implement Measure 9.1, which stipulates actions required of the contractor(s) to reduce potential traffic safety impacts to a less-than-significant level. **Measure 9.3b:** Prior to construction, the contractor(s), in cooperation with the agencies having jurisdiction over the affected roadways, will survey and describe the pre-construction roadway conditions on rural roadways and residential streets. Within 30 days after construction is completed, the affected agencies will survey these same roadways and residential streets in order to identify any damage that has occurred. Roads damaged by construction will be repaired to a structural condition equal to the condition that existed prior to construction activity. **Measure 9.3c:** Prior to initiation of project operations, the project sponsor(s) will submit a Spill Prevention Plan to the appropriate local agency. The Spill Prevention Plan will include, among other provisions, a requirement that each truck driver know how to carry out the emergency measures described in the Spill Prevention Plan (therefore reducing roadway hazards if an accidental spill were to occur).	S	LSM
Impact 9.4: AD facilities could intermittently and temporarily impede access to local streets or adjacent uses (including access for emergency vehicles), as well as disruption to bicycle/pedestrian access and circulation.	**Measure 9.4:** Implement Measure 9.1, which stipulates actions required of the contractor(s) to reduce potential access impacts to a less-than-significant level.	S	LSM
Impact 9.5: The project could contribute to cumulative impacts to traffic and transportation (traffic congestion, traffic safety, and emergency vehicle access).	**Measure 9.5a:** Prior to construction, the project sponsor will coordinate with the appropriate local government departments, Caltrans, and utility districts and agencies regarding the timing of construction projects that would occur near AD project sites. Specific measures to mitigate potential significant impacts will be determined as part of the interagency coordination, and could include measures such as employing flaggers during key construction periods, designating alternate haul routes, and providing more outreach and community noticing. **Measure 9.5b:** Implement Mitigation Measure 9.2. **Measure 9.5c:** Implement Mitigation Measures 9.1, 9.3b and 9.3c.	S	LSM

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
10. Aesthetics			
Impact 10.1: AD facilities could have adverse effects on a scenic vista and/or scenic resources.	**Measure 10.1a:** Avoid siting AD facilities near scenic vistas and corridors designated within an applicable land use plan and the State Scenic Highway Program. **Measure 10.1b**: Landscaping and/or vegetated berms should be used to minimize views of facilities from sensitive views.	S	LSM
Impact 10.2: AD facilities could degrade the existing visual character/quality of the site and its surroundings.	**Measure 10.2a:** Implement Mitigation Measures 10.1a and 10.1b. **Measure 10.2b:** Facilities using truck tippers or other un-enclosed unloading should consider using litter fences to manage blowing litter. Facilities should educate haulers delivering materials to the AD facility through literature, web links, or provide training on the acceptance of waste at the facilities to minimize litter. Facility operators should develop a protocol to identify feedstocks that are severely contaminated with potential litter and reject unacceptable loads. **Measure 10.2c:** Clean-up crews can be used as necessary to control litter. **Measure 10.2d:** Feedstocks and digestate byproducts should be stored in enclosed facilities or processed in a timely manner to prevent visibly deteriorated site conditions. **Measure 10.2e:** Project operators should consider enclosure of pre-processing operations if it provides an aesthetic and/or noise attenuating benefit.	S	LSM
Impact 10.3: AD facilities could create a new source of light or glare with adverse affects to daytime and/or nighttime views.	**Measure 10.3a:** Implement 10.1b. **Measure 10.3b:** Any lighting (portable or permanent) should be hooded and directed onto the project site. This would reduce effects to nighttime skies from uplighting, reduce glare, and prevent light from spilling onto adjoining properties and roads. **Measure 10.3c:** Flares may be enclosed to reduce the visibility of flames during operation.	S	LSM
Impact 10.4: The project could result in cumulative impacts to visual resources.	**Measure 10.4:** Implement Mitigation Measures 10.1a, 10.1b, 10.2a, 10.2b, 10.2c, 10.2d, 10.2e, 10.3a, 10.3b, and 10.3c.	S	LSM
11. Hazards and Hazardous Materials			
Impact 11.1: Construction of AD facilities could result in the potential exposure of construction workers, the public and the environment to preexisting soil and/or groundwater contamination.	**Mitigation Measure 11.1:** Prior to final project design and any earth disturbing activities, the applicant or agency(ies) responsible shall conduct a Phase I Environmental Site Assessment (ESA). The Phase I ESA shall be prepared by a Registered Environmental Assessor (REA) or other qualified professional to assess the potential for contaminated soil or groundwater conditions at the project site; specifically in the area proposed for construction of AD facilities. The Phase I ESA shall include a review of appropriate federal, State and local hazardous materials databases to identify hazardous waste sites at on-site and off-site locations within a one quarter mile radius of the project location. This Phase I ESA shall also include a review of existing and past land uses through aerial photographs, historical records, interviews of owners and/or operators of the property, observations during a reconnaissance site visit, and review of other relevant existing information that could identify the potential existence of contaminated soil or groundwater. If no contaminated soil or groundwater is identified or if the Phase I ESA does not recommend any further investigation then the project applicant or agency(ies) responsible shall proceed with final project design and	S	LSM

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

TABLE 1-1 (REVISED)
ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

Impact	Mitigation Measure	Impact Significance	
		Before Mitigation	After Mitigation
	construction. OR If existing soil or groundwater contamination is identified, and if the Phase I ESA recommends further review, the applicant or agency(ies) responsible shall retain a REA to conduct follow-up sampling to characterize the contamination and to identify any required remediation that shall be conducted consistent with applicable regulations prior to any earth disturbing activities. The environmental professional shall prepare a report that includes, but is not limited to, activities performed for the assessment, summary of anticipated contaminants and contaminant concentrations at the proposed construction site, and recommendations for appropriate handling of any contaminated materials during construction.		
Impact 11.2: Transportation, use, disposal or accidental spill of hazardous materials during construction of AD facilities would not result in the potential exposure of construction workers, the public and the environment to hazardous materials.	None required.	LS	LS
Impact 11.3: Transportation, use, disposal or accidental spill of hazardous materials during the operation and maintenance of AD facilities would not result in potential harmful exposures of the public or the environment to hazardous materials.	**Mitigation Measure 11.3:** Implement Mitigation Measures 5.1a and 6.2a-f.	S	LSM
Impact 11.4: Operation of AD facilities could increase the risk of fire hazards due to the potential release of biogas.	**Mitigation Measure 11.4a:** Prior to project approval, AD facility operators shall prepare and implement a Fire Safety Plan that outlines fire hazards, describes facility operations procedures to prevent ignition of fires, requires regular inspection of fire suppression systems, and provides for worker training in safety procedures as well as protocols for responding to fire incidents. The Fire Safety Plan shall be reviewed and approved by the local fire enforcement agency. **Mitigation Measure 11.4b**: Implement Mitigation Measure 11.5.	S	LSM
Impact 11.5: AD facilities could be located within one quarter mile of a school resulting in potential hazards associated with accidental release of hazardous materials, including biogas.	**Mitigation Measure 11.5:** AD facilities shall be sited at least one quarter mile from existing or proposed schools, daycare facilities, hospitals and other sensitive land uses.	LS	LS
Impact 11.6: AD facility operations could generate vectors (flies, mosquitoes, rodents, etc.) exceeding regulatory agency thresholds for the presence of vectors.	None required.	LS	LS
Impact 11.7: AD facilities could be located within five miles of a public airport or private airstrip and create an aviation hazard.	**Mitigation Measure 11.7:** For any AD facility proposed within 5 statute miles of an airport's air operations area, the operator will notify the Federal Aviation Administration (FAA) Regional Airports Division office and the airport operator of the proposed facility as early in the process as possible. AD facilities with any open air (outdoor) activities must receive an FAA Determination of No Hazard prior to project approval.	S	LSM
Impact 11.8: Development of AD facilities could contribute to cumulative impacts related to hazardous materials.	**Mitigation Measure 11.8:** Implement Mitigation Measures 11.1, 11.4, 11.5, and 11.7.	LS	LS

LS – Less than Significant LSM – Less than Significant with Mitigation NI – No Impact S – Significant

Appendix D
Preliminary Initial Checklist

STUDY PURPOSE

The California Environmental Quality Act (CEQA) process is often required for projects that require a discretionary approval and might result in physical changes to the environment. It is up to the lead agency to determine whether CEQA applies to a given project and as well as the level of CEQA review required. The County of Ventura Public Works Agency Watershed Protection District will be the lead agency for this project.

The first step of the CEQA process includes development of an Initial Study to determine the appropriate environmental document process for the project. For this evaluation, AECOM has reviewed available related environmental documents prepared for the adjacent City of Ventura Avenue Water Treatment Plant and the CalRecycle Program Environmental Impact Report (EIR) for AD projects. Using these documents, AECOM has prepared a preliminary CEQA Initial Study checklist to assist in identifying potential significant impacts and recommend the appropriate next steps. The Ventura County Initial Study Assessment Guidelines (July 2010) were used in the preparation of this document. This environmental analysis contained in the this Initial Study checklist is not intended to constitute a complete and comprehensive CEQA Initial Study checklist, but instead, to determine project feasibility related to environmental constraints. As such, the "Project Impact Degree of Effect" in Section B of this Initial Study should not be considered final, as a more refined project description and additional analysis will be required to determine the significance of impacts. The determination of "Cumulative Impact Degree of Effect" in Section B has not been determined as project-level impacts need to be finalized before analyzing the project's contribution to a cumulative impact and a list proposed and pending cumulative projects would be needed to determine potential cumulative impacts.

RESPONSIBLE AGENCIES

Responsible agencies may include United States Army Corps of Engineers, California Department of Fish and Game, Regional Water Quality Control Board and Ventura County Air Pollution Control District. A complete list of Responsible Agencies and required permits will be included as part of the CEQA document prepared for the project.

Attachments:

Figure 1 Site Location
Technical Memorandum No.2

Ventura County Watershed Protection District	
Potential Project Site	
November 2012	Figure 1

SECTION B
INITIAL STUDY CHECKLIST AND DISCUSSION OF RESPONSES

PROJECT: Ventura River Watershed Biodigester Project

APPLICANT: [For Feasibility Study purposes only, the Ventura County Watershed Protection District is shown as the applicant. A final decision on who the project applicant will be or whether there will be a project is yet to be determined.]

LOCATION: Ventura County

	ISSUE (RESPONSIBLE DEPARTMENT)	PROJECT IMPACT DEGREE OF EFFECT				CUMULATIVE IMPACT DEGREE OF EFFECT			
		N	LS	PS-M	PS	N	LS	PS-M	PS
RESOURCES:	**1. AIR QUALITY (APCD)**			X		TBD			
	2. WATER RESOURCES (PWA):								
	A. GROUNDWATER QUANTITY		X			TBD			
	B. GROUNDWATER QUALITY		X			TBD			
	C. SURFACE WATER QUANTITY		X			TBD			
	D. SURFACE WATER QUALITY		X			TBD			
	3. MINERAL RESOURCES (Plng.):								
	A. AGGREGATE	X				TBD			
	B. PETROLEUM	X				TBD			
	4. BIOLOGICAL RESOURCES			X		TBD			
	5. AGRICULTURAL RESOURCES (Ag. Dept.):								
	A. SOILS	X				TBD			
	B. LAND USE INCOMPATIBILITY	X				TBD			
	6. SCENIC RESOURCES (Plng.)		X			TBD			
	7. PALEONTOLOGICAL RESOURCES			X		TBD			
	8. CULTURAL RESOURCES:								
	A. ARCHAEOLOGICAL			X		TBD			
	B. HISTORICAL (Plng.)	X				TBD			
	9. COASTAL BEACHES & SAND DUNES	X				TBD			
HAZARDS:									
	10. FAULT RUPTURE (PWA):	X				TBD			
	11. GROUND SHAKING (PWA):		X			TBD			
	12. LIQUEFACTION (PWA):		X			TBD			
	13. SEICHE AND TSUNAMI (PWA):	X				TBD			
	14. LANDSLIDES/MUDSLIDES (PWA):	X				TBD			

	ISSUE (RESPONSIBLE DEPARTMENT)	PROJECT IMPACT DEGREE OF EFFECT				CUMULATIVE IMPACT DEGREE OF EFFECT			
		N	LS	PS-M	PS	N	LS	PS-M	PS
	15. EXPANSIVE SOILS (PWA):		X			TBD			
	16. SUBSIDENCE (PWA):		X			TBD			
	17. HYDRAULIC HAZARDS:								
	A. NON-FEMA (PWA)		X			TBD			
	B. FEMA (WPD)		X			TBD			
	18. FIRE HAZARDS (Fire)		X			TBD			
	19. AVIATION HAZARDS (AIRPORTS)	X				TBD			
	20. HAZARDOUS MATERIALS/WASTE:								
	A. HAZARDOUS MATERIALS (EH/Fire)			X		TBD			
	B. HAZARDOUS WASTE (EH)			X		TBD			
	21. NOISE AND VIBRATION		X			TBD			
	22. DAYTIME GLARE		X			TBD			
	23. PUBLIC HEALTH (EH)			X		TBD			
	24. GREENHOUSE GASES (APCD)		X			TBD			
LAND USE:	**25. COMMUNITY CHARACTER (Plng.)**		X			TBD			
	26. HOUSING (Plng.)	X				TBD			
PUBLIC FACILITIES/ SERVICES:	**27. TRANSPORTATION/CIRCULATION:**								
	A. ROADS AND HIGHWAYS:								
	(1) LEVEL OF SERVICE (PWA)	X				TBD			
	(2) SAFETY/DESIGN OF PUBLIC ROADS (PWA)	X				TBD			
	(3) SAFETY/DESIGN OF PRIVATE ACCESS (Fire)	X				TBD			
	(4) TACTICAL ACCESS (Fire)	X				TBD			
	B. PEDESTRIAN/BICYCLE (PWA/Plng.)	X				TBD			
	C. BUS TRANSIT	X				TBD			
	D. RAILROADS	X				TBD			
	E. AIRPORTS (Airports)	X				TBD			
	F. HARBORS (Harbors)	X				TBD			
	G. PIPELINES	X				TBD			
	28. WATER SUPPLY:								
	A. QUALITY (EH)	X				TBD			
	B. QUANTITY (PWA)			X		TBD			

	ISSUE (RESPONSIBLE DEPARTMENT)	PROJECT IMPACT DEGREE OF EFFECT				CUMULATIVE IMPACT DEGREE OF EFFECT			
		N	LS	PS-M	PS	N	LS	PS-M	PS
	C. FIRE FLOW (Fire)	X				TBD			
	29. WASTE TREATMENT/DISPOSAL:								
	A. INDIVIDUAL SEWAGE DISPOSAL SYSTEM (EH)	X				TBD			
	B. SEWAGE COLLECTION/ TREATMENT FACILITIES (EH)		X			TBD			
	C. SOLID WASTE MANAGEMENT (PWA)		X			TBD			
	D. SOLID WASTE FACILITIES (EH)		X			TBD			
	30. UTILITIES:		X			TBD			
	31. FLOOD CONTROL/DRAINAGE:								
	A. WPD FACILITIES/ WATERCOURSES (WPD)		X			TBD			
	B. OTHER FACILITIES/WATERCOURSES (PWA)		X			TBD			
	32. LAW ENFORCEMENT/EMERGENCY SVS. (SHERIFF):		X			TBD			
	33. FIRE PROTECTION (Fire):								
	A. DISTANCE/RESPONSE TIME		X			TBD			
	B. PERSONNEL/ EQUIPMENT/FACILITIES		X			TBD			
	34. EDUCATION:								
	A. SCHOOLS	X				TBD			
	B. LIBRARIES (Lib. Agency)	X				TBD			
	35. RECREATION: (GSA)	X				TBD			

DEGREE OF EFFECT:
N = No Impact.
LS = Less Than Significant
PS-M = Potentially Significant Impact Unless Mitigation Incorporated
PS = Potentially Significant Impact

TBD = To be Determined

AGENCIES:
APCD - Air Pollution Control District
Airports - Department Of Airports
Harbors- Harbor Department
WPD - Watershed Protection District
PWA - Public Works Agency
Fire - Fire Protection District
Ag. Dept. - Agricultural Department
Plng. - Planning Division
Sheriff - Sheriff's Department
Lib. Agency - Library Services Agency
GSA - General Services Agency
EH - Environmental Health Division

RESOURCES

1. AIR QUALITY

Air pollutants would be generated during construction and operation of the proposed biodigester facility.

Regional Impacts. Regional air quality impacts refer to the concentration of ozone and particulate matter in the ambient air. The project site is located within the Ventura County Air Basin and is under the jurisdiction of two air quality management agencies. The California Air Resources Board (CARB) is responsible for regulating mobile emission sources (vehicles) and the Ventura County Air Pollution Control District (VCAPCD) regulates stationary sources. The VCAPCD considers operational air quality impacts to be significant if a project would generate more than 25 pounds per day of Reactive Organic Compounds (ROC) or Nitrogen Oxides (NOx). The VCAPCD has not adopted significance thresholds for construction-related emissions since such emissions are temporary. Regional air quality impacts will need to be quantified and compared to the VCAPCD thresholds.

Source Documents: Ventura County Initial Study Assessment Guidelines, 2010; Ventura County, Air Quality Assessment Guidelines, 2003.

Local Air Quality Impacts. Localized air quality impacts refer to the concentration of dust, odors, carbon monoxide, and toxins present in the ambient air. These emissions will need to be quantified and compared to VCAPCD thresholds to determine impacts. A Best Available Control Technology (BACT) analysis will be needed and offsets may need to be required for the project.

Source Documents: Ventura County Initial Study Assessment Guidelines, 2010; Ventura County, Air Quality Assessment Guidelines, 2003.

Objectionable Odors. Construction of the proposed project would generate odors that are typical of construction activities, such as odors associated with the combustion of fuel, concrete processing, asphalt and coatings. Odors generated during construction would be temporary and are not anticipated to adversely affect nearby sensitive receptors.

Anaerobic decomposition of organic materials can be a source of odor during operation. Though odors rarely cause any physical harm, they remain unpleasant and can lead to public distress generating complaints. The occurrence and severity of odor impacts depend on the nature, frequency and intensity of the source; wind speed and direction; and the sensitivity of receptors (Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011). Sensitive receptors closest to the project site include people passing by the site on the Ventura River Trail, located immediately west of the project site, and a single-family residences located approximately 800 feet southeast and southwest of the site.

Potential odorous substances can be formed in the residual digestate during the anaerobic digestion process. Emissions of these odorous substances can occur at several stages during the process, including loading the digestate for transport, transporting it, unloading the digestate at the composting area, turning of the compost piles during composting, and loading the finished compost for transport from the facility.

A complete odor analysis will be needed to quantify impacts. The primary data required for an odor assessment consists of the composition of the odorous substances formed during the digestion and composting processes, the quantity of these substances released during each part of the process, and the emission release characteristics of each source. Once the source characteristics are quantified, an odor modeling analysis will need to be performed and an air quality dispersion model will need to be used to estimate the dilution requirement for each emission source. The model will produce estimates of 1-hour concentrations and will be adjusted using peak to mean ratios to obtain a dilution ratio representative of a 10-minute averaging period, since the odor threshold is typically assumed to apply for a period of 10 minutes or less. It is anticipated that to avoid a significant impact for odor, exhaust streams will need to be routed to a control device.

Source Documents: Ventura County, Air Quality Assessment Guidelines, 2003; Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011.

2. WATER RESOURCES

Item A - Groundwater Quantity. The proposed project is not anticipated to substantially increase the demand for groundwater in the County. The project would not involve withdrawals of groundwater that would affect groundwater basins or the quantity of groundwater. The proposed project would increase the amount of impervious surface area onsite compared to the existing permeable surfacing onsite. Therefore, the rate of groundwater recharge may incrementally decline compared to existing conditions; however, this would not adversely affect groundwater recharge. Nonetheless, potential impacts to groundwater quantity will need to be further analyzed during the CEQA process.

Item B - Groundwater Quality. Construction of the project would involve activities that could affect the quality of groundwater onsite; however, with implementation of standard Best Management Practices (BMPs) no significant impacts would occur. Currently, the horse manure and bedding that would be used to fuel the facility may be subject to surface water flows, which may percolate into the groundwater and cause adverse impacts. The proposed project would reduce this potential impact by collecting the horse manure and bedding and storing it in the facility where it would not percolate into the groundwater. Adverse effects to groundwater quality could occur as a result of pre-processing, post-processing, and to a lesser extent, digestion operations (Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011). However, disposal of digestate during operation of the project is anticipated to require a Waste Discharge Report (WDR), which will set forth proper disposal methods to avoid adverse impacts to groundwater quality.

Item C - Surface Water Quantity. Due to the increase in impervious surfacing onsite, the rate of surface water runoff during storm events could increase. However, pursuant to Ventura County Stormwater Ordinance No. 4142, the project would be required to incorporate BMPs to address stormwater quantity and increased runoff. Such BMPs may include, but are not limited to, reduced slope grading, drainage through vegetative zones (e.g., bio-swale) and other options to intercept water being conveyed toward drainage, and landscaping to increase filtration and reduce runoff.

Source Documents: Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011; Ventura County Initial Study Assessment Guidelines, July 2010.

Item D - Surface Water Quality. The Ventura River is located approximately 500 feet west of the site. As such, runoff from the site has a relatively short distance to travel before entering the Ventura River. During construction of the project, drainage patterns and runoff could be altered as trenching and grading would temporarily create the potential for increased erosion and siltation. However, the proposed project would be required to be undertaken in accordance with conditions and requirements established by the Ventura Countywide Stormwater Quality Management Program, the National Pollutant Discharge Elimination System (NPDES) Permit No. CAS000002 and Ventura Stormwater Quality Management Ordinance No. 4142. These regulations require the preparation and approval of a Stormwater Pollution Control Plan (SWPCP) prior to issuance of grading permits. The SWPCP would require that BMPs, such as bio-swales, covering exposed earth, proper disposal of trash, maintenance of equipment, be implemented during construction to reduce impacts related to water quality, erosion and siltation during construction.

Currently, the horse manure and bedding that would be used to fuel the facility may be subject to surface water flows, which may cause adversely affect surface water quality. The proposed project would reduce this potential impact by collecting the horse manure and bedding and storing it in the facility where it would not enter surface water flows. Operation of the project would include disposal of digestate, which could affect the quality of surface waters in the vicinity of the site, namely the Ventura River. However, as discussed above under Groundwater Quality, the project would be required to comply with the requirements set forth by the Waste Discharge Reports, which would reduce the potential for digestate to adversely affect surface water quality. In addition, implementation of standard BMPs would reduce impacts to surface water quality. Nevertheless, surface water quality impacts will need to be analyzed further to identify potential impacts and mitigation.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010

3. MINERAL RESOURCES

Item A – Aggregate. Aggregate resources consist of sand, gravel, and crushed rock used in the construction industry. The *Ventura County Zoning Ordinance* includes Mineral Resource Protection (MRP) overlay zones for areas where important mineral resources do or may exist and the extraction of these resources may be a compatible land use. The

location of the proposed project is classified as MRZ-2, which indicates that significant mineral resource deposits exist in the vicinity. However, the project does not have the potential to hamper or preclude future extraction of or access to the aggregate resources; therefore, no impact would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010, and Ventura County General Plan Resources Appendix, 2011

Item B – Petroleum. During construction and operation of the project, petroleum-based fuel would be utilized for the operation of machinery. However, since there are sufficient resources to meet local needs, the project would not adversely affect petroleum resources. Additionally, according to Figure 1.4.7, Petroleum Resources Map of the Ventura County General Plan Resources Appendix, no significant petroleum resources are known to exist on the project site. Therefore, implementation of the project would not have a substantial impact to petroleum resources.

Source Documents: Ventura County Initial Study Assessment Guidelines, July 2010; and Ventura County Resources Appendix, September 2008.

4. BIOLOGICAL RESOURCES

An aECOM Biologist conducted a reconnaissance-level biological survey of the proposed site on September 25, 2012. Dominant plant species observed were documented, as well as wildlife or sign thereof.

The project site appears to have been subjected to past heavy disturbance. Vegetation on the site is comprised primarily of non-native, ruderal (weedy) vegetation, including castor bean (*Ricinis communis*), Bermuda grass (*Cynodon dactylon*), Russian thistle (*Salsola* sp.), fennel (*Foeniculum vulgare*), mustard (*Brassica* sp.), and non-native annual grasses. Ruderal native species are also present on the site, such as western ragweed (*Ambrosia psilotachyia*) and horseweed (*Conyza canadensis*). Other scattered native vegetation occurs on the site, primarily in its southwest portion. These species include several coyote brush shrubs (*Baccharis pilularis*) and one sprawling California blackberry (*Rubus ursinus*).

Wildlife was not observed on the site during the survey. However, numerous scats, likely coyote (Canis latrans), and a few small burrows (1-2 inches in diameter) were observed. Based on the level of disturbance on the site and lack of native habitat, it is unlikely that the site is permanently inhabited by sensitive species. The burrows described above are likely occupied by common small mammals or reptiles. However, due to the proximity of the site to the Ventura River, which functions as a wildlife movement corridor, it is possible that one or more special-status species may occur on the site as a transient. A more thorough analysis of biological resources would be needed to assess potential impacts.

Source Documents: Ventura County Initial Study Assessment Guidelines, July 2010

5. AGRICULTURAL RESOURCES

Item A – Soils. The project site is located within the County of Ventura, which currently has an estimated 318,166 acres of agricultural land (California Department of Conservation, Important Farmland Mapping and Monitoring Program Report, 2008), of which approximately 122,492 acres are designated as "important farmlands." The project site is not designated as unique or important farmland. No impact would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010; Ventura County General Plan Resources Appendix, 2011; California Department of Conservation, Ventura County Important Farmland Map, 2008.

Item B - Land Use Incompatibility. Analysis of land use incompatibility with agricultural operations is based on the distance between new non-agricultural structures or uses and any common lot boundary line adjacent to off-site classified farmland. The project site is not adjacent to agricultural operations. In addition, the project would not include a land use that would cause incompatible land uses adjacent to lands in agricultural production. Therefore, no adverse effects would occur with regard to land use compatibility with agricultural resources.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

6. SCENIC RESOURCES

Scenic Highway. Highway 33, which is approximately 350 feet east of the project site, is potentially eligible for designation as a scenic highway. While this highway is potentially eligible as a scenic highway, it has not been so designated. In addition, the biodigester would be compatible with the existing surrounding land uses, such as the adjacent Ventura Avenue Water Treatment Plant, and would not substantially affect views from Highway 33.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Scenic Area/Feature. The project site would include construction of a biodigester on a currently vacant site south of the Ventura Avenue Water Treatment Plant. The biodigester facility would be compatible with existing land uses and would not substantially alter the visual character of the project site. Nonetheless, an analysis of visual resources pursuant to the Ventura County Initial Study Guidelines Section 6 should be conducted. This analysis should include identification of potential scenic resources in the vicinity of the project site and potential public viewpoints, such as State Route 33, Ventura Avenue, and the Ventura River Trail.

Source Documents: Ventura County Initial Study Assessment Guidelines, July 2010.

7. PALEONTOLOGICAL RESOURCES

During project construction, excavation and/or trenching activities could uncover paleontological resources. A paleontological assessment based on the type of soils underlying the site would need to be performed to determine the likelihood for paleontological resources to occur onsite. If it is determined that underlying soils have a high likelihood of containing paleontological resources and substantial excavation and/or

trenching would be needed, then mitigation may be required. Typically, mitigation would involve monitoring of excavation and trenching activities by a qualified paleontologist.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

8. CULTURAL RESOURCES

Item A – Archaeological Resources. Due to known Chumash settlements along the Ventura River, the potential to encounter previously undiscovered archaeological resources exists in the project site area. An assessment of potential archaeological resources would need to be performed. A standard mitigation measure to reduce impacts to unknown archeological resources during construction is to temporarily halt ground disturbing work in the vicinity of a find until an archaeologist has evaluated the nature and significance of the find. Work in the area would resume after the archeologist and County of Ventura determine that the find has been appropriately handled.

Source Documents: Ventura County Initial Study Assessment Guidelines, July 2010.

Item B – Historical Resources. The proposed project would be located on vacant land and would not involve impacts to any structures. Therefore, no impact to historic resources would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

9. COASTAL BEACHES & SAND DUNES

The project site is not located within the Coastal Zone of the County's *Local Coastal Program*. Therefore, no impact to the coastal beaches and sand dunes would occur.

Source Document: Ventura County Local Coastal Plan; Ventura County Initial Study Assessment Guidelines, July 2010.

HAZARDS

10. FAULT RUPTURE

Pursuant to the Earthquake Fault Hazards Zone Map (Figure 2.2.3b) in the County of Ventura General Plan Hazards Appendix, the project site is not located within a fault hazard zone. In addition, the project site is not located within an Alquist-Priolo zone according to the California Department of Conservation Ventura Quadrangle Hazards Map (1978). The proposed biodigester facility would be required to comply with the most recent County of Ventura, California, and Uniform Building Codes.

Source Documents: California Department of Conservation Ventura Quadrangle Hazards Map (1978); County of Ventura General Plan Hazards Appendix, November 2005.

11. GROUND SHAKING

The proposed project is located in a seismically active region and would be subject to moderate to strong ground shaking from seismic events on local and regional fault systems. However, the proposed biodigester facility would be required to comply with the most recent County of Ventura, California, and Uniform Building Codes. Implementation of these standards would reduce potential ground shaking effects to a less than significant level.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010; Ventura County Building and Safety Division, Ventura County Building Code, 2007.

12. LIQUEFACTION

Liquefaction is the phenomenon whereby strong, cyclic ground motions during an earthquake transform a soil mass from a solid to a liquid state. The occurrence of liquefaction is strongly dependent upon the strength and duration of ground shaking, the depth to saturated soil, and local soil properties. The project site is located in a liquefaction hazard zone as delineated by the State of California Seismic Hazard Zone Map (2000). However, the facility would be engineered pursuant to the requirements of the County's Building and Safety Division. Engineering techniques commonly used for projects located in liquefiable soils include excavation and removal or recompaction of potentially liquefiable soils; and/or in-situ ground densification (e.g., compaction with vibratory probes, dynamic consolidation, compaction piles, compaction grouting); Mandatory compliance with applicable construction and design standards would reduce impacts to below a level of significance.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010; State of California, Division of Mines and Geology, Seismic Hazards Zones Map, Moorpark Quadrangle, 2000.

13. SEICHE AND TSUNAMI

Pursuant to the Countywide General Plan, Hazards Appendix, Figure 2.6, the project site is not located in a Tsunami Zone or a Seiche Zone. Therefore, no impact related to tsunamis and seiches would occur.

Source Document: County of Ventura General Plan Hazards Appendix, November 2005.

14. LANDSLIDE/MUDSLIDE

Landslide/mudflow hazards generally exist in and at the base of hillside terrain where channel erosion, weathering and tectonic movement have caused unstable conditions. The project site is not located within an area identified on figures 2.7.1 and 2.7.2 of Ventura County's General Plan Hazards Appendix which identify landslide hazard areas. Therefore, no impact related to landslide or mudslides would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010; Ventura County General Plan Hazards Appendix, November 2005.

15. EXPANSIVE SOILS

Expansive soils are primarily clay-rich soils subject to changes in volume with changes in moisture content. The resultant shrinking and swelling of soils can influence all fixed structures, utilities and roadways. Pursuant to Ventura County's Guidelines, expansive soil hazards are assessed within the existing regulatory framework of both the Public Works Agency and the Building and Safety Departments. Mandatory compliance with the regulations of these entities would reduce potential expansive soil impacts to a less than significant level.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

16. SUBSIDENCE

Subsidence is a general term for the slow, long-term regional lowering of the ground surface with respect to sea level. It can be caused by natural forces such as the consolidation of recently deposited sediments or by man-induced changes such as the withdrawal of oil field fluids or the dewatering of an aquifer. The project site is not located within the subsidence zone identified on Figure 2.8 of Ventura County's General Plan Hazards Appendix. Per standard building requirements, the nature of the soils will be taken into consideration for the design of the facility.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010; Ventura County General Plan Hazards Appendix, November 2005.

17. HYDRAULIC HAZARDS

Hydraulic hazards, in the context of flood control and drainage, consist of the wearing away or deposition of land surface by wind or water. Erosion occurs naturally from weather or runoff but can be intensified by land clearing practices.

Flooding is an overflow of water onto land that is normally dry. Flooding is a general and temporary condition of partial or complete inundation of normally dry land areas from the overflow of inland or tidal waters; the unusual and rapid accumulation of runoff of surface waters from any source, and the condition resulting from flood-related erosion. Flood hazard is determined as being public and private lands and infrastructure that have a high risk of being damaged or destroyed as a result of major flooding conditions.

Item A – Non-FEMA. During construction of the project, absorption rates, drainage patterns and runoff would be altered as trenching and grading would temporarily create the potential for increased erosion and siltation. However, the project would be required to be undertaken in accordance with conditions and requirements established by the Ventura Countywide Stormwater Quality Management Program, the National Pollutant Discharge Elimination System (NPDES) Permit No. CAS000002, and Ventura Stormwater Quality Management Ordinance No. 4142. These regulations require the preparation and approval of a Stormwater Pollution Control Plan (SWPCP) prior to issuance of grading/building permits. The SWPCP would require that BMPs be implemented during construction to reduce impacts related to water quality, erosion and siltation during construction. Examples of BMPs that may be implemented during construction include: the use of

geotextiles and mats, temporary drains and swales, silt fences and sediments traps. The required implementation of the aforementioned programs would reduce impacts to a less than significant level.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item B – FEMA. The project site is located within Flood Zone X (outside of the 100-year flood zone) with the exception of a small portion of the southeast corner of the site located in Zone A, which is inside the 100-year flood zone (FIMA, FIRM Map Panel Number 06111C0733E, 2010). Impacts related to flooding should not be significant, especially if the project is designed to avoid the mapped Zone A flood zone. However, due to the proximity of the site to the Ventura River, a more detailed hydraulic condition analysis should be considered during engineering of the project.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

18. FIRE HAZARDS

The proposed project would involve construction of a biodigester facility. This facility would not increase fire hazards in the area or require additional fire protection services beyond existing conditions. Impacts would be less than significant.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

19. AVIATION HAZARDS

The nearest airport is the Oxnard Airport, located approximately 16 miles to the southeast of the project site. No impact to air traffic safety would occur.

Source Document: Ventura County General Plan and the Ventura County Initial Study Assessment Guidelines, July 2010.

20. HAZARDOUS MATERIALS / WASTE

Item A - Hazardous Materials. The proposed biodigester would involve the delivery and handling of biological wastes, which would be classified as hazardous. An analysis of hazardous waste associated with the biodigester should be conducted. The analysis should identify proper handling, storage and disposal of hazardous materials.

Source Document: County of Ventura Initial Study Assessment Guidelines, July 2010.

Item B - Hazardous Waste. The project site is currently vacant and located immediately west of the North Ventura Avenue and Highway 33, south of the Ventura Avenue Water Treatment Facility, and east of the Ventura River. The project site is located in an area where oil extraction and processing occurs and historically occurred at a higher intensity. Therefore, due to the surrounding uses, as well as current and past oil extraction and processing in the project areas, the project site could potentially contain hazardous materials. It is recommended that an investigation of potential hazardous materials be conducted prior to construction to determine if site remediation would be necessary.

Source Document: County of Ventura Initial Study Assessment Guidelines, July 2010.

21. NOISE / VIBRATION

The noise sensitive receptors closest to the project site are the residences located approximately 800 feet southeast of the site across Highway 33 and the residence located about 800 feet southwest of the project site on the opposite side of the Ventura River.

During construction, sensitive receptors would be exposed to noise from equipment, loading, truck trips, and worker trips. Operational activities associated with the project that would generate noise include pre-processing, vehicle circulation, and the operation of certain mechanical equipment such as stationary pumps, motors, compressors, fans, generators, and other equipment.

Pre-processing activities include noise generating steps such as sorting and grinding. The amount of pre-processing equipment differs from facility to facility; furthermore, pre-processing activities could occur prior to delivery to the AD facility, thus eliminating pre-processing noise at these locations. Some equipment such as electrical generators operates 24-hours a day, creating operational noise during night time hours. (Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011).

Because the closest noise sensitive receptors are located 800 feet or more from the site, it is unlikely that noise during construction or operation of the project would affect ambient noise levels for those sensitive receptors. However, for noise generators, the County of Ventura Initial Study Assessment Guidelines recommends the following to determine impacts:

Estimate Potential Noise Impact - If the project is a noise-generator, it will be necessary to determine:

- The noise-generating equipment‘s and activities‘ estimated noise levels and the times at which the noise levels would occur; and,
- The proximity of the noise-generating equipment to the noise-sensitive uses using the project plans, information gathered during a site visit, aerial imagery, and land use maps that are available from the Resource Management Agency, GIS Development and Mapping Services Division.

Although adverse impacts are not anticipated, it is recommended that a more detailed noise analysis be conducted to determine estimated noise levels from the equipment and the proximity of equipment to noise sensitive uses.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

22. DAYTIME GLARE

Glare is the continuous or periodic intense light that may cause eye discomfort or be blinding to humans. Glare and lighting impacts are typically associated with development from structures that would add new lighting in an area or create reflective surfaces. The project would involve a new building and equipment that would increase the number of surfaces producing glare in the area. However, glare from the proposed facility would not substantially increase glare as it is expected that building surfaces

would generally have a finish with low reflectivity. Therefore, nearby sensitive receptors would not be adversely affected by glare from the proposed facility.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

23. PUBLIC HEALTH

The biodigester project would involve hazardous materials onsite that could adversely affect public health if not properly handled and disposed. A plan for handling and disposing of hazardous waste would be required. In addition, air emissions generated during construction and operation would need to be considered from a public health perspective. Impacts related to public health would likely be less than significant with implementation of a hazardous waste safety plan and other required safety and control measures, such as scrubbing the hydrogen sulfide (H2S) contained in the biogas before emission to air can occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

24. GREENHOUSE GAS EMISSIONS

Gases that absorb and re-emit infrared radiation in the atmosphere are called greenhouse gases (GHG). Common GHGs include water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxides (N2Ox), fluorinated gases, and ozone. GHG are emitted by both natural processes and human activities. The project would generate GHGs from energy use and vehicle trips to and from the site. However, it is anticipated that the renewable energy generated by the proposed project would result in an overall net decrease in GHGs by displacing GHGs generated by energy created by fossil fuel (i.e., gas and coal) and by reducing the energy needed to process/accommodate organic solid waste in landfills. Nonetheless, it is recommended that GHG emissions be quantified and compared to thresholds to determine impacts.

Source Documents: Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011; Ventura County Initial Study Assessment Guidelines, July 2010.

Energy Resources. Construction of the proposed project would consume energy. As identified in the Ventura County Guidelines, “no individual project is considered as having a significant impact because solar, wind and hydraulic energy sources are renewable, and petroleum resources are covered separately.” Moreover, although project construction would consume energy, the project would be expected to reduce energy use in the long term because it would generate renewable energy. Therefore, the project would create an overall beneficial impact to energy resources.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

LAND USE

25. COMMUNITY CHARACTER

The site is zoned Industrial by the North Ventura Avenue Area Plan. The Industrial designation allows the development of oil related manufacturing, light manufacturing, and open storage facilities. It is anticipated that the project would be compatible with the Industrial zoning designation. The project site area is characterized by a mix of industrial, agricultural, and residential uses. The Ventura Avenue Water Treatment Plant is immediately north of the project site and the Ojai Valley Sanitary District Waste Water Treatment Plant is immediately northwest of the site. Therefore, the proposed biodigester would be compatible with the surrounding industrial uses. In addition, the project would not disrupt or divide the existing physical arrangement of the surrounding community. Impacts would be less than significant.

26. HOUSING

The project would involve construction of a biodigester on a currently vacant site. As such, the proposed project would not add or remove housing. No impact to the housing stock in the area is anticipated.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

PUBLIC FACILITIES/SERVICES

27. TRANSPORTATION/CIRCULATION

Items A - Roads & Highways (1) Level of Service; (2) Safety/Design of Public Roads; (3) Safety/Design of Private Access; and (4) Tactical Access. The proposed project would involve construction of a biodigester on a currently vacant site off of Ventura Avenue in the County of Ventura.

During construction of the project, traffic on Ventura Avenue, Highway 33, and other surrounding roads may incrementally increase compared to existing conditions. Vehicles using the roads during construction would include trucks as well as vehicles used by workers commuting to and from the site. It is estimated that approximately 14 workers would be onsite during construction. The incremental increase in trips associated with construction workers commuting and the delivery of materials and equipment would not substantially adversely affect the local or regional circulation system. In addition, impacts during construction would be temporary and would not be anticipated to adversely impact surrounding roads or highways. Construction would not be anticipated to occur on or near any private roads; therefore, impacts to private access would not occur.

During operation of the project, an incremental increase in trips would be anticipated for maintenance of the facility. However, this incremental increase would not generate trips that would adversely affect roads or highways in the vicinity of the project site.

Source Documents: Ventura County Initial Study Assessment Guidelines, July 2010.

Item B - Pedestrian/ Bicycle. The Ventura River Trail is a public pedestrian and bicycle trail that runs along the western side of the project site. The proposed project would involve construction of a biodigester facility on vacant land. The project would not interfere with existing or proposed pedestrian or bicycle facilities. No impact is anticipated.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item C - Bus Transit. The project would not generate an increase in demand for bus transit or affect existing bus facilities. Therefore, no impact to bus transit would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item D – Railroads. The project site is not on or near a railroad; therefore, it would not interfere with existing or proposed railroad operations. No impact would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item E – Airports. The nearest airport is the Oxnard Airport, located approximately 16 miles to the southeast of the project site. The proposed project would not result in impacts to compatibility of airport land uses.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item F – Harbors. The nearest harbor is the Ventura Harbor, located approximately six miles south of the project site. Since the project site is not located near a harbor, no impact would occur with respect to harbor activities.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item G – Pipelines. The nearby water treatment and wastewater treatment facilities each have underground pipeline conveyance infrastructure. The exact location of pipelines will need to be determined during the planning stage of the project. In the event that pipelines are located within the project site, the pipelines would need to be avoided or relocated to accommodate the project. The County Planning GIS Maps will need to be reviewed by project engineers. No impact to pipelines would occur.

Source Document: Planning GIS – Pipelines Layer

28. WATER SUPPLY

Item A – Quality. Please refer to the discussion of groundwater and surface water quality above under Water Resources. With implementation of BMPs, the project would not adversely affect the quality of water supply.

Source Documents: Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011; Ventura County Initial Study Assessment Guidelines, July 2010.

Item B – Quantity. Please refer to the discussion of groundwater and surface water quantity above under Water Resources. The volume of water required to operate biodigester facilities, including pre-processing, digestion, and post- processing, varies depending upon the anaerobic digester and digester feedstock's characteristics

(Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011). According to the Statewide Anaerobic Digester Facilities Final Impact Report, the amount of water required is primarily a function of the type of feedstock used and the capacity of the digester. In addition, water may be required for post-processing liquid wastes. Because of the variables, a more detailed analysis of the water required for the facility is recommended.

Source Documents: Statewide Anaerobic Digester Facilities Final Program Environmental Impact Report, June 2011; Ventura County Initial Study Assessment Guidelines, July 2010.

Item C - Fire Flow. The proposed project would be located on a site that is currently vacant. The proposed digester facility would be required to pass inspection from the Ventura County Fire Protection District prior to construction. Fire flow would be required to meet the Fire Protection District's standards. No impact would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

29. WASTE TREATMENT / DISPOSAL

Item A - Individual Sewage Disposal System and Item B - Sewage Collection/Treatment Facilities. The proposed project would connect to the existing sewer system. It is anticipated that the incremental increase in sewage generated by employees of the facility would not significantly affect sewage conveyance or treatment infrastructure.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item C - Solid Waste Management. Solid waste would be generated during construction of the project and transported to area landfills. The project would not generate a substantial amount of solid waste. The project would not affect the County's ability to meet required disposal diversion. No impact would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item D - Solid Waste Facilities. The proposed digester would be fueled by organic waste that is delivered to the site. Some of the organic solid waste delivered to the site may otherwise have been delivered to a solid waste facility. Therefore, it is anticipated that the project would incrementally reduce the throughput of solid waste facilities in the area.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

30. UTILITIES

Electric. The proposed project would require electricity to operate the biodigester. It is anticipated that the electricity generated by the biodigester would provide the electricity to the facility. Surplus energy could be exported to the grid or other County facilities, thereby, resulting in a beneficial impact.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Gas. The proposed project would not use a substantial amount of natural gas. Depending on the design of the facility, natural gas may not be needed if the biogas and electricity generated onsite meet the facility's energy needs. The energy generated by the proposed facility could incrementally reduce the demand for gas, thereby, resulting in a potentially beneficial impact.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Communications. The proposed project would not adversely affect existing communications service. Therefore, no impact would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

31. FLOOD CONTROL/DRAINAGE

Item A - WPD Facilities/Watercourses. Flood control impacts are discussed in Section 17, *Hydraulic Hazards*, Item B. The project site is located within Flood Zone X (outside of the 100-year flood zone) with the exception of a small portion of the southeast corner of the site located in Zone A, which is inside the 100-year flood zone (FIMA, FIRM Map Panel Number 06111C0733E, 2010).

It is anticipated that the project could be designed to avoid the mapped flood zone. Therefore, impacts related to flooding are not considered a significant issue. However, due to the proximity of the site to the Ventura River, a more detailed hydraulic condition analysis should be considered during engineering of the project.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item B - Other Facilities/Watercourses. The project would not be expected to result in changes to the flood levels on neighboring properties and would not expose other facilities to flooding. In addition, the project would not increase the capacity of watercourses. Nonetheless, a more detailed hydraulic condition analysis should be considered during engineering of the project.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

32. LAW ENFORCEMENT/EMERGENCY SERVICE

Law enforcement and emergency services for the project site are provided by the Ventura County Sheriff's Department. The proposed project would involve construction of a biodigester facility, which would not generate additional calls for service in the County. Therefore, no significant impact to law enforcement resources would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

33. FIRE PROTECTION

Item A Distance/Response Time and Item B Personnel/Equipment Facilities. Fire protection services in the project site vicinity are provided by the Ventura County Fire Department (VCFD). The facility would be constructed to the most recent California Building Code standards. The project may incrementally increase the demand for fire

protection services by developing a site that is currently vacant. However, no significant impact to fire protection services would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

34. EDUCATION

Item A – Schools. The proposed biodigester facility would not generate an increase in population or school age children that would attend nearby schools. Therefore, no impact to school facilities would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Item B – Libraries. The proposed biodigester facility would not generate an increase in population. As such, there would be no increase in the demand for library resources and no impact would occur.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

35. RECREATION

Local Parks/Facilities. The proposed project would not generate an increase in population. As such, there would be no increase in the demand for local parks or facilities. Additionally, because there is no local park or facility on the project site, the project would not directly affect any local parks or facilities.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Regional Parks/Facilities. The proposed project would not generate an increase in population. As such, there would be no increase in the demand for regional parks or facilities. Additionally, because there is no regional park or facility on the project site, the project would not directly affect any regional parks or facilities.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010.

Regional Trails/Corridors. The project would be constructed on vacant land. No regional trails or corridors are located on the project site. The Ventura River Trail runs along the western side of the project site, but would not be affected by implementation of the project.

Source Document: Ventura County Initial Study Assessment Guidelines, July 2010;

SECTION C
MANDATORY FINDINGS OF SIGNIFICANCE

PROJECT: Ventura River Watershed Biodigester Project

APPLICANT: [For Feasibility Study purposes only, the Ventura County Watershed Protection District is shown as the applicant. A final decision on who the project applicant will be or whether there will be a project is yet to be determined.]

LOCATION: North Ventura Avenue, Ventura County

D.	MANDATORY FINDINGS OF SIGNIFICANCE Based on the information contained within Sections B and C:	YES/ MAYBE	NO
	1. 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?	X	
	2. Does the project have the potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment is one that occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future).	X	
	3. 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 effect of other current projects, and the effect of probable future projects. (Several projects may have relatively small individual impacts on two or more resources, but the total of those impacts on the environment is significant).	X	
	4. Does the project have environmental effects that will cause substantial adverse effects on human beings, either directly or indirectly?	X	

SECTION D
DETERMINATION OF ENVIRONMENTAL DOCUMENT

PROJECT: Ventura River Watershed Biodigester Project

APPLICANT: [For Feasibility Study purposes only, the Ventura County Watershed Protection District is shown as the applicant. A final decision on who the project applicant will be or whether there will be a project is yet to be determined.]

LOCATION: North Ventura Avenue, Ventura County

E.	DETERMINATION OF ENVIRONMENTAL DOCUMENT	
	On the basis of this initial evaluation:	
	☐	I find the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION should 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 the mitigation measure(s) described in section B of the Initial Study will be applied to the project. A **Mitigated Negative Declaration** should be prepared.
	☐	I find the proposed project, individually and/or cumulatively, 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.

_____ _____

NAME **Date**

County of Ventura Public Works Agency
Watershed Protection District

Appendix E
Financial Analysis

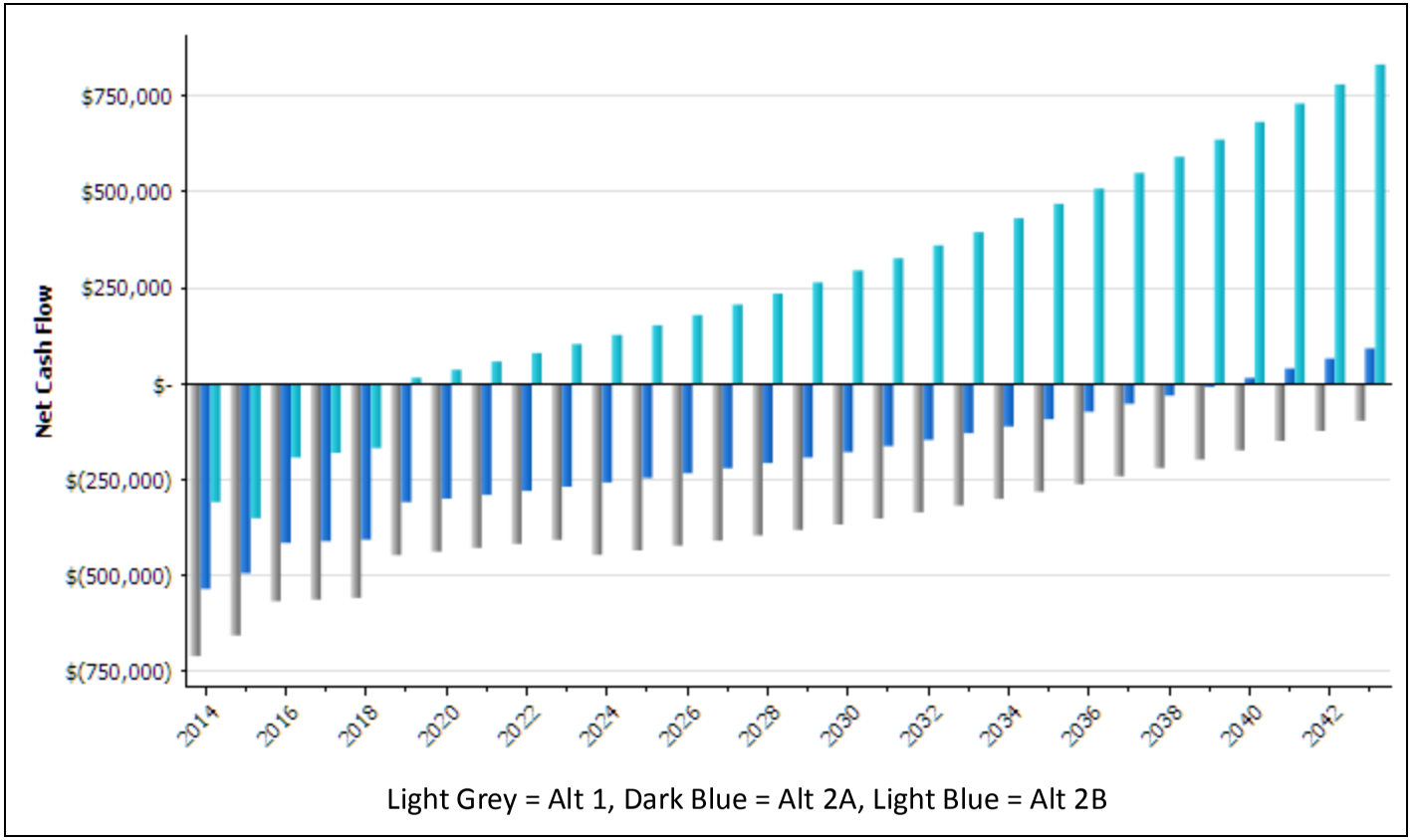
Ventura River Watershed
Biodigester
Financial Analysis

February, 2013

Net Cash Flow

	Alt 1			Alt 2A			Alt 2B		
	Costs	Revenues	Net	Costs	Revenues	Net	Costs	Revenues	Net
2013	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2014	$ (948,228)	$ 237,250	$ (710,978)	$ (759,311)	$ 223,896	$ (535,415)	$ (853,601)	$ 544,689	$ (308,912)
2015	$ (1,054,908)	$ 397,600	$ (657,308)	$ (865,991)	$ 370,892	$ (495,099)	$ (865,991)	$ 514,861	$ (351,130)
2016	$ (1,161,649)	$ 594,019	$ (567,630)	$ (972,732)	$ 557,015	$ (415,717)	$ (972,732)	$ 779,830	$ (192,902)
2017	$ (1,178,209)	$ 614,882	$ (563,326)	$ (989,291)	$ 577,878	$ (411,413)	$ (989,291)	$ 808,491	$ (180,800)
2018	$ (1,195,348)	$ 636,552	$ (558,796)	$ (1,006,431)	$ 599,548	$ (406,883)	$ (1,006,431)	$ 838,233	$ (168,198)
2019	$ (1,311,321)	$ 863,611	$ (447,710)	$ (1,122,403)	$ 813,253	$ (309,151)	$ (1,122,403)	$ 1,137,491	$ 15,088
2020	$ (1,333,119)	$ 894,720	$ (438,399)	$ (1,144,202)	$ 844,362	$ (299,839)	$ (1,144,202)	$ 1,179,949	$ 35,747
2021	$ (1,355,680)	$ 927,037	$ (428,642)	$ (1,166,763)	$ 876,679	$ (290,083)	$ (1,166,763)	$ 1,224,012	$ 57,249
2022	$ (1,379,030)	$ 960,610	$ (418,421)	$ (1,190,113)	$ 910,252	$ (279,861)	$ (1,190,113)	$ 1,269,741	$ 79,628
2023	$ (1,403,198)	$ 995,488	$ (407,711)	$ (1,214,281)	$ 945,130	$ (269,152)	$ (1,214,281)	$ 1,317,201	$ 102,919
2024	$ (1,428,212)	$ 981,364	$ (446,848)	$ (1,239,295)	$ 981,364	$ (257,931)	$ (1,239,295)	$ 1,366,457	$ 127,162
2025	$ (1,454,102)	$ 1,019,008	$ (435,093)	$ (1,265,184)	$ 1,019,008	$ (246,176)	$ (1,265,184)	$ 1,417,580	$ 152,396
2026	$ (1,480,897)	$ 1,058,119	$ (422,778)	$ (1,291,980)	$ 1,058,119	$ (233,861)	$ (1,291,980)	$ 1,470,640	$ 178,661
2027	$ (1,508,630)	$ 1,098,753	$ (409,877)	$ (1,319,713)	$ 1,098,753	$ (220,960)	$ (1,319,713)	$ 1,525,713	$ 206,000
2028	$ (1,537,334)	$ 1,140,971	$ (396,363)	$ (1,348,417)	$ 1,140,971	$ (207,446)	$ (1,348,417)	$ 1,582,875	$ 234,458
2029	$ (1,567,043)	$ 1,184,837	$ (382,206)	$ (1,378,125)	$ 1,184,837	$ (193,289)	$ (1,378,125)	$ 1,642,207	$ 264,081
2030	$ (1,597,791)	$ 1,230,414	$ (367,377)	$ (1,408,874)	$ 1,230,414	$ (178,460)	$ (1,408,874)	$ 1,703,792	$ 294,918
2031	$ (1,629,616)	$ 1,277,772	$ (351,844)	$ (1,440,698)	$ 1,277,772	$ (162,927)	$ (1,440,698)	$ 1,767,718	$ 327,020
2032	$ (1,662,554)	$ 1,326,980	$ (335,574)	$ (1,473,637)	$ 1,326,980	$ (146,657)	$ (1,473,637)	$ 1,834,075	$ 360,438
2033	$ (1,696,645)	$ 1,378,112	$ (318,533)	$ (1,507,728)	$ 1,378,112	$ (129,616)	$ (1,507,728)	$ 1,902,955	$ 395,227
2034	$ (1,731,930)	$ 1,431,246	$ (300,684)	$ (1,543,013)	$ 1,431,246	$ (111,767)	$ (1,543,013)	$ 1,974,458	$ 431,445
2035	$ (1,768,449)	$ 1,486,459	$ (281,990)	$ (1,579,532)	$ 1,486,459	$ (93,073)	$ (1,579,532)	$ 2,048,684	$ 469,152
2036	$ (1,806,247)	$ 1,543,835	$ (262,412)	$ (1,617,330)	$ 1,543,835	$ (73,495)	$ (1,617,330)	$ 2,125,738	$ 508,408
2037	$ (1,845,367)	$ 1,603,460	$ (241,907)	$ (1,656,450)	$ 1,603,460	$ (52,990)	$ (1,656,450)	$ 2,205,729	$ 549,279
2038	$ (1,885,857)	$ 1,665,423	$ (220,434)	$ (1,696,940)	$ 1,665,423	$ (31,516)	$ (1,696,940)	$ 2,288,772	$ 591,832
2039	$ (1,927,764)	$ 1,729,818	$ (197,945)	$ (1,738,847)	$ 1,729,818	$ (9,028)	$ (1,738,847)	$ 2,374,984	$ 636,138
2040	$ (1,971,137)	$ 1,796,742	$ (174,395)	$ (1,782,220)	$ 1,796,742	$ 14,522	$ (1,782,220)	$ 2,464,489	$ 682,268
2041	$ (2,016,029)	$ 1,866,295	$ (149,734)	$ (1,827,112)	$ 1,866,295	$ 39,183	$ (1,827,112)	$ 2,557,413	$ 730,301
2042	$ (2,062,492)	$ 1,938,583	$ (123,910)	$ (1,873,575)	$ 1,938,583	$ 65,008	$ (1,873,575)	$ 2,653,889	$ 780,315
2043	$ (2,110,581)	$ 2,013,714	$ (96,868)	$ (1,921,664)	$ 2,013,714	$ 92,050	$ (1,921,664)	$ 2,754,056	$ 832,392
2044	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2045	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2046	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2047	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2048	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2049	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
2050	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Sum of Y $^{\Sigma}$	$ (47,009,367)	$ 35,893,673	$ (11,115,694)	$ (41,341,850)	$ 35,490,809	$ (5,851,042)	$ (41,436,140)	$ 49,276,721	$ 7,840,581

Net Cash Flow



Alternative 1 – *Private Ownership, Operation and Financing*

Capital Cost Assumptions

		Total $
Base Costs	Sub Total Base Costs	$ 5,127,000
CBI Costs	Contingency	$ 1,281,750
	Bonds & Insurance	$ 102,540
	Sub Total CBI	$ 1,384,290
Sub Total Construction		$ 6,511,290
EAEL Costs	Design and Construction	$ 976,694
	Administration	$ 325,565
	Environmental Permitting	$ 325,565
	Land Acquisition	$ 500,000
	Sub Total EAELA	$ 2,127,823
Total Capx		$ 8,639,113

Capital Financing Assumptions

	Alternative 1	Alternative 2	Alternative 2b
Start Date	2014	2014	2014
Period (yrs)	30	30	30
Borrowing Rate	6.89%	4.00%	4.00%

O&M Assumptions

Inservice Date		2014
Base Throughput (tons)		10,700
Base O&M	Annual Fees	$ 23,000
	Repair and Maintenance	$ 100,000
	Personnel	$ 84,000
	Consumables	$ 120,000
	Leasing Machinery	$ 27,000
	Sum of O&M	$ 354,000
Base O&M Cost per Ton		$ 33.08
Escalation	O&M	3.50%

Tonnage Input Assumptions

	Alternative 1	Alternative 2a	Alternative 2b
Years 0 to 1	5,000	5,000	10,700
Years 1 to 2	10,700	10,700	10,700
Years 2 to 5	16,000	16,000	16,000
Years 5 to 30	21,000	21,000	21,000

Discount Factor

Factor	1.10%

Performance Metrics

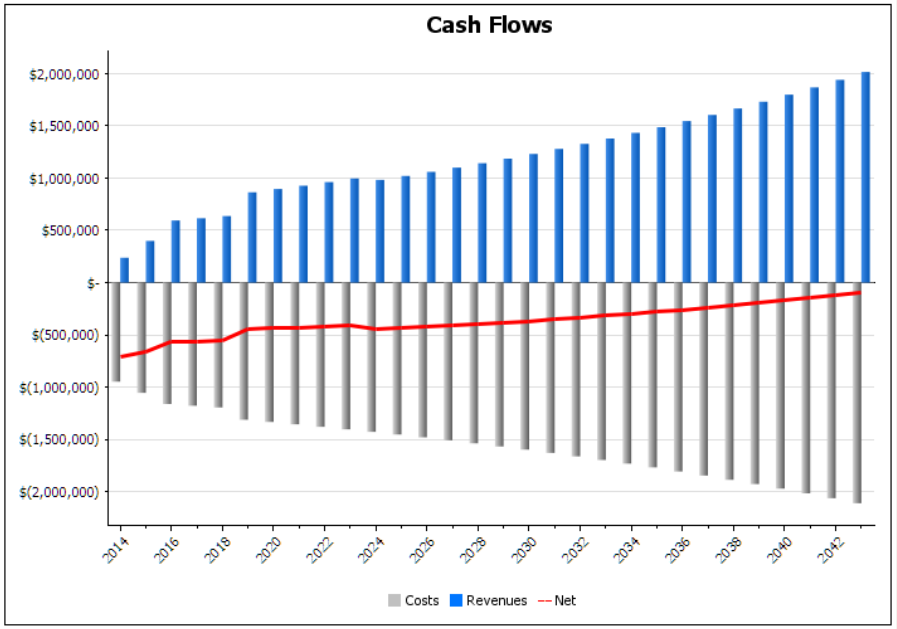
	Net Cash Flow	Discounted Cash Flow
Net Present Value	$ (9,877,303)	$ (8,841,874)
Internal Rate of Return	#NUM!	#NUM!

Revenue Assumptions

		Alternative 1	Alternative 2a	Alternative 2b
Feedstock Input	Tipping Fee ($/ton)	$ 22	$ 22	$ 35
	Tipping Fee Escalation	3.50%	3.50%	3.50%
Electricity Output	Base ($/kwh)	$ 0.092740	$ 0.092740	$ 0.092740
	Base Rate Escalation	4.50%	4.50%	4.50%
	PTC ($/kwh)	$ 0.022000		
	PTC Term (yrs)	10		
	SGIP ($/kw)	500	500	500
	SGIP Term (yrs)	5	5	5

Kwh Output Assumptions

	Alternative 1	Alternative 2a	Alternative 2b
Years 0 to 1	607,000	607,000	1,214,000
Years 1 to 2	1,214,000	1,214,000	1,214,000
Years 2 to 5	1,682,000	1,682,000	1,682,000
Years 5 to 30	2,289,000	2,289,000	2,289,000



Alternative 2A – *Public Private Partnership with Public Financing*

Capital Cost Assumptions

		Total $
Base Costs	Sub Total Base Costs Σ	$ 5,127,000
CBI Costs	Contingency	$ 1,281,750
	Bonds & Insurance	$ 102,540
	Sub Total CBI Σ	$ 1,384,290
Sub Total Construction Σ		$ 6,511,290
EAEL Costs	Design and Construction	$ 976,694
	Administration	$ 325,565
	Environmental Permitting	$ 325,565
	Land Acquisition	$ 500,000
	Sub Total EAELA Σ	$ 2,127,823
Total Capx Σ		$ 8,639,113

Capital Financing Assumptions

	Alternative 1	Alternative 2	Alternative 2b
Start Date	2014	2014	2014
Period (yrs)	30	30	30
Borrowing Rate	6.89%	4.00%	4.00%

O&M Assumptions

Inservice Date		2014
Base Throughput (tons)		10,700
Base O&M	Annual Fees	$ 23,000
	Repair and Maintenance	$ 100,000
	Personnel	$ 84,000
	Consumables	$ 120,000
	Leasing Machinery	$ 27,000
	Sum of O&M Σ	$ 354,000
Base O&M Cost per Ton		$ 33.08
Escalation	O&M	3.50%

Tonnage Input Assumptions

	Alternative 1	Alternative 2a	Alternative 2b
Years 0 to 1	5,000	5,000	10,700
Years 1 to 2	10,700	10,700	10,700
Years 2 to 5	16,000	16,000	16,000
Years 5 to 30	21,000	21,000	21,000

Discount Factor

Factor	1.10%

Performance Metrics

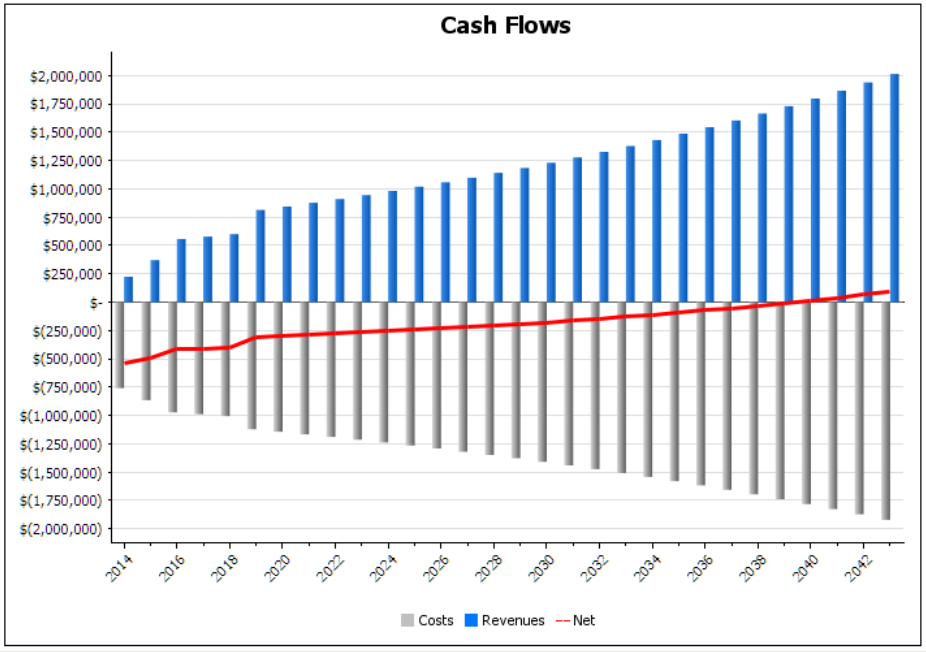
	Net Cash Flow	Discounted Cash Flow
Net Present Value	$ (5,399,888)	$ (5,000,309)
Internal Rate of Return	-19.9%	-20.7%

Revenue Assumptions

		Alternative 1	Alternative 2a	Alternative 2b
Feedstock Input	Tipping Fee ($/ton)	$ 22	$ 22	$ 35
	Tipping Fee Escalation	3.50%	3.50%	3.50%
Electricity Output	Base ($/kwh)	$ 0.092740	$ 0.092740	$ 0.092740
	Base Rate Escalation	4.50%	4.50%	4.50%
	PTC ($/kwh)	$ 0.022000		
	PTC Term (yrs)	10		
	SGIP ($/kw)	500	500	500
	SGIP Term (yrs)	5	5	5

Kwh Output Assumptions

	Alternative 1	Alternative 2a	Alternative 2b
Years 0 to 1	607,000	607,000	1,214,000
Years 1 to 2	1,214,000	1,214,000	1,214,000
Years 2 to 5	1,682,000	1,682,000	1,682,000
Years 5 to 30	2,289,000	2,289,000	2,289,000



Alternative 2B – *Public Private Partnership with Enhanced Tipping Fee*

Capital Cost Assumptions

		Total $
Base Costs	Sub Total Base Costs	$ 5,127,000
CBI Costs	Contingency	$ 1,281,750
	Bonds & Insurance	$ 102,540
	Sub Total CBI	$ 1,384,290
Sub Total Construction		$ 6,511,290
EAEL Costs	Design and Construction	$ 976,694
	Administration	$ 325,565
	Environmental Permitting	$ 325,565
	Land Acquisition	$ 500,000
	Sub Total EAELA	$ 2,127,823
Total Capx		$ 8,639,113

Capital Financing Assumptions

	Alternative 1	Alternative 2	Alternative 2b
Start Date	2014	2014	2014
Period (yrs)	30	30	30
Borrowing Rate	6.89%	4.00%	4.00%

O&M Assumptions

Inservice Date		2014
Base Throughput (tons)		10,700
Base O&M	Annual Fees	$ 23,000
	Repair and Maintenance	$ 100,000
	Personnel	$ 84,000
	Consumables	$ 120,000
	Leasing Machinery	$ 27,000
	Sum of O&M	$ 354,000
Base O&M Cost per Ton		$ 33.08
Escalation	O&M	3.50%

Tonnage Input Assumptions

	Alternative 1	Alternative 2a	Alternative 2b
Years 0 to 1	5,000	5,000	10,700
Years 1 to 2	10,700	10,700	10,700
Years 2 to 5	16,000	16,000	16,000
Years 5 to 30	21,000	21,000	21,000

Discount Factor

Factor	1.10%

Performance Metrics

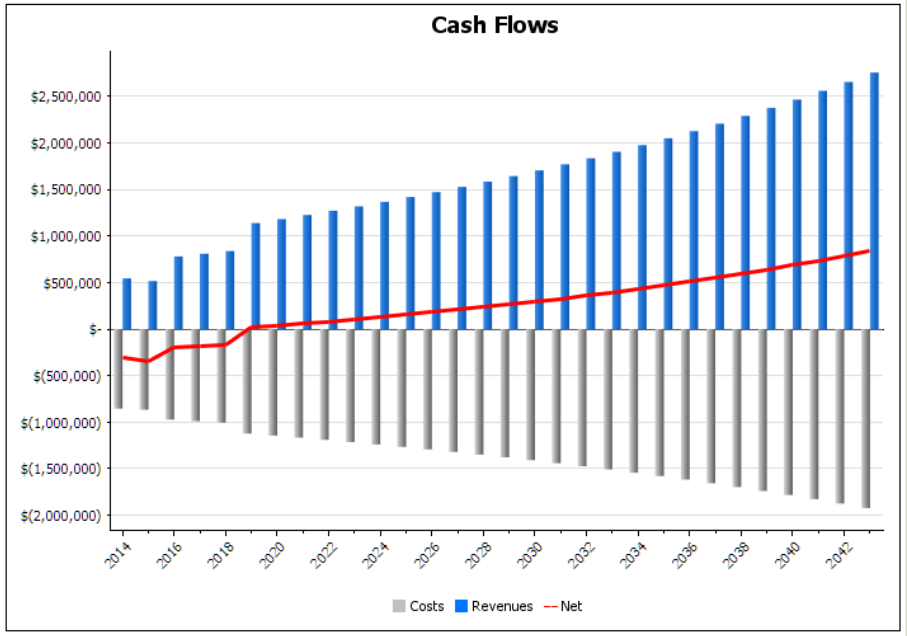
	Net Cash Flow	Discounted Cash Flow
Net Present Value	$ 5,954,768	$ 4,493,453
Internal Rate of Return	11.7%	10.5%

Revenue Assumptions

		Alternative 1	Alternative 2a	Alternative 2b
Feedstock Input	Tipping Fee ($/ton)	$ 22	$ 22	$ 35
	Tipping Fee Escalation	3.50%	3.50%	3.50%
Electricity Output	Base ($/kwh)	$ 0.092740	$ 0.092740	$ 0.092740
	Base Rate Escalation	4.50%	4.50%	4.50%
	PTC ($/kwh)	$ 0.022000		
	PTC Term (yrs)	10		
	SGIP ($/kw)	500	500	500
	SGIP Term (yrs)	5	5	5

Kwh Output Assumptions

	Alternative 1	Alternative 2a	Alternative 2b
Years 0 to 1	607,000	607,000	1,214,000
Years 1 to 2	1,214,000	1,214,000	1,214,000
Years 2 to 5	1,682,000	1,682,000	1,682,000
Years 5 to 30	2,289,000	2,289,000	2,289,000

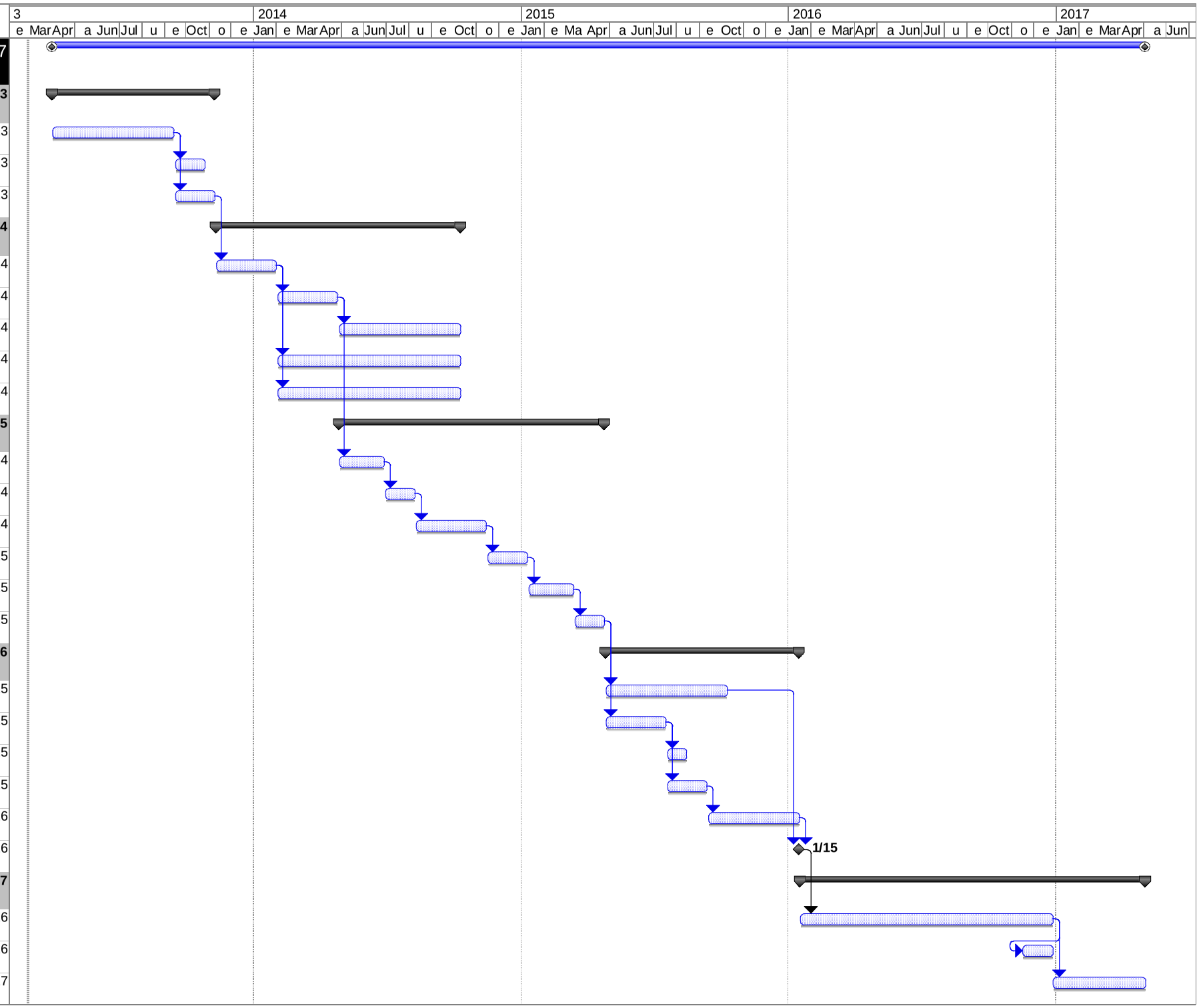


Appendix F
Schedule

Ventura River Watershed Biodigester Feasibility Study
Technical Memorandum No. 4 – Schedule
(DRAFT)

AECOM

ID	Task Name	Duration	Start	Finish
1	**Overall Project Delivery**	**1067 days**	**Mon 4/1/13**	**Tue 5/2/17**
2	**OWNER FORMATION**	**160 days**	**Mon 4/1/13**	**Fri 11/8/13**
3	Form Agency/ COOP/Governing Group	120 days	Mon 4/1/13	Fri 9/13/13
4	Select Owner's Representative / Program Manager	30 days	Mon 9/16/13	Fri 10/25/13
5	Identify Property Funding Source	40 days	Mon 9/16/13	Fri 11/8/13
6	**PROJECT DEVELOPMENT**	**240 days**	**Mon 11/11/13**	**Fri 10/10/14**
7	Secure Property Funding and Complete Due Diligence	60 days	Mon 11/11/13	Fri 1/31/14
8	Procure Property	60 days	Mon 2/3/14	Fri 4/25/14
9	Land Use Modification (If Required)	120 days	Mon 4/28/14	Fri 10/10/14
10	Formalize Partnership Contracts (Hauler, SCE, etc.)	180 days	Mon 2/3/14	Fri 10/10/14
11	Finalize Feedstock Supplier Agreement	180 days	Mon 2/3/14	Fri 10/10/14
12	**ENVIRONMENTAL IMPACT REPORT (EIR)**	**260 days**	**Mon 4/28/14**	**Fri 4/24/15**
13	Prepare Initial Study	45 days	Mon 4/28/14	Fri 6/27/14
14	Circulate Notice of Preparation	30 days	Mon 6/30/14	Fri 8/8/14
15	Prepare Administrative Draft EIR and Technical Studies	70 days	Mon 8/11/14	Fri 11/14/14
16	Circulate Public Draft EIR	40 days	Mon 11/17/14	Fri 1/9/15
17	Respond to Public Comments and Prepare Final EIR	45 days	Mon 1/12/15	Fri 3/13/15
18	Certification of Final EIR and Filing Notice of Determination	30 days	Mon 3/16/15	Fri 4/24/15
19	**PROCUREMENT**	**190 days**	**Mon 4/27/15**	**Fri 1/15/16**
20	Identify Project Funding Source (If Required)	120 days	Mon 4/27/15	Fri 10/9/15
21	Develop RFQ	60 days	Mon 4/27/15	Fri 7/17/15
22	Short List (3-5)	20 days	Mon 7/20/15	Fri 8/14/15
23	Develop RFP	40 days	Mon 7/20/15	Fri 9/11/15
24	Interview/Selection/ Negotiations	90 days	Mon 9/14/15	Fri 1/15/16
25	Notice to Proceed to DBOF Team	0 days	Fri 1/15/16	Fri 1/15/16
26	**CONSTRUCTION**	**337 days**	**Mon 1/18/16**	**Tue 5/2/17**
27	Construction	247 days	Mon 1/18/16	Tue 12/27/16
28	Begin Collection to Temporary Drop Off	30 days	Wed 11/16/16	Tue 12/27/16
29	Start-Up	90 days	Wed 12/28/16	Tue 5/2/17



Project: Project1
Date: Tue 2/26/13

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Appendix G
Comments and Responses

Comment Number	Commenter Name	Commenter Affiliation	Comment	AECOM Response/Report Location
1	Philip J. Sherman	Hawks & Associates	I didn't understand that a "Tipping Fee" is being proposed to be charged to all participants. In all other analyses of Bio Digesters that I have seen the tipping fees were considered a cost savings as the material was not being taken to a landfill. Most of the ranchers now do not hall off the wastes and this would be an additional fee that they would object to. It could be a deal breaker in a lot of cases.	For horse manure currently collected in the area and delivered to Ojai Valley Organics or Agromin tipping fees are collected. See note (a) on Table 6-1.
2	Philip J. Sherman	Hawks & Associates	Some indicated that the Co-op module was the most desirable. It would be good to explore that concept further, but this may be beyond the scope of this study.	Beyond scope of Feasibility Study. Community Cooperatives addressed in Section 5.4.1.
3	Philip J. Sherman	Hawks & Associates	Foot note (b) on page 4 refers to upgrading to BioCNG. It should be noted that upgrading may be necessary even to use the gas for power generation in order to meet Air Resources Board clean air requirements. This is the reason that I originally proposed that we look toward fuel cell technology.	Note (b) on Table 6-1 has been updated.
4	Steve Offerman		Overall, T4 reads much more like a technical report than a summary report. I wonder if it would be better to put it into a more readily digestible version and attach the techno stuff as appendices. Or, should T4 stand as-is as a technical study and have a separate summary report that pulls in the highlights of the prior phases and has a good conclusion section?	A technical study and a separate summary report will be included
5	Steve Offerman		A four-fold growth in input tons in 5-6 years does not seem realistic, particularly given the other competing green waste options, existing and planned, and the "flow control" issue. Perhaps the whole analysis should be done on a "high input" and "moderate input" scenarios.	Table 6-3 summarizes estimated rate of increase in feedstock. The increase over several years was assumed to be the conservative approach since these feedstocks are currently available. As such, the scenario included in the report reflects the "moderate input" approach, which is preferred for a feasibility level analysis.
6	Steve Offerman		I didn't follow previous reports, but couldn't a higher price for electricity be achieved by selling directly to either OVSD or Ventura Water (rather than to SCE)?	Potentially. SCE was chosen as a more conservative option, and since additional investigation is required to determine feasibility of connecting to OVSD or Ventura Water. See Section 3.2.3 and 4.3.3.
7	Steve Offerman		Should input of OVSD sewage sludge in the wet season be factored in?	Sludge from Casitas Municipal Water District was initially considered, but was not continued forward due to a relatively small volume (Section 3.2.2). OVSD could be considered during further investigations.
8	Steve Offerman		in the O&M ledger, "personnel" at $84K seems low; that's just one FTE (barely), and it seems that running the plant daily plus financial admin is more than one FTE's worth (even if OVSD does it). I'd guess that it would be closer to $200K. Seems there should be a detailed analysis.	This will be refined in future studies, following confirmation of the proposed operation approach. See Table 6-2.
9	Bill O'Brien	NextGen Engineering	If possible lets show a range of benefits of the digestate and supernate from positive to negative (if we have to pay to take it away). Lets come up with a way to describe them as potential benefits and what it would take to make them financially viable. Also in this mix of potential benefits should be a discussion of carbon credits.	Feedstock, digestate and carbon credit market study recommended for additional investigation. See Section 1.
10	Bill O'Brien	NextGen Engineering	The public need and I think public agency role of reducing long-term pollution and preventing further algae/nutrient problems needs to be stated and a description of how a biodigester has benefits in the long run. At least we can describe that there is a long-term public/watershed/environment benefit even if we can't put a price on it.	Non-economic benefits are briefly highlighted in Section 1. In depth analysis and review are outside the scope of this feasibility analysis.
11	Bill O'Brien	NextGen Engineering	The list of benefits may include those we can't quantify as long as we describe the range that they can have.	Non-economic benefits are briefly highlighted in Section 1. In depth analysis and review are outside the scope of this feasibility analysis.

Comment Number	Commenter Name	Commenter Affiliation	Comment	AECOM Response/Report Location
12	Margaret Burgess		Not sure you received my fax so am sending you another one. Also a little food for thought. Have you considered setting a limit to how many horses per acre? Or, No horses or stables within a certain distance of a well that supplies water for domestic or agriculture use.	Outside the scope of this feasibility analysis.
13	Margaret Burgess		You address the issue of removing horse 'pucky' and bedding to a bunker. What about the urine that leaches directly and immediately into the ground. Also, when it rains the pucky that has not been removed also goes into the ground. There is a horse and riding facility in the East End on Grand Ave. and I understand another boarding facility is going in on Gorham. Both facilities are in agriculture orchards. I believe, zoned for agriculture use. These facilities either have or are located adjacent to PRIVATE water wells.	Outside the scope of this feasibility analysis.
14	Philip J. Sherman	Hawks & Associates	Would like to see addressed in the TM: The possibility of a co-op being formed to return any benefits back to the community.	Community Cooperatives addressed in Section 5.4.1.
15	Philip J. Sherman	Hawks & Associates	Would like to see addressed in the TM: Potential value in the byproducts, planting mix and liquid fertilizer.	Feedstock, digestate and carbon credit market study recommended for additional investigation. See Section 1.
16	Philip J. Sherman	Hawks & Associates	Would like to see addressed in the TM: Potential for grant monies for project completion.	See Table 6-1, "Incentive".
17	Philip J. Sherman	Hawks & Associates	Would like to see addressed in the TM: Potential for participation of entities that need to further their “green” participation to meet new regulations.	Feedstock, digestate and carbon credit market study recommended for additional investigation. See Section 1.
18	Philip J. Sherman	Hawks & Associates	Would like to see addressed in the TM: Compare bio-digestion with composting with regard to the environmental impact.	Comparative analysis is recommended for additional investigation. See Section 1.
19	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Add a list of benefits that are considered, even if at this point cannot be quantified (and why not quantified)...carbon credits, sale of liquid fertilizer (supernatant), sterile compost, benefits of meeting the Algae/Nutrient TMDL. Others? Is there no value to any of the byproducts?	Feedstock, digestate and carbon credit market study recommended for additional investigation. See Section 1.
20	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Tie down the sale of our irregular electricity user better if possible - describing more what SCE can do, and/or separate out the standby demand charge for the WWTP or WTPs.	Beyond the scope of this feasibility analysis.
21	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Is another benefit to the project reduced Nitrous Oxide emissions?	Non-economic benefits are briefly highlighted in Section 1.
22	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Are the O&M and repair costs sufficient to work out the learning curve or bugs in the system?	Beyond the scope of this feasibility analysis.
23	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Discuss the concern about the higher tipping fee works against the assumption of full horse manure/bedding capacity the first year. As the tipping fee goes up, demand may be slower to ramp up? If tipping fees are paid by Harrison or corporations, it may be a mute point because the issue is what does the rancher pay to have the manure collected. Other competing options for disposal may limit interest in participation.	Beyond the scope of this feasibility analysis.
24	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Attachment 1: Does the Net Cash Flow make sense as the revenues begin in 2014? If the project will not be complete for 49 months, revenue should be adjusted to start later.	Economic analysis is done with costs and revenues starting the same year and is adequate for a planning level estimate.
25	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Attachment 2: Alternatives 1, 2, & 2A, Several Tables on each of these pages show Alternative 1, Alternative 2a and Alternative 2b. Just be consistent.	Appendix has been updated.
26	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Schedule: Consider adding a year for permitting with the Air Resources Board with this new type of feedstock (following CEQA completion but prior to construction). Consider VRSD’s time working with the Air board.	Permit requirements would be determined during development of the Design-Build Procurement documents. However, permitting would occur by Design-Build Team during construction phase.

Comment Number	Commenter Name	Commenter Affiliation	Comment	AECOM Response/Report Location
27	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Add list of recommendations for follow-up of this study.	Added to Executive Summary. See Section 1.
28	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Provide spreadsheet tools used in this study to test options or changes in cost or benefits that will obviously come up after this feasibility study is over.	Electronic data files will be provided to the County.
29	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Review results of this feasibility study with Ventura River Watershed Council	Presentation is scheduled.
30	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Review results with VRSD and County Integrated Waste Management to get their take on how to move forward with organic waste disposal in general and how they think a biodigester project could be adapted to fit in the bigger picture.	Presentation is scheduled.
31	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Support the Resource Conservation District (RCD) programs to improve manure and green waste management. These serve the immediate needs and can also serve the interim until a bio-digester or other process is feasible.	Beyond the scope of this feasibility analysis.
32	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Write up the lessons learned from this feasibility study and circulate to alternative energy and biosolids groups.	Beyond the scope of this feasibility analysis.
33	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Keep in touch with research on the use and value of byproducts – such as at UC Davis and VRSD.	Beyond the scope of this feasibility analysis.
34	Bill O'Brien, Phil Sherman, and Others	Waste to Energy	Build an educational size biodigester and demonstrate to schools, agencies and the public (already in development)	Recommendation for pilot/demonstration facility provided. See Section 1.