LAS VIRGENES - TRIUNFO
JOINT POWERS AUTHORITY
AGENDA

CLOSING TIME FOR AGENDA IS 8:30 A.M. ON THE TUESDAY PRECEDING THE MEETING. GOVERNMENT CODE SECTION 54954.2 PROHIBITS TAKING ACTION ON ITEMS NOT ON POSTED AGENDA UNLESS AN EMERGENCY, AS DEFINED IN GOVERNMENT CODE SECTION 54956.5 EXISTS OR UNLESS OTHER REQUIREMENTS OF GOVERNMENT CODE SECTION 54954.2(B) ARE MET.

5:00 PM April 2, 2012

PLEDGE OF ALLEGIANCE

1. CALL TO ORDER AND ROLL CALL

A The meeting was called to order at _____ p.m. by _____ in the Las Virgenes Municipal Water District office and the Clerk of the Board called the roll.

Triunfo Sanitation District	Present	Left	Absent
Steven Iceland	______	______	______
Michael McReynolds	______	______	______
Janna Orkney, Vice Chair	______	______	______
Michael Paule	______	______	______
James Wall	______	______	______
Las Virgenes Municipal Water District			
Joseph Bowman	______	______	______
Charles Caspary	______	______	______
Glen Peterson	______	______	______
Lee Renger, Chair	______	______	______
Barry Steinhardt	______	______	______

2. APPROVAL OF AGENDA

A Moved by _____, seconded by _____, and _____, that the agenda for the April 2, 2012 meeting be approved as presented/amended.

3. PUBLIC COMMENTS

Members of the public may now address the Board of Directors **ON MATTERS NOT APPEARING ON THE AGENDA**, but within the jurisdiction of the Board. No action shall be taken on any matter not appearing on the agenda unless authorized by Subdivision (b) of Government Code Section 54954.2

4. CONSENT CALENDAR

A **Minutes: Regular JPA Meeting of March 5, 2012.** Approve

5. ACTION ITEMS

A Rancho Las Virgenes Design of a Third Digester: Preliminary Design Report

Receive and file the preliminary design report for the Third Digester at the Rancho Las Virgenes Composting Facility from Kennedy/Jenks Consultants

B Cancellation of May 7, 2012 Regular JPA Board Meeting

Authorize the Administering Agent General Manager to issue a cancellation notice for the Regular JPA Board Meeting of May 7, 2012, and discuss whether a Special Meeting needs to be scheduled for an alternate date.

C Heal the Bay - Bring Back the Beach: Director Attendance

The JPA Board of Directors to provide direction to the Administering Agent/General Manager as to whether to participate, and if participating, designate one Director from each agency to attend at a cost of $500.00 per person.

D Tapia Water Reclamation Facility: Lease of Recreation Land

Authorize the Administering Agent/General Manager to execute the Lease agreement of the Recreation Land with The Salvation Army.

6. BOARD COMMENTS

7. FUTURE AGENDA ITEMS

8. INFORMATION ITEMS

A CH2M Hill Biosolids Compost Market Analysis

B Rancho Las Virgenes Compost Reactor Building Ceiling Repair: Approval of Change Order No. 1

C Sewer Bridge Rehabilitation Project: Award of Contract

D Tapia WRF Alternative Disinfection Project: Approval of Plans and Specifications and Call for Bids

9. CLOSED SESSION

10. ADJOURNMENT

LAS VIRGENES - TRIUNFO
JOINT POWERS AUTHORITY
MINUTES

5:00 PM March 5, 2012

PLEDGE OF ALLEGIANCE

The Pledge of Allegiance to the Flag was led by Vice Chair Orkney.

1. CALL TO ORDER AND ROLL CALL

A Call to order and roll call.

The meeting was called to order at 5:00 p.m. by Chair Renger and the Deputy Clerk called the roll. Those answering present were Directors Iceland, McReynolds, Orkney, Paule, Wall, Caspary, Peterson, Renger and Steinhardt. Absent: Paule and Bowman.

2. APPROVAL OF AGENDA

A Approval of agenda.

On a motion by Director Charles Caspary, seconded by Director Barry Steinhardt, the Board of Directors voted 8-0 -2 to Approve the agenda for the Regular meeting of March 5, 2012 as amended by recommendation of Administering Agent/General Manager Mundy to correct the agenda roll call item to state Lee Renger as Chair, and Janna Orkney as Vice Chair.
AYES: Director(s) Caspary , Iceland , McReynolds , Orkney , Peterson , Renger , Steinhardt , Wall
ABSENT: Director(s) Bowman , Paule

3. PUBLIC COMMENTS

Members of the public may now address the Board of Directors **ON MATTERS NOT APPEARING ON THE AGENDA**, but within the jurisdiction of the Board. No action shall be taken on any matter not appearing on the agenda unless authorized by Subdivision (b) of Government Code Section 54954.2

No speakers cards were received.

4. ILLUSTRATIVE AND/OR VERBAL PRESENTATION AGENDA ITEMS

A Compost Survey

Jacqy Gamble, Management Analyst and Doug Anders, Administrative Services Coordinator gave the Compost Survey presentation. A speaker card was received on this item from Eric R. Haupt. He thanked the presenters for an informative presentation and thanked the JPA for providing compost to the community. He felt it is a true asset to the community and uses it on his property in Agoura.

ITEM 4A

Director Orkney noted that the presentation had more detail and information than anticipated. Director Caspary talked about a 3-pronged approach to compost marketing that includes serious negotiations with users, stockpiling, bulk marketing and hauling for commercial users. Director Iceland noted that the transportation cost was more than the product cost. Director Orkney asked if we knew farmers in Ventura County. Director Peterson stated that we should put out a Request for Quotation (RFQ) for bulk compost. Director Orkney said that she liked the 3-pronged approach and wanted to see bagging and samples provided to customers and the public. Director Peterson noted that the citizens should not pay for compost because they paid for the facility already. Director Steinhardt would like to see all the suggestions put together.

B Budget Discussion for FY12-13

Discuss budget issues and questions with staff.

Sandra Hicks, Director of Finance & Administration presented this item.

5. CONSENT CALENDAR

A Minutes: Special Meeting of January 9, 2012 and Regular Meeting of February 6, 2012. **Approve**

On a motion by Director Steven Iceland, seconded by Director Barry Steinhardt, the Board of Directors voted 8-0 -2 to Approve as amended by recommendation of Director Iceland. He clarified that he led the pledge of allegiance not given on the February 6, 2012 minutes.
AYES: Director(s) Caspary , Iceland , McReynolds , Orkney , Peterson , Renger , Steinhardt , Wall
ABSENT: Director(s) Bowman , Paule

6. ACTION ITEMS

A JPA Infrastructure Investment Plan, Fiscal Year 2012/2013 - 2016/2017

Receive and file the JPA Infrastructure Investment Plan, Fiscal Year 2012/2013 - 2016/2017.

On a motion by Director Charles Caspary, seconded by Director Glen Peterson, the Board of Directors voted 8-0 -2 to Approve the recommendation as presented. David Lippman, Director of Facilities & Operations gave the presentation. He stated the document is a planning tool and only to give the JPA an idea of the upcoming capital projects needed for the next 5 years.
AYES: Director(s) Caspary , Iceland , McReynolds , Orkney , Peterson , Renger , Steinhardt , Wall
ABSENT: Director(s) Bowman , Paule

7. BOARD COMMENTS

None.

8. FUTURE AGENDA ITEMS

None.

9. INFORMATION ITEMS

A RWQCB Settlement Offer / Notice of Violations

10. CLOSED SESSION

None.

11. ADJOURNMENT

The meeting adjourned at the hour of 7:17 p.m.

Lee Renger, Chair

ATTEST:

Janna Orkney, Vice Chair

April 2, 2012 JPA Board Meeting

TO: JPA Board of Directors

FROM: Facilities & Operations

Subject: Rancho Las Virgenes Design of a Third Digester: Preliminary Design Report

SUMMARY:

At the November 7, 2011 JPA meeting, the JPA awarded the design of a third digester at the Rancho Las Virgenes Composting Facility to Kennedy/Jenks Consultants. As part of their design services, Kennedy/Jenks has prepared a preliminary design report that analyzes project drivers, evaluates design alternatives, makes recommendations and provides an opinion of probable cost for a complete, proposed digester system.

RECOMMENDATION(S):

Receive and file the preliminary design report for the Third Digester at the Rancho Las Virgenes Composting Facility from Kennedy/Jenks Consultants

FINANCIAL IMPACT:

There is no financial impact associated with this action.

DISCUSSION:

The existing digestion system at the Rancho Las Virgenes Composting Facility includes two 1.16 million gallon digesters, which were constructed as part of the original design of the facility. Additional components of the system are a pump mixing system that serves both digesters, a steam heating system that maintains temperatures at approximately 95 degrees Fahrenheit in the digesters, and a gas handling system.

The existing digesters have been in continuous service since the initial startup of the facility in 1993 and there is insufficient capacity to take either of the digesters out of service for cleaning and maintenance. Sludge is pumped from Tapia to Rancho where it is stored in raw sludge wet wells until it is fed to the digesters incrementally. The digesters were originally designed for a loading rate of 80,000 gallons per day to achieve a 29 day solids retention time. Lately, Tapia has increased sludge production and is currently sending approximately 99,000 gallons per day. The maximum allowable loading rate with two digesters is 120,000 gallons per day to assure a minimum 20 day solids retention time. To ensure that the required solids retention time is met and to provide the necessary redundancy for maintenance, the preliminary design report recommends that a third 1.16 MG digester be constructed. The proposed digester would be a pre-stressed or cast-in-place, concrete tank similar to the existing two. Additionally, as part of the design for the proposed digester, the report recommends upgrading the existing digester heating system. The digesters are currently heated by a steam injection system. This system, however, has partially failed; and the system cannot function using the waste heat from the cogeneration engine. It is recommended that it be replaced with a more efficient and reliable system such as a heat exchanger.

With the additional capacity provided by a third digester, the JPA would also be able to take in and digest fats, oils, and grease (FOG) and food waste to facilitate the generation of additional power at Rancho in the future. It is possible that with a reliable FOG source the digesters could generate sufficient power to satisfy the average power needs at the facility. District staff coordinated with Kennedy/Jenks throughout the preparation of the preliminary design report to provide critical design parameters as well as value engineering to eliminate aspects of the design which were not required. After reviewing staff comments on the preliminary draft reports, the engineer's opinion of probable cost for the construction of a third digester and heating system improvements is $5,000,000.

Prepared By: James Spicer II, Associate Engineer

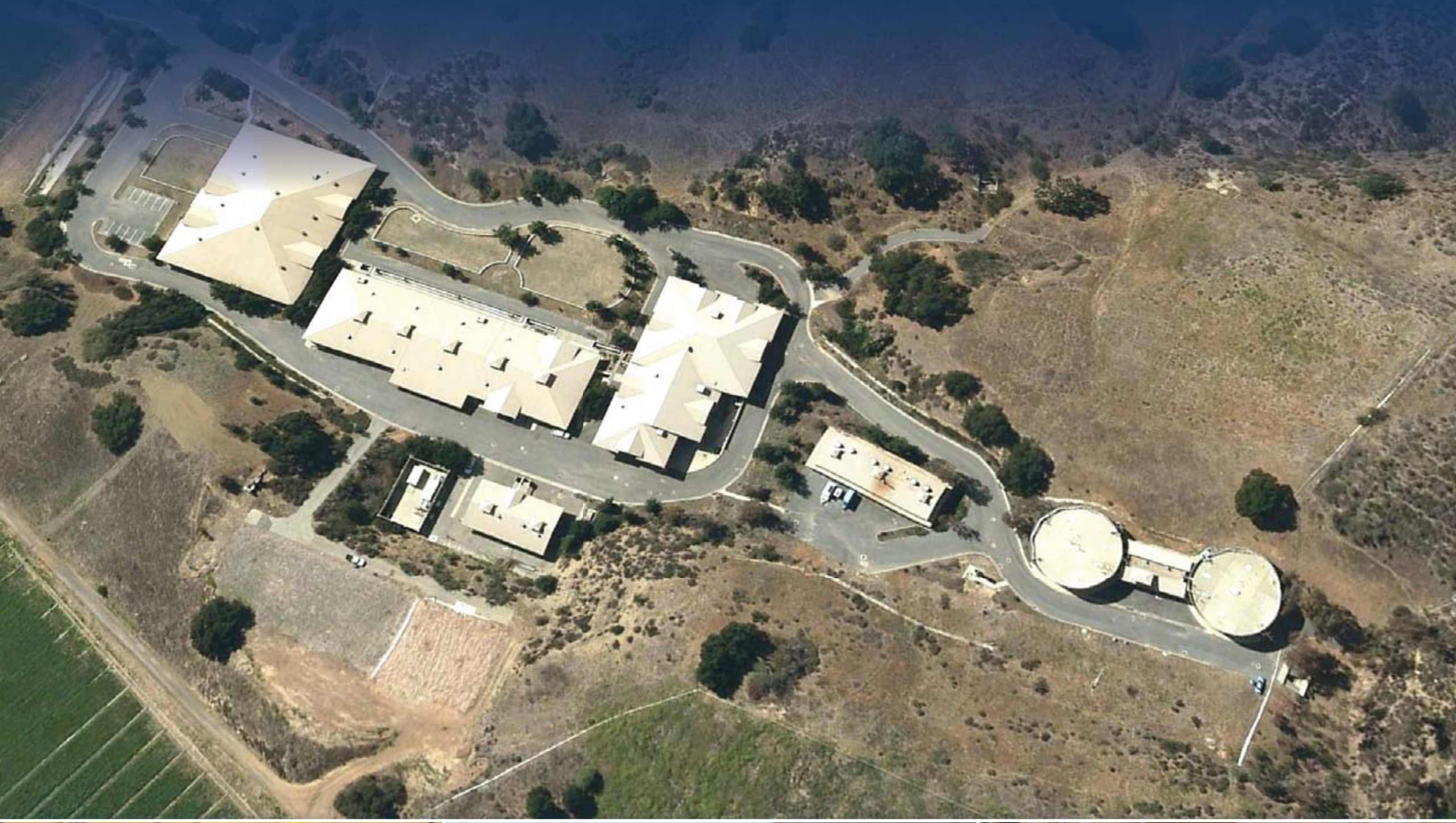
ATTACHMENTS:

Final PDR Las Virgenes Third Digester

ITEM 5A

Las Virgenes Municipal Water District
Triunfo Sanitation District
Joint Powers Authority

Rancho Las Virgenes: Design of a Third Digester



Preliminary Design Report

April 2012

ITEM 5A

Kennedy/Jenks Consultants

Kennedy/Jenks Consultants

2775 North Ventura Road, Suite 100
Oxnard, California 93036
805-973-5700
FAX: 805-973-1440

ITEM 5A

Preliminary Design Report
Rancho Las Virgenes: Design of a Third Digester

April 2012

REGISTERED PROFESSIONAL ENGINEER
KAPIL R. VERMA
C 74589
EXP. 12/31/13
CIVIL
STATE OF CALIFORNIA

3/22/12

Prepared for

Las Virgenes Municipal Water Dist.
Triunfo Sanitation Dist.
Joint Powers Authority
4232 Las Virgenes Road
Calabasas, CA 91302

K/J Project No. 1188026*00

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Executive Summary

ES-1 Existing Digestion System at Rancho

The existing digestion facilities at the Rancho site include the following:

- Two 1.16 million gallon (MG) anaerobic digesters constructed in 1993.
- A pump mixing system that serves both digesters.
- A steam heating system, including a boiler that maintains mesophillic temperatures in the digesters.
- A gas handling system that conveys the flammable digester gas to the flare, a new cogeneration engine, and the steam boiler
- A new cogeneration system that burns digester gas in an engine and generates power for use on the Rancho site.

ES-2 Project Drivers

The following are the key drivers for a digester project at Rancho at this time:

- The existing digesters have been in continuous operation for 17 years. There is insufficient capacity (essentially no redundancy) to take either of the digesters out of service for much needed cleaning and maintenance.
- Growth in the District's service area could result in a 33 percent increase in wastewater solids for digestion by 2030.
- The existing digester heating system requires a high level of maintenance, has partially failed and been abandoned, and cannot function using the waste heat from the cogeneration engine. Therefore, much of the digester gas must be used directly in a steam boiler and cannot be used to generate power.
- The new cogeneration facility, operated under a power purchase agreement, offers the District an average 54 percent savings for all power generated on site from the digester gas. Currently, much of the digester gas is used to fire the steam boiler to heat the digesters. The waste heat from the cogeneration engine is placed in a makeup tank which provides feed water to the boiler, which in turn produces steam to heat the digesters. A new heating system for the digesters would utilize the waste heat from the cogeneration engine and free up more digester gas for power generation. Additionally, the digesters have the capability of producing considerably more digester gas, if a high strength waste stream, like FOG, could be brought to the site and added to the digesters.

ES-3 Sizing and Features of New Third Digester

Capacity of Third Digester

The appropriate sizing for the proposed Third Digester was evaluated based on the project drivers mentioned above and key anaerobic digestion design criteria. Process data for 2010 to

2011 provided by District staff was compiled and analyzed to determine parameters for which the design recommendations are based. Table ES-1 below represents a summary of the pertinent process data.

TABLE ES-1
TAPIA AND RANCHO PROCESS FLOW CHARACTERISTICS

Characteristic	Value
Influent Flow Rate (MGD)	9.07
Influent BOD (mg/l)	223
Influent TSS (mg/l)	310
Tapia to Rancho Sludge Total Solids (%)	2.8
Raw Sludge Flow to Digesters – AVG (gpd)	86,000
Raw Sludge Flow to Digesters – Max Month (gpd)	120,000

Addressing the need for full redundancy suggests that the Third Digester should be the same 1.16 MG capacity as Digesters Nos. 1 and 2.

Near term Maximum Month flows from Tapia can be accommodated by the existing two digesters plus a Third 1.16 MG Digester.

If full build out growth (a population increase of 33 percent) occurs in the District, the Maximum Month can be accommodated by a Third 1.16 MG Digester in combination with any one of the following measures:

- Modification of Tapia operations to reduce Max Month flows
- Provision of sludge thickening at Rancho prior to digestion
- Construction of a fourth digester in the future

Additionally, three 1.16 MG digesters (the existing two plus a new third) will have the capacity to yield sufficient digester gas to generate the entire average power load at the Rancho site, provided additional high strength waste streams, like FOG and food waste, are added to the digesters.

The recommended capacity for the Third Digester is 1.16 MG of dimensions similar to the existing two digesters.

Digester Heating

As indicated in the project drivers section, the existing digester heating system (steam injection) requires a high level of maintenance, has partially failed and been abandoned, and cannot function using the waste heat from the cogeneration engine. An assessment was performed to evaluate the physical condition of the steam system, and to determine whether the system will be usable to heat the digesters until the construction of the Third Digester and the recommended heating improvements is complete. The assessment found that although there are some minor deficiencies in the existing heating system, it should continue to be usable for the duration of the project. Furthermore, it is recommended that the digester heating improvements include a replacement of the existing steam system with a more efficient and reliable heating technology.

A conventional digester heating system that utilizes hot water, a heating loop and heat exchangers is recommended. This system can effectively utilize the waste heat from the cogeneration engine. The steam heating system on the existing digesters will also be replaced with a new hot water system. This system will be designed to reliably maintain the digester temperature within a narrow range above 95 degrees.

Digester Mixing

The existing digesters currently utilize an externally pumped mixing system which consists of three centrifugal sludge pumps which serve to turn over the contents of each digester approximately 6 times each day. The District has indicated this mixing scenario to be preferred for Digester 3.

A pump mixing system, similar to the one on the existing digesters, is recommended with capacity and features to accommodate alternative waste streams like FOG and food waste.

Structural Considerations for New Digester

The digester will be constructed of reinforced concrete. The size of the digester suggests that both cast-in-place construction and pre-stressed will be cost competitive and that both options should be included in the bid documents.

Digester Cover Alternatives

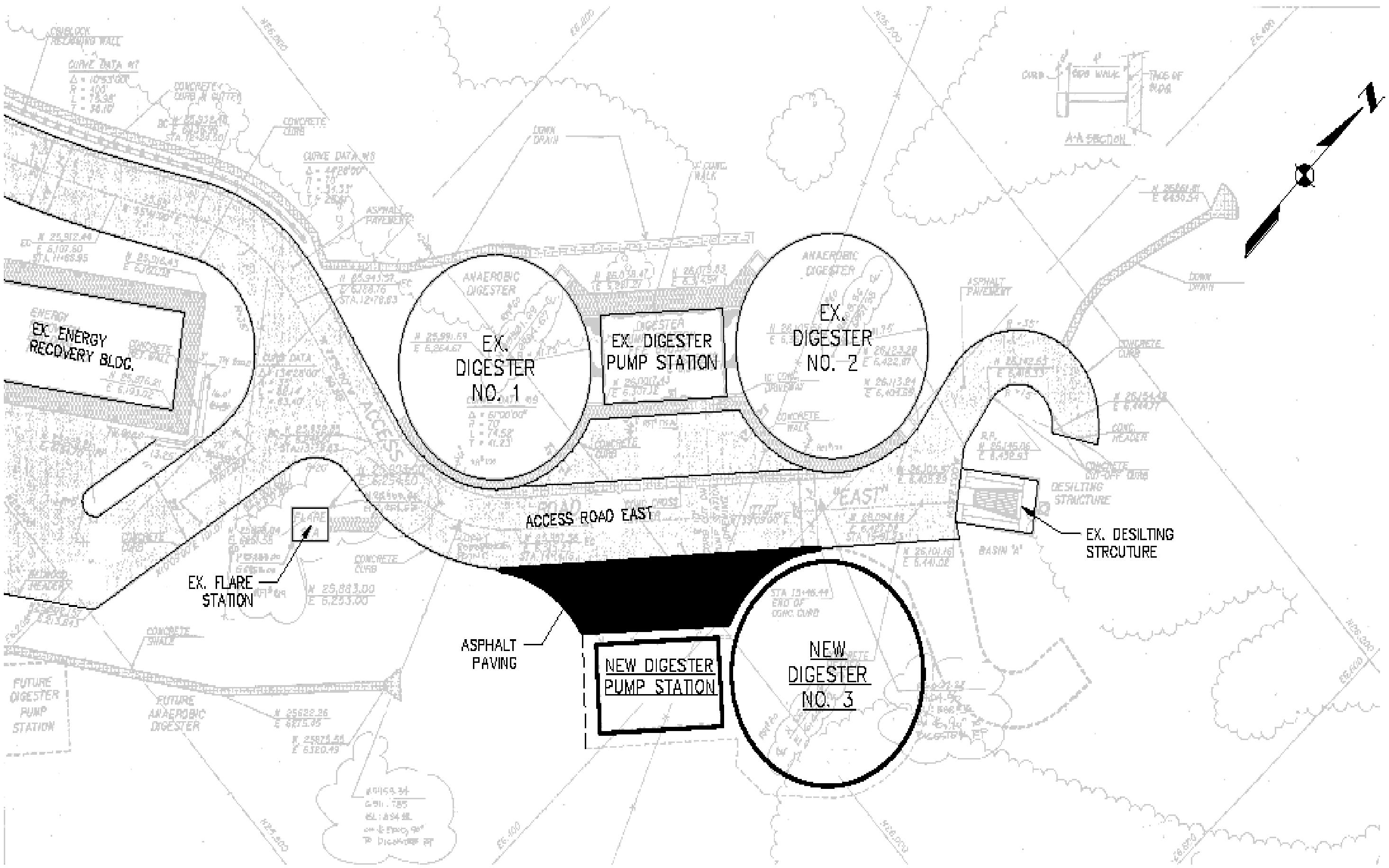
Low profile and aesthetics are key considerations for selection of the cover design and material. The lowest profile and best aesthetics are provided by a flat concrete cover similar to those on the existing digesters. The best operational characteristics are provided by the free-spanning, insulated steel cover. However, there is a potential for significant cost savings with the concrete cover, due to the elimination of expensive interior coatings and cover insulation.

ES-4 Potential for FOG and Food Waste as Supplementary Digester Feed Stocks

If the 1.16 MG Third Digester is constructed, the District would have the capacity to take in and digest sufficient FOG and food waste to generate all of the average power needs at the Rancho site. While multiple sources of FOG and food waste have been identified and some have been contacted, a successful FOG and/or food waste program is generally dependent on well-defined and reliable sources. If the District determines that a FOG and/or food waste program would be advantageous, it is recommended that additional work be performed to confirm sources and prepare a conceptual design of the receiving facilities.

Opinion of Probable Cost of Construction

The Engineers Opinion of the Probable Cost of Construction for the construction of a Third Digester and Heating System Improvements is $5,300,000. Costs are currently estimated to have an accuracy of plus 50 percent to minus 30 percent. It is currently estimated that the construction of the proposed facilities will take approximately 12-18 months in duration to complete.



Kennedy/Jenks Consultants
LAS VIRGENES MWD
CALABASAS, CALIFORNIA

SITE PLAN
DIGESTER NO.3 AND PUMP STATION

1188026.00
APRIL 2012

FIGURE 1

ITEM 5A

Section 1: Data Compilation and Analysis

1.1 Data Received

Digester systems evaluations and subsequent recommendations were based on background documentation and plant operating data provided by District staff to Kennedy/Jenks Consultants (Kennedy/Jenks). The background documentation used for the development of this report included the following:

- Request For Proposals For Rancho Las Virgenes: Design of a Third Digester
- Sanitation Master Plan Update 2008, LVMWD Report No. 2406.00
- Rancho Las Virgenes Site Development and Buffer Acquisition Initial Study and Addendum, Las Virgenes Municipal Water District, August 1990
- Operations and Maintenance Manual for the Anaerobic Digestion Process at the Rancho Las Virgenes Solids Handling Facility, Volume 2, April 1995
- Geotechnical Engineering Investigation Proposed Rancho Las Virgenes Solids Handling Facility, Harding Lawson Associates, January 9, 1991

The plant operating data information included selected data from years 2010 and 2011. The plant data set included the following data sets:

- Final Tapia Effluent Flow Rate (assumed to also be representative of WWTP influent and primary effluent flow rates)
- Total Suspended Solids (TSS) concentrations milligram per liter (mg/l) – Influent TSS
- Biochemical Oxygen Demand (BOD) concentrations (mg/l) – Influent BOD
- Tapia to Rancho Sludge Total Solids (%)
- Tapia to Rancho Sludge “Pumped” gallons per day (gpd)
- Rancho Sludge “Received” (gpd)
- Raw Sludge Flow to Digesters (gpd)
- Digester 1 Gas Flow cubic feet per day (ft^3/d)
- Digester 2 Gas Flow (ft^3/d)
- Digester Gas Flare (ft^3/d)
- Digester 1 Temperature (deg F)
- Digester 2 Temperature (deg F)
- Digester 1 Level (ft)
- Digester 2 Level (ft)

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Table 1-1 provides an overview of select Tapia and Rancho process flow characteristics. It shows averages for years 2010 and 2011.

TABLE 1-1
TAPIA AND RANCHO PROCESS FLOW CHARACTERISTICS

Characteristic	Value
Influent Flow Rate (MGD)	9.07
Influent BOD (mg/l)	223
Influent TSS (mg/l)	310
Tapia to Rancho Sludge Total Solids (%)	2.8
Raw Sludge Flow to Digesters – Avg (gpd)	86,000
Raw Sludge Flow to Digesters – Max Month (gpd)	120,000

This data was the basis for evaluating the sizing and capacity of the new digester, existing and proposed heating systems, mixing systems, and gas production estimates. A detailed table of compiled data is located in Appendix A of this report.

Section 2: Sizing and Type of New Digester

This section contains evaluations for the sizing and type of the proposed new 3rd Digester. The section is divided into capacity, sizing and dimensions, structural considerations, digester cover alternatives, gas handling, and the new digester pump building.

2.1 Digester Capacity Evaluation

The certified Environmental Impact Report (EIR) for the Regional Facilities Expansion IV that included the Rancho Composting Facility provided for four anaerobic digesters of 1.16 million gallons (MG) each. The first two digesters were constructed in the 1990's. This project involves the construction of a Third Digester. The basis for the District's decision to move forward with a project at this time is described under the "Project Drivers" heading of the Executive Summary. Those drivers include: a lack of redundancy, a need for more capacity and a desire to produce more digester gas for onsite power production. The decision on the appropriate capacity of the Third Digester involves three key considerations which are framed below.

1. Provision for redundancy.
2. Future growth.
3. Enhanced digester gas production.

The decision on the capacity will determine the physical size of the digester structure which must be configured within the stipulations of the EIR. That discussion is presented in Section 2.3 of this report. Following are discussions of the three key considerations that will influence the decision on the appropriate capacity for the Third Digester on the Rancho site.

At the end of this section is a summary of the capacity considerations and impacts on sizing decisions for the Third Digester.

2.1.1 Provision of Digester Tank Redundancy

Typically anaerobic digesters are sealed vessels whose interiors can only be accessed when they are taken out of service, emptied and cleaned for inspection. Two factors generally drive the need to take anaerobic digesters out of service; (1) the corrosive atmosphere above the liquid surface can jeopardize interior surfaces and (2) the grit and debris that is contained in the feed sludge tends to accumulate in the digester displacing active volume.

Maintenance intervals for digesters vary from site to site but typically range from 3 to 10 years. Although it is expensive to take an anaerobic digester out of service, empty and clean it, the risk of damage to interior surfaces is real if protective coatings have failed and the concrete or steel surfaces are exposed. Periodic interior maintenance is an important aspect of protecting the valuable asset that is a digester. Existing Digesters Nos. 1 and 2 have not been taken out of service for interior maintenance since first being placed into service. It is unclear from the original Composting Facility record drawings what, if any, protective coatings systems currently exist in Digesters Nos. 1 and 2.

ITEM 5A

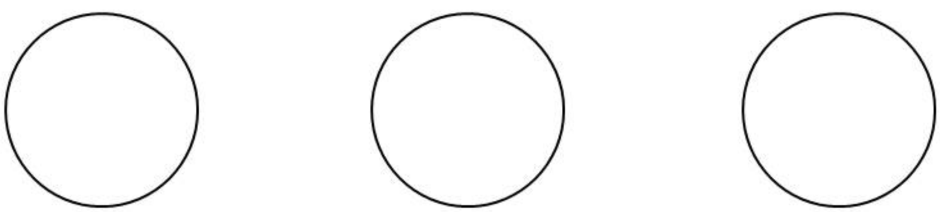
When a digester is taken out of service for periodic maintenance the downtime will vary based on the condition of the digester and repair work to be done. However, it is reasonable to plan for the digester to be out of operation for at least six months. During that period the function of that digester must be replaced. At the Rancho site, one of the objectives is to meet the requirements for Class B biosolids with the anaerobic digestion process. Maintaining that capability on the site is critical because the only reliable alternative to composting is landfilling the biosolids. Therefore, providing the required unit digestion redundancy on the Rancho site involves the following:

> ***Provision of the capability of taking any one of the digesters out of service for an extended period of time while still meeting requirements of producing Class B biosolids (a minimum of 15 days detention time at a minimum of 95 degrees F). See Figure 2-1 (Section 2.1.2.1).***

The existing two digesters have not been taken out of service since they were put into operation in 1993. If one of the two digesters is taken out of service the detention time would drop below the 15 day requirement. Therefore, a Third Digester of a minimum capacity equal to each of the existing units (1.16 MG) is needed to provide the required redundancy so the District can move forward with overdue maintenance of the existing units.

Considering only the need for redundancy, the capacity of the new Third Digester, as compared to the existing would be the same 1.16 MG.

Digester Sizing Considering Redundancy



Dig #1	Dig #2	**Dig #3**
1.16 MG	1.16 MG	**1.16 MG**

2.1.2 Provision for Future Growth

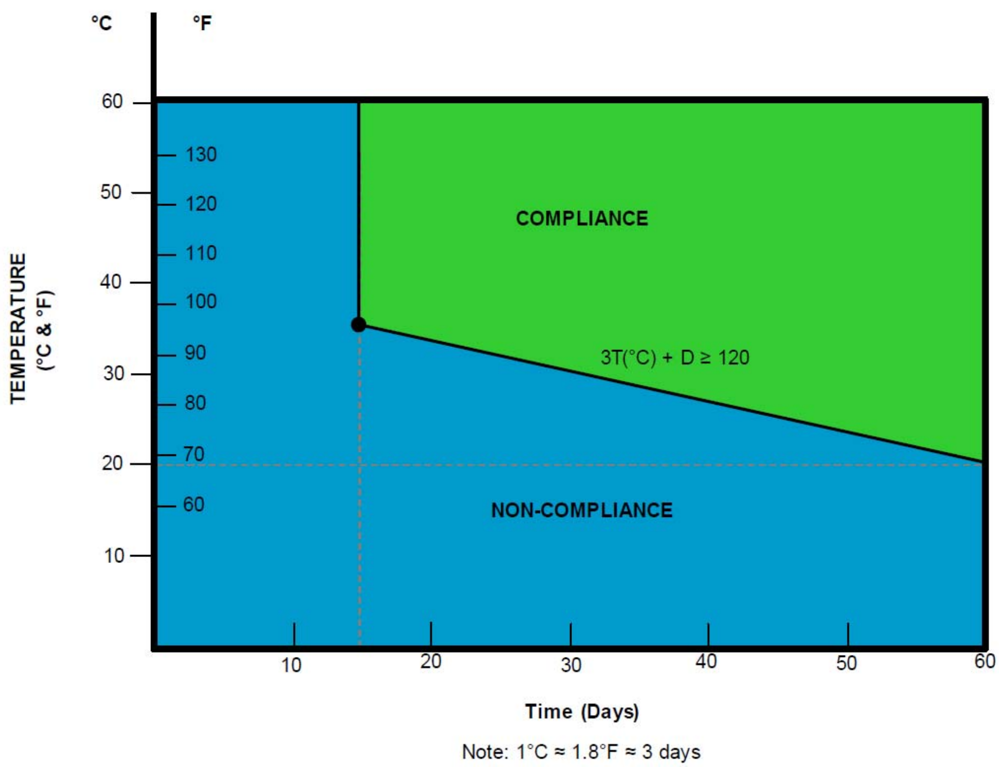
Typically, the following two parameters are used for sizing anaerobic digesters;

1. Hydraulic detention time
2. Volatile solids loading

2.1.2.1 Hydraulic Detention Time

The requirements for hydraulic detention time target viral deactivation and are based in the Part 503 regulations for Class B biosolids. The relationship of detention time and temperature is illustrated in Figure 2-1. The minimum allowable detention time is 15 days provided the temperature never drops below 95 degrees F.

FIGURE 2-1
EPA 503 REGULATION FOR VIRAL DEACTIVATION



A minimum of 20 days detention time is a reasonable design goal and provides for consistent compliance with Class B requirements, even with an occasional small temperature excursion below 95 degrees, which did occur in both existing digesters during the 2010-2011 period.

The flow data to the digesters has been compiled for 2010 and 2011. The average daily flow to the digesters during that period was 86,000 gpd. With the two existing digesters in operation, and assuming a fully active volume, the detention time during that period averaged 27 days. The maximum month calculation (a running 30-day average), which is a conventional design parameter for anaerobic digestion systems, for 2010-11 resulted in an average daily flow of about 120,000 gpd. The max month occurred from 15 December 2010 through 13 January 2011. The detention time during the max month was 19 days.

The 2008 Sanitation Master Plan Update includes a projection of an average dry weather flow (ADWF) of 12 million gallons per day (MGD) at build-out in the service area, estimated to occur by 2030. The current average flow is 9 MGD. Therefore the max month flow to the digesters in 2030 is projected to be about 160,000 gpd (12/9 x 120,000).

The actual flow to the digesters in 2010 and 2011 and the projection of flow to the digesters in 2030 are tabulated in Table 2-1.

TABLE 2-1
CURRENT AND FUTURE SLUDGE FLOWS TO DIGESTERS

Planning Horizon	Tapia Flow[(a)]	Avg Flow to Dig[(b)]	Max Month[(c)]
2010-11	9	86,000	120,000
2030	12	**114,000**	**160,000**

Notes:
(a) Maximum 30-day average dry weather flow into Tapia (MGD)
(b) Average daily flow to digesters (gpd)
(c) Maximum 30-day average flow to digesters (gpd)

Considering the above projections for future flow to the digesters, the following Table 2-2 is a tabulation of the capacity requirements for the entire digestion system and subsequently the new Third Digester at a minimum hydraulic detention time of 20 days.

TABLE 2-2
DIGESTER CAPACITY REQUIREMENTS (MG)

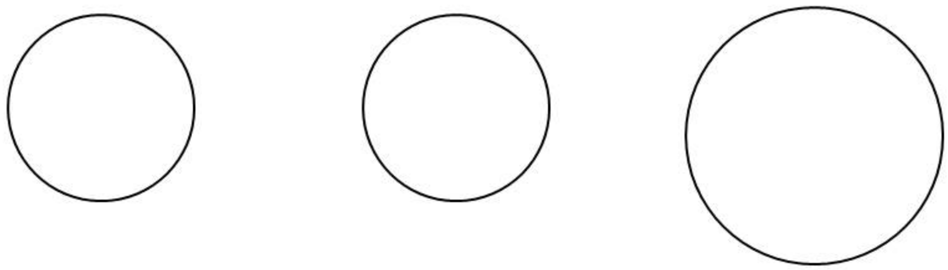
2030 Design Criteria	Total Dig. Capacity @ 20 days DT	Existing Dig. Capacity	Minimum Capacity of 3rd Digester[(a)]	Provision for Redundancy[(b)]
Avg Flow	2.28	2.3	0	1.16
Max Month	3.2	2.3	0.9	2.1

Notes:
(a) Assuming zero digesters out of service
(b) Assuming one 1.16 mg digester out of service

Considering the provision for future growth through 2030, combined with the long term need for redundancy, the capacity of the new digester would be about 2 MG provided the District wants to maintain the opportunity to have one of the digesters out of service at any time of the year. ***However, if the District is prepared to schedule shut downs to occur only during the dry season the new digester could have a capacity the same as the existing.***

ITEM 5A

Digester Sizing Considering Hydraulic Detention Time and Redundancy

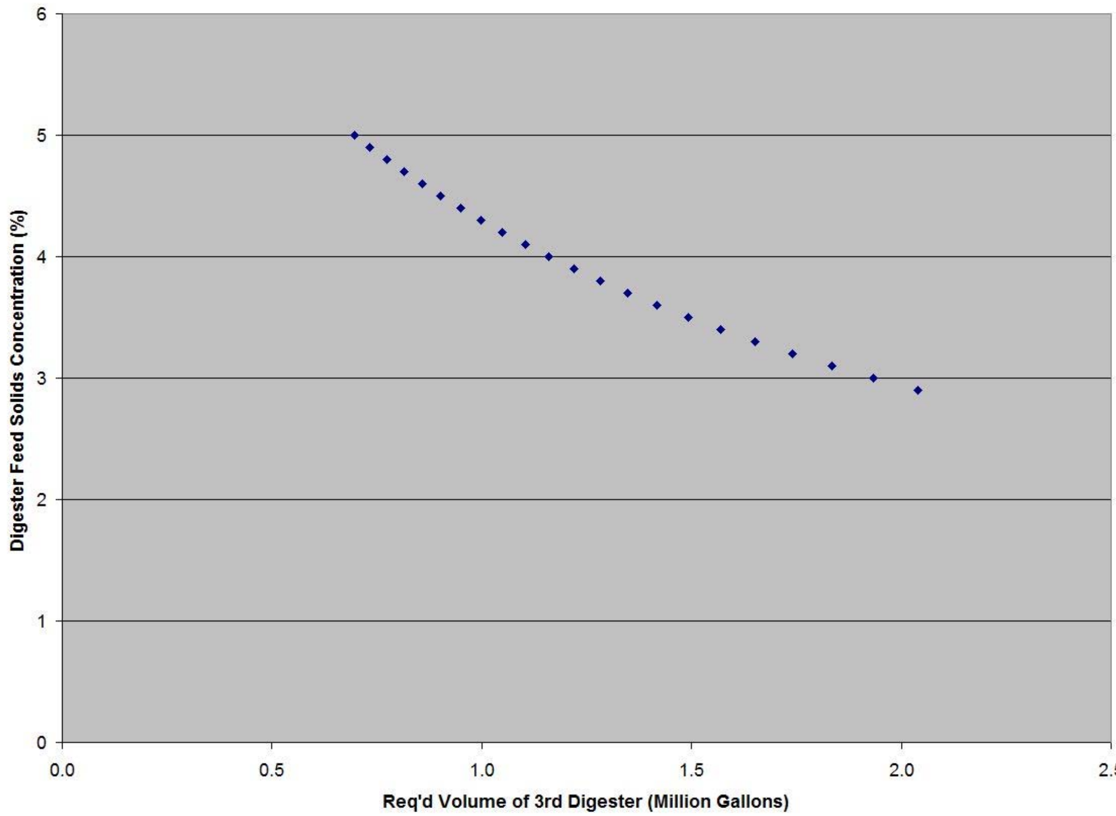


Dig #1	Dig #2	**Dig #3**
1.16 MG	1.16 MG	**2.1 MG**

The need for redundancy in combination with the provision for future growth suggests a digester larger than the minimum 1.16 MG that is required for redundancy alone. An alternative of using thickening at the Rancho site to reduce the sludge volume sent to the digesters, and thereby increasing the hydraulic detention time, warrants consideration. Due to pressure concerns in the sludge line between Tapia and Rancho the solids concentration pumped to Rancho is generally kept below 3 percent.

The potential impacts of thickening on digester sizing requirements, based on hydraulic detention time, are illustrated in Figure 2-2 below. The graph shows that, using the sizing criteria of a projected maximum month in the year 2030 and one digester out of service for maintenance, if the feed sludge is thickened to about 4 percent, then a Third Digester of 1.16 MG (same as existing two digesters) would meet the District's needs.

FIGURE 2-2
IMPACT OF THICKENING ON DIGESTER SIZING



2.1.2.2 Volatile Solids Loading

In an anaerobic digester, it is through the metabolic breakdown of volatile solids that characteristic populations of acetogenic and methanogenic microbes proliferate and out-compete undesirable pathogenic populations. The benefits of this destruction of volatile solids are considerable:

- Production of renewable fuel in the form of methane as a byproduct
- Reduced volume of solids to dispose after digestion
- Production of highly stabilized solids with reduced odor and vector potential
- Notable reduction in the pathogenic microbial population

The upper limits for volatile solids loading are associated with the rate of activity in the digester which can create conditions in the digester that are toxic to methanogenic bacteria. The toxicity is generally related to accumulation of ammonia or volatile acids in the digesting liquid. Typically, volatile solids are degraded to volatile acids and metabolized to release methane and carbon dioxide in an anaerobic digester.

Two main microbial populations dominate in an anaerobic digester; acid formers that form short-chain organic acids and methane formers that convert organic acids to methane and carbon dioxide. The methane formers tend to metabolize waste slower than the acid formers which, at high loadings, can result in the accumulation of organic or volatile acids, accompanied by a drop in pH. Many conditions impact the dynamics in a digester. Alkalinity, from the source water and metabolic breakdown of proteins, tends to stabilize pH.

Because sludge feeds to digesters at wastewater treatment plants are typically dilute (5 percent solids or less), the actual volatile solids (VS) loading on most municipal digesters is less than 0.1 lbs of VS per cubic foot of tank volume per day. The recommended upper limit on VS loading has, as noted above, historically been related to the chemistry in the digester; volatile acid production from the breakdown of VS and the buffering capacity of the source water.

Although excessive volatile solids loadings can result in the development of inhibitory conditions in a digester, it is not operationally advantageous to try to operate at a low solids loading. Rather the biology of an anaerobic digester is most stable and yields the best results if the microbiology is highly active and growing rapidly. That activity is dependent on ideal temperature combined with a constant supply of digestible food (volatile solids).

Determination of the ideal VS loading rate for any particular digestion system is best done empirically. The ideal range for volatile solids loading is dependent on the following key factors:

- Temperature
- Digestibility of the VS (food supply)
- Effectiveness of mixing the biomass and VS
- Hydraulic detention time

The importance of temperature is discussed in Section 3 of this report and mixing is the subject matter for Section 4. Digestibility varies with the waste stream fed to the digester but significant data exists on the degradation rates for typical primary and secondary biosolids. In a well-fed, well-operated anaerobic digester, most of the metabolic breakdown of biosolids occurs in the first few days. Even complex fats and oils, like peanut oil, breakdown quite rapidly in a digester conditioned to handle the particular waste.

The actual total solids loading to the digesters in 2010/11 and the projection of total solids loading to the digesters in 2030 are tabulated in Table 2-3.

TABLE 2-3
SOLIDS LOADING TO DIGESTERS

Planning Horizon	Avg Tapia Flow[(a)]	Pounds Flow to Dig[(b)]	Max Month[(c)]	Solids[(d)]
2010-11	9	86,000	120,000	28,000
2030	12	**114,000**	**160,000**	**37,000**

Notes:
(a) Maximum 30-day average dry weather flow (MGD)
(b) Average daily flow to digesters (gpd)
(c) Maximum 30-day average flow to digesters (gpd)
(d) Pounds of total solids per day for Max Month based on average solids concentration of 2.8 percent

Considering the above projections for pounds (lbs) of solids to the digesters, and assuming that the volatile content of the solids is 80 percent, Table 2-4 represents a tabulation of the projected VS loading on the digesters for 2030.

TABLE 2-4
PROJECTED VS LOADING FOR 2030[(a)]

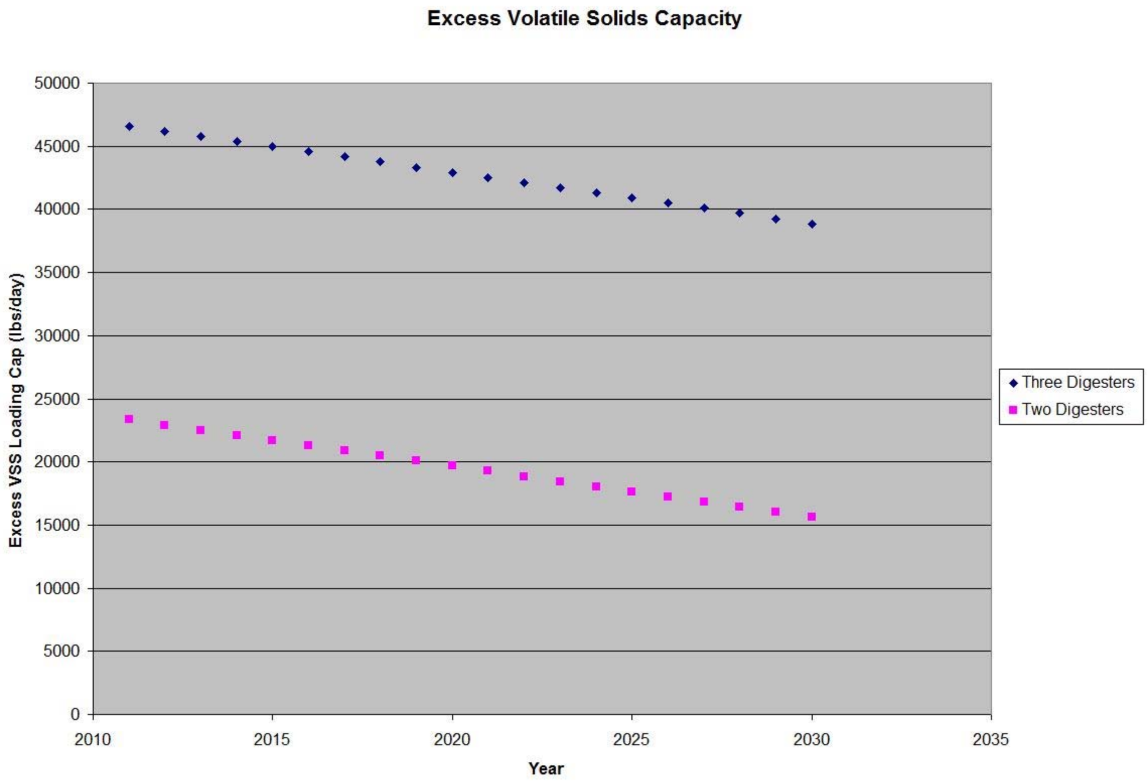
	3 – 1.16 MG Dig		2-1.16 MG and 1- 2 MG Dig	
2030 Design Criteria	All Units Active	One Unit Inactive	All Units Active	One 1.16 MG Unit Inactive
Avg Flow	0.047	0.071	0.038	0.050
Max Month	0.066	0.100	0.053	0.070

Note:
(a) VS Loading = (flow to dig)(8.33)(2.9%)(80%)/(133,700 ft3/mg)(dig vol in mg)

Considering the foregoing analysis of digester system capacity based on hydraulic detention time and volatile solids loading, the sizing of the new Third Digester will be determined based on the hydraulic detention time and the need to provide unit redundancy. With a digestion system sized for the Max Month or Average Flow and Redundancy scenarios considered above, and considering the 2030 planning horizon, the volatile solids loading, from biosolids alone will never approach a practical upper design limit of 0.15 lbs/ft3/day.

Following are graphs to illustrate the un-utilized volatile solids loading capacity for possible Rancho digestion systems sized volumetrically to meet the requirements for redundancy and hydraulic detention time. It is this excess volatile solids capacity that could be exploited to produce additional digester gas through the addition of high strength waste streams, like Fats, Oils and Grease (FOG) and food waste (discussed in Section 5).

FIGURE 2-3
EXCESS VOLATILE SOLIDS CAPACITY



These graphs illustrate that a Rancho digestion system designed to meet the requirements for hydraulic detention time and redundancy will be substantially oversized with regard to volatile solids loading. This apparent discrepancy is primarily related to the dilute concentration of the sludge from Tapia. The excess volatile solids capacity can be addressed in a couple ways; the sludge feed to the digesters could be thickened to remove water, as illustrated above or the volatile solids gap could be beneficially filled by introducing high carbon, low volume waste streams such as FOG and food waste.

2.1.3 Provision for Increased Digester Gas Production

With the installation of the new cogeneration facilities, the District has the ability to put excess digester gas to beneficial use. Currently, there is unused capacity in the cogeneration engine due to an insufficient supply of digester gas. Following are the three primary approaches to enhancing digester gas production:

- Maximize the volatile solids destruction efficiency in the digesters
- Maximize the digestibility of the biosolids fed to the digesters
- Maximize the amount of digestible volatile solids fed to the digesters

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Each of those three approaches are discussed below as they relate to the Rancho site and facilities.

2.1.3.1 Maximizing VS Destruction Efficiency

Maximum volatile solids destruction and, consequently methane production, relate to maintaining ideal conditions for a highly active biomass at all times in the digester.

Maintaining ideal mesophillic temperature is critical to maximum methane production. See Section 3 of this report for that discussion. A variation of just a few degrees from the ideal range, high or low, can result in a 30 percent drop in methane production.

In addition to temperature, it is critical for a highly active biomass that the food (digestible material) is thoroughly and continuously mixed with the biology. Kennedy/Jenks believes that the pump mixing system, similar to that installed on Digesters Nos. 1 and 2 at Rancho, is the most effective system for providing the required thorough mixing. Pump mixing systems are efficient for transferring energy to the digester contents and distributing that energy evenly in the tank. A discussion of the approach to pump mixing for this project is presented in Section 4.

2.1.3.2 Maximizing Digestibility of Biosolids

Typically, mixed primary and secondary sludge is about 80 percent volatile solids as measured by the Standard Methods volatile solids test. This test measures all organic matter that will burn off at temperatures up to 550 degrees C. Of the 80 percent volatile content, usually only about 55 to 58 percent of the volatiles are readily digestible. The un-digestible portion generally consists of the following

- Highly stable organics like cellulose or
- Inaccessible organics like cell matter that is enclosed in a stable cell wall.

Pre-conditioning processes have been developed that can break down cellulosic compounds and make them available for conventional mesophillic digestion. These processes usually require some combination of temperature and/or pressure conditioning or enzyme treatment.

Contained within the typical microbial cell wall are organic materials that are readily degraded in anaerobic digesters. However, these organics remain inaccessible unless the cell wall is breached. Various approaches have been tested to compromise the cell wall and increase digester gas production. For some mechanical or ultrasonic processes the energy input proved similar to the output. However, research has continued and an approach using an electrical field to penetrate cell walls has yielded favorable results in full scale application on waste activated sludge. These results suggest that VS destruction rates in the digester can be increased by about ten percentage points; possibly for a typical 58 percent VS destruction up to 68 percent destruction.

2.1.3.3 Maximizing the Amount of Digestible Volatile Solids

In recent years many successful FOG digestion programs have been started. FOG, commonly referred to as brown grease, consists of the contents of collection systems grease traps and interceptors. The contents of the traps are pumped out into 3,000 to 50,000 gallon tank trucks for transport and disposal.

ITEM 5A

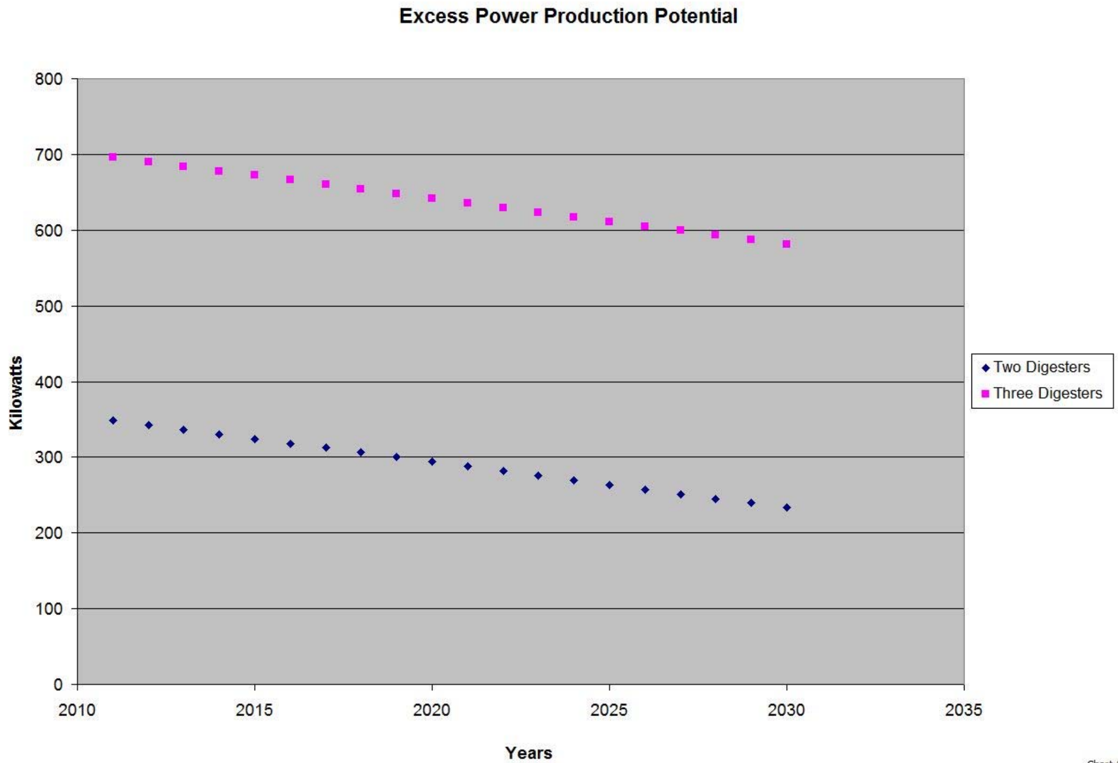
With appropriate provisions for mixing, a mesophillic digester is capable of degrading the typical long chain fatty acids contained in FOG. FOG is generally a concentrated source of highly digestible volatile solids. When properly mixed into a conditioned digester, FOG can yield significant quantities of beneficial methane.

Food waste is another high-carbon waste stream that has been identified and tested full-scale as a digestible waste that can increase gas production from a digester. Both FOG and food waste are discussed in more detail in Section 5 of this report.

One of the advantageous characteristics of FOG, food waste, and some other waste streams, is that they are rich in fuel value for a digester while being low in volume. These waste streams typically have very little impact on hydraulic detention time but do influence volatile solids loading. Since the controlling design criterion for the digesters at the Rancho site is hydraulic detention time, waste streams with high volatile solids content and low volume can easily be accommodated.

On average FOG has about four times the volatile solids content (about 0.8 lbs/gal for FOG vs 0.2 lbs/gal for Tapia sludge), per unit volume, as compared to the sludge from Tapia. Therefore, the addition of FOG, or a similar high carbon waste, to the Rancho digesters will beneficially impact the balance of the key design criteria; **hydraulic detention time** and **volatile solids loading** while increasing digester gas production. Figure 2-4 illustrates the potential for FOG (or similar waste) addition to the digesters for various sizing scenarios along with the projected gas production.

FIGURE 2-4
POTENTIAL FOR INCREASED GAS PRODUCTION FROM FOG



2.1.4 Summary of Capacity Considerations

Table 2-5 summarizes the three key considerations that influence the sizing decisions for the Third Digester.

TABLE 2-5
COMBINED REDUNDANCY AND HYDRAULIC DETENTION TIME

Design Sizing Scenario	Third Dig. Capacity (MG)	Detention Time[a] (days)
1. Redundancy @ current ADWF	1.16	27
2. Redundancy @ current Max Month	1.16	19
3. Redundancy @ 2030 ADWF	1.16	20
4. Redundancy @ 2030 Max Month	2.10[b]	20
5. Redundancy @ 2030 Max Month w/Thickening	1.16	20[c]

Notes:
(a) With one 1.16 mg digester out of service
(b) Options include 1 – 2.1 mg digester or 2 – 1.16 mg digesters
(c) Thickening to 4 % at Rancho site

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2.1.4.1 Recommendations for Sizing of Third Digester

Design Scenarios Nos. 1 and 2 above show that, for the **current flow conditions at Tapia (2011)**, a Third Digester matching the existing two with a size of 1.16 MG will meet the critical design criteria for redundancy and detention time.

Design Scenarios Nos. 3, 4 and 5, for the **projected 2030 flow conditions at Tapia,** identify three reasons to recommend to the District that this proposed Third Digester should be sized at 1.16 MG, even when considering the 2030 planning horizon.

Design Sizing Scenario No. 3 (Redundancy @ 2030 ADWF) – Since the Max Month Flows were caused by elective, and atypical, operational decisions at Tapia, the District could plan for a future digester shut down window during which the Max Month conditions at Tapia would not be realized. Two (2) 1.16 MG digesters can handle the projected average dry weather sludge flow from Tapia.

Design Sizing Scenario No. 4 (Redundancy @ 2030 Max Month) – Two (2) 1.16 MG digesters can handle the current Max Month flows while providing adequate detention time. In the years ahead, if the flows from Tapia increase as the service area develops further, the District could construct a fourth digester to handle the Max Month flow.

Design Sizing Scenario No. 5 (Redundancy @ 2030 Max Month w/Thickening) - Two (2) 1.16 MG digesters can handle the current Max Month flows while providing adequate detention time. In the years ahead, if the flows from Tapia increase as the area develops further, the District could construct thickening facilities at Rancho which would serve to maintain adequate detention time in two digesters, while one digester is out of service.

CAPACITY RECOMMENDATION – At this time the District should construct a third 1.16 MG digester.

This sizing recommendation creates minimal financial risk for the District as follows:

A Third 1.16 MG Digester is the smallest required for meeting redundancy needs.

The need for 3.2 MG of digester capacity, with one out of service (see Table 2-2), may not develop in the future. Growth in the service area has slowed and unit wastewater generation rates have generally dropped in California. Therefore, the firm 2.3 MG of capacity provided by two (2) 1.16 MG digesters, with one out of service, could provide adequate capacity well into the future. Also, as noted above, the digesters provide substantial volatile solids loading capacity to accommodate a program to increase gas production by receiving high strength waste streams.

If flows from Tapia do increase in the future to the point that two (2) digesters are inadequate, the District has the three reasonable options, in likely ascending order of cost:

- Modify operations practices at Tapia to reduce the Max Month flows
- Provide thickening facilities at Rancho
- Construct a fourth digester

2.2 Digester Sizing and Dimensions

As mentioned previously, the sizing and dimensions of the new digester are stipulated in the EIR; they restrict the digester to a diameter of 80 feet, and height (visual, above grade) of approximately 20 feet. Note that this height restriction is above grade and does not restrict the below grade depth. Therefore, increasing depth below grade will be the primary means for increasing tank capacity.

Assuming a sludge volume of 1.16 MG, and an 80-foot diameter tank, the required water depth is approximately 30 feet (34 feet of wall height including freeboard). Pending a decision for the type of digester cover (flat versus dome), the overall height of the structure could potentially increase by a few feet (4 to 8 feet for a dome cover). To meet the height restriction set forth in the EIR, the digester will need to be 12 to 20 feet below grade.

2.3 Digester Structural Considerations

The following structural design requirements will be utilized for the design of a Third Digester at the Rancho site. The digester is anticipated to be a reinforced concrete or prestressed concrete circular tank, approximately 34 feet in sidewall height. The roof is anticipated to be either a shallow slope steel dome roof or a flat panel concrete roof with intermediate columns and drop panels. The tank is anticipated to resist approximately 10 feet of soil load on the outside and be founded at least 10 feet below grade.

2.3.1 General Design Requirements

This section prescribes structural design requirements applicable to the proposed improvements.

Buildings and treatment structures, including elements of these structures, may be designed utilizing allowable stress design, strength design, or load and resistance factor design. Allowable stress design is a method of proportioning structural elements such that computed stresses produced in the elements by the allowable stress load combinations do not exceed specified allowable stresses (also called working stress design). Load and Resistance Factor Design (LRFD) (known as strength design for certain materials) is a method of proportioning structural elements using load and resistance factors such that no applicable limit state is reached when the structure is subjected to all appropriate load combinations. The term LRFD is used in the design of steel and wood structures.

2.3.2 Codes and Standards

The building codes and standards listed below may be utilized in the design of buildings and treatment structures or elements of these structures.

- 2010 California Building Code, Title 24, Part 2, Volume 2, International Code Council and California Building Standards Commission, 2009.
- 2009 International Building Code, Volume 1, Administrative, Fire- and Life-Safety, and Field Inspection Provisions, International Code Council, 2009.

- 2009 International Building Code, Volume 2, Structural Engineering Design Provisions, International Code Council, 2009.
- Minimum Design Loads for Buildings and Other Structures, ASCE Standard, ANSI/ASCE 7-05, Revision of ASCE 7-02, American Society of Civil Engineers, 2005.
- Standard Specifications for Highway Bridges, Fifteenth Edition, American Association of State Highway and Transportation Officials, Inc., 1992.
- Building Code Requirements for Reinforced Concrete (ACI 318-08) and Commentary (ACI 318R-08), American Concrete Institute.
- Environmental Engineering Concrete Structures (ACI 350R-06), Reported by ACI Committee 350, American Concrete Institute, 2006.
- Seismic Design of Liquid-Containing Concrete Structures (ACI 350.3-06), Reported by ACI Committee 350, American Concrete Institute, 2006.
- Manual of Steel Construction, Specification for Structural Steel Buildings with Commentary, Allowable Stress Design and LRFD, American Institute of Steel Construction, Inc., Thirteenth Edition, 2005.

2.3.3 Design Loads

- Dead Loads: Dead loads shall consist of the weight of all materials and fixed equipment incorporated into the building or other structure.
- Live Loads: Live loads are those loads produced by the use and occupancy of the building or structure and do not include dead load, construction load, or environmental loads such as wind load, snow load, rain load, earthquake load or flood load. Floors shall be designed for the unit loads in Table 2-6.

TABLE 2-6
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS AND MINIMUM CONCENTRATED LIVE LOADS

Occupancy or Use	Uniform (psf)	Concentrated (lbs)
Catwalks for maintenance access	40	300
Fixed Ladders		300
Handrails, guardrails, and grab bars	50	200
Roofs (uniform load subject to reduction for area and pitch)	20	2,000
Sidewalks, vehicular driveways	250	8,000
Stairs and exit-ways	100	300/tread
Storage areas above ceilings	20	-
Light manufacturing or storage warehouse	125	2,000
Walkways and elevated platforms	60	-

For additional loads not indicated in Table 2-6, design for the unit loads will be as set forth in ASCE 7-05, Table 4-1. Concrete floor slabs-on-grade should not be less than those given for heavy manufacturing or storage warehouse; 250 pounds per square foot (psf) uniform load and 3,000 pound (lb) concentrated load except in areas where vehicles may access and then the concentrated load should be increased to 8,000 lbs. Floor live loads in equipment rooms, pump rooms, electrical rooms, and areas where equipment may be moved to various locations should be not less than those given for light manufacturing or storage warehouse; 125 psf uniform load and 2,000 lb concentrated load. Live loads for grated and plated areas should equal or exceed the corresponding floor live load for the given area. Access hatches should equal or exceed the corresponding floor live load for the given area.

Vehicle loads shall be in accordance with the latest edition of the AASHTO Standard Specifications for Highway Bridges. There are four standard classes of highway loading: H 20, H 15, HS 20, and HS 15. Loadings H 15 and HS 15 are 75 percent of loadings H 20 and HS 20, respectively. The H loadings are for two axle trucks and the HS loadings are for a tractor truck with a semi-trailer. The maximum axle loading for an H 20 or HS 20 vehicle is 32,000 lbs and the maximum axle loading for an H 15 or HS 15 vehicle is 24,000 lbs.

- Snow Loads: Not applicable.
- Wind Loads: Buildings and treatment structures less than 60 feet in height should be designed in accordance with ASCE 7-05 Chapter 6 for wind effects based on the factors identified in Table 2-7.

TABLE 2-7
WIND LOAD DESIGN REQUIREMENTS AND CRITERIA

Description of Coefficient	Coefficient
Exposure (flat and generally open terrain)	C
Basic wind speed, mph	85
Combined height, exposure, gust factor	$\lambda = 1.29$
Topographic Factor	$K_{ZT} = 1.0$
Wind Importance Factor	$I_W = 1.15$

- Earthquake Loads: Buildings and treatment structures will be designed to resist the effects of earthquake ground motions in accordance with adopted building codes and national standards for non-building structures. The purpose of the earthquake provisions in building codes is primarily to safeguard against major structural failures and loss of life, not to limit damage or maintain function. The design basis ground motion utilized in the design of the buildings and treatment structures is that ground motion that has a 10 percent chance of being exceeded in 50 years. The design of new buildings and the earthquake forces shall be determined considering seismic design category, site characteristics, occupancy, configuration, structural system and building height. The existing buildings and new buildings are primarily bearing wall structural systems with CMU shear walls utilized as the lateral force resisting system. Existing and new buildings typically have flexible roof diaphragms of either plywood or structural metal materials. Seismic load design requirements and criteria are summarized in Table 2-8.

TABLE 2-8
SEISMIC LOAD DESIGN REQUIREMENTS AND CRITERIA

Description of Coefficient	Coefficient
Occupancy Category	III
Seismic Importance Factor, S_S	1.601
Seismic Importance Factor, S_1	0.648
Soil Profile	Sc
Soil Coefficient F_A	1.0
Soil Coefficient F_v	1.3
Seismic Coefficient, S_{DS}	1.067
Seismic Coefficient, S_{D1}	0.562
Seismic Design Category	D

Hydraulic structures are considered special structures by the building codes and require special consideration for their response characteristics and environment that is not covered by most building codes. Earthquake loads for non-building liquid containing concrete structures should be determined utilizing ACI 350.3-06 Standard. It should be noted that the ACI 350 standard provides results at working stress levels, which are lower than the seismic forces obtained from the 2006 IBC, which are at strength levels. In addition to calculating the seismic loads on rectangular and circular liquid containing concrete structures, the ACI 350.3 standard will be utilized for determining the freeboard associated with the maximum wave oscillation generated by earthquake acceleration.

- Other Minimum Loads: In addition to the loads listed above, buildings and non-building structures will be designed to resist other loads including fluid pressures, hydrostatic uplift, lateral soil pressures, ponding loads, and self-straining forces.

2.3.4 Structural Tests and Inspections

Structural tests and inspections shall be provided for certain types of work. The drawings and the technical specifications will provide detailed information on the quality assurance and testing and inspection requirements for different materials in the shop and in the field.

- Special Inspections: Special inspections for certain materials of construction or procedures will be provided as noted on the Special Inspection and Testing Schedule on the Structural Drawings.

- Structural Observation: Structural observation by a registered design professional shall be provided for all new construction for buildings and non-building structures in Seismic Design Category D, E or F when facilities are in occupancy category, III or IV, or when designated by the engineer of record or the local building official. Structural observation will be required for this structure due to its occupancy category and seismic design category.

2.3.5 Foundations

The foundation for this digester is anticipated to be either a mat foundation or a continuous foundation at the wall with isolated foundations for any columns needed for the roof.

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2.3.6 Concrete Structures

Concrete buildings shall be designed in accordance with Chapter 19 of the IBC and Building Code Requirements for Reinforced Concrete (ACI 318-05) published by the American Concrete Institute. Concrete treatment structures shall be designed in accordance with the ACI Standard Environmental Engineering Concrete Structures (ACI 350R-06) published by the American Concrete Institute. Different types of concrete may be utilized where different compressive strengths are required or where different performance requirements are required of the mix design. In general, one or more of the mix designs shown in Table 2-9 may be utilized for concrete building and treatment structure construction:

TABLE 2-9
CONCRETE MIX DESIGN TYPES

Concrete Type	A	B	C	D	E
Specified 28-Day Compressive Strength (lb/in2)	4,000	4,500	4,000	4,500	2,500
Maximum Coarse Aggregate Size (in)	1-1/2	1-1/2	1	1	1
Air Content at Point of Placement (%)	5-1/2	5-1/2	1	4-1/2	1
Maximum Water-Cementitious Material Ratio	0.45	0.40	0.50	0.45	0.55
Minimum Cementitious Material Content (lb/yd3)	530	590	570	570	510
Maximum 28-Day Drying Shrinkage (%)	0.05	0.05	--	--	--

Type A and B concretes are typically utilized for non-building liquid-containing structures. Type A concrete is for normal sanitary exposure where crack width is intended to be limited to 0.01 inches. Type B concrete is for severe sanitary exposure where crack width is intended to be limited to 0.0085 inches. Type C and D concretes are typically utilized for buildings. Type C concrete is a basic building concrete. Type D concrete is concrete for severe weather conditions with significant freezing and thawing. Type E concrete will be used when strength and durability are not requirements such as for sidewalks, curbs, bollards and other non-structural concrete.

2.3.6.1 Conventionally Reinforced versus Prestressed Tanks

There are two distinct structural systems primarily used for round concrete tanks in the Western United States, a conventionally reinforced Cast-in-Place concrete tank, and a vertically prestressed, strand or wire wound prestressed concrete tank. Each system has advantages and disadvantages for the application here. In many ways, however, the systems are both suited to the proposed application. Both systems would have a circular wall concrete tank, support the proposed steel roof system, allow the necessary buried depth, and provide adequate durability and structural performance for this application and location.

The advantages of the conventionally reinforced concrete system include flexibility in layout, reduced specialty equipment, and the potential for more bidders and reduced cost for portions of the job. These tanks are conventionally formed and cast, allowing the same flexibility for pipe placement, now or in the future, allowed by any conventional means. No specialized wrapping or stressing equipment is necessary, making the tank construction accessible to a broader set of contractors. Modifications and repairs to conventional tanks do require the cutting of reinforcing steel and the potential for strengthening of the tank around the opening but when compared to prestressed tanks the modifications easier and do not require specialized equipment. In addition, these tanks can be cost competitive in certain situations, especially for smaller tanks.

Conventionally reinforced tanks offer a few disadvantages as well. Since the tanks are not prestressed, the wall is in tension when the tank is filled. To limit cracking, and the potential degradation from such cracking, additional reinforcing steel is needed in the wall, making the system more costly at higher volumes. Additionally, this approach is not as effective at limiting cracking as prestressing, so the system is less durable over the long term, although both systems can be expected to perform adequately over 50 to 100 years in service, a conventional system might require more maintenance towards the tail end of that expected life span.

There are several prestressed concrete tank contractors offering two distinct types of prestressed concrete tanks; a precast, tilt up tank with a metal membrane in the walls, and a cast in place tank with no steel membrane. A decision as to whether to pursue one, or both, of these systems would be made in final design if a prestressed tank system is selected. The advantages of prestressed concrete tanks include efficiency of materials, improved durability, and consistent quality of product. The prestressed system allows the use of reduced amounts of conventional reinforcing and concrete, reducing cost for higher volume tanks. The system also provides consistent compression on the wall, which controls cracking and improved durability. Finally, due to the limited number of contractors who perform the prestressing work, the quality of tank produced is generally consistently high.

The prestressed system does have some disadvantages. The system is less flexible for placement of piping penetrations in the future, requiring that a prestressing contractor be engaged to modify the tank for any penetrations. In addition, the specialized equipment can cause the cost of smaller tanks to be higher due to the mobilization cost. Fortunately, the market for tanks is very competitive, so the limited number of prestressing contractors does not tend to drive the price of tanks higher.

2.3.7 Seismic Anchorage design

Anchorage of Equipment is referenced in the IBC from Chapter 13 of ASCE 7-05. In accordance with this standard, design of equipment attachment is required for higher risk seismic areas (Seismic Design Categories D, E and F) for the following pieces of equipment:

- Any equipment with a component importance factor I_P greater than 1.0. This includes all equipment necessary for storage or distribution of fire water and all equipment related to the handling of hazardous materials and any fire suppression systems.
- Any equipment without flexible connections to associated piping ductwork or conduits.
- Any equipment weighing more than 400 lbs.
- Any equipment mounted more than 4 feet above the floor and weighing more than 20 lbs, or 5 lb/ft for distribution systems.

2.4 Digester Cover Alternatives

2.4.1 Digester Cover Alternatives

The existing digesters at Rancho use a flat concrete cover supported by internal columns. Four different cover alternatives were evaluated for the new 3rd digester. The results of the evaluation, including a description of the alternative, advantages, disadvantages, and costs are included in this section. A recommended alternative is provided at the end of the section.

2.4.1.1 Alternative 1 – Fixed Steel Cover with External Supports

Fixed steel covers consist of radial steel supports converging on a central compression ring. At the tank wall, a skirt plate is provided for a gas seal, and a thrust ring carries all radial loads and prevents radial load transmittal to the tank wall. Alternative 1 is a fixed steel cover that is characterized by an external support system. The radial steel supports, typically tube steel, are welded to the exterior side of the cover plates. The cover is anchored to the top of the digester wall using between 20 and 30 steel outriggers and is self-supporting, requiring no interior columns. The outriggers are designed to allow differential movement, including thermal expansion and contraction, between the steel cover and the concrete wall. Fixed steel covers are most commonly applied to digesters where little variation in liquid level or sludge volume is expected.

2.4.1.1.1 Advantages

Flexible installation. The steel cover can be installed using two different methods. The first method would involve lowering the pieces of the cover into the base of the digester, assembling the pieces, and hoisting the assembled cover into place with some type of jacking system (see Figure 2-5). The second method would involve assembling the cover outside of the digester and hoisting into place with a crane.

FIGURE 2-5
INSTALLATION OF FIXED STEEL COVER WITH EXTERNAL SUPPORT SYSTEM

Reduced coating effort. Since the support system is located on the exterior surface of the cover, the interior surface is entirely smooth. The result of this smooth surface is a reduced effort involved in coating the underside of the cover (relative to fixed steel covers with internal support systems). Coatings can be spray or brush applied in a minimal amount of time due to the absence of multiple welded joints, as shown in Figure 2-6.

FIGURE 2-6
COATING OF FIXED STEEL COVER WITH EXTERNAL SUPPORT SYSTEM

Reduced potential for corrosion. Harsh conditions exist inside a digester, and iron-based materials can rapidly corrode if not adequately protected. A properly applied coating system provides a reduced potential for corrosion of these steel surfaces. Interior supports present an application challenge that often results in inadequate protection of the steel. Exterior supports limit the extent of this potential.

2.4.1.1.2 Disadvantages

Tripping hazard. An external steel support has the potential to become a tripping hazard, as it normally extends approximately 4” above the main shell of the cover. This hazard is greatly reduced, if not eliminated, by the use of a foamed roofing product. Foamed roofing fills the voids between external supports as well as provides an important layer of insulation for the digester. High-tensile fabric and grit are often encapsulated in the foam to provide a non-slip walking surface.

Long lead time. Two of the key manufacturers of this particular cover have indicated that the lead time for fabrication and delivery is longer than a comparable cover with internal steel supports. This significance of this factor is a function of project schedule.

Increased costs. For the size of cover appropriate for the Third Digester (80’ diameter), the materials and installation costs for the cover alone are comparable to concrete covers. However, the need for robust coating of the underside of the dome, along with the foam insulation on top of the dome make this Alternative more costly than concrete covers (without coating).

2.4.1.2 Alternative 2 – Fixed Steel Cover with Internal Supports

Alternative 2 is a fixed steel cover that is identical to Alternative 1, with the exception that the support system for this cover is welded to the underside of the shell. The radial steel supports,

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typically tube steel, are welded to the interior side of the cover plates. This particular style of steel cover is the most common used in the industry today.

2.4.1.2.1 Advantages

Flexible installation. The steel cover could be installed using two different methods. The first method would involve lowering the pieces of the cover into the base of the digester, assembling the pieces, and hoisting the assembled cover into place with some type of jacking system. The second method would involve assembling the cover outside of the digester and hoisting into place with a crane.

Multiple insulation options. The smooth exterior of this particular cover allows for installation of various types of insulating materials. Although foamed roofing would be recommended, composite roofing or a mortar-type roofing system are other options. Figure 2-7 shows a fixed steel cover with internal supports on a digester in Redwood City, California. Foamed roofing and a non-slip walkway have been applied to the shell of the cover.

FIGURE 2-7
FIXED STEEL COVER WITH INTERNAL SUPPORTS
AND FOAMED ROOFING

2.4.1.2.2 Disadvantages

Increased coating effort. Since the support system is located on the interior of the cover, significant effort is involved in applying an effective coating system to the underside of the cover. Coatings can be spray, but many of the welded joints must be brushed by hand to verify adequate coverage. Coating the interior surfaces of this particular cover involves 3 to 4 times more labor than Alternative 1, which results in extra cost.

Increased potential for corrosion. Harsh conditions exist inside a digester, and iron-based materials can rapidly corrode if not adequately protected. A properly applied coating system

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provides a reduced potential for corrosion of these steel surfaces. Interior supports present an application challenge that often results in inadequate protection of the steel.

Increased costs. The associated costs for the construction of this Alternative are similar to Alternative 1, with a slight escalation as a result of the increased coating effort on the underside of the dome.

2.4.1.3 Alternative 3 – Fixed Concrete Flat Cover

Pictured in Figure 2-8 shows the existing fixed concrete flat cover on Digester 1 at Rancho. Concrete covers are normally installed on new digesters (as opposed to retrofitting existing digesters) because it is more cost-effective to tie-in and form the cover while forming the digester walls. Many treatment plants are operating digesters with original concrete covers that have been in service for more than 50 years.

FIGURE 2-8
FIXED CONCRETE FLAT COVER

2.4.1.3.1 Advantages

Clean appearance. Concrete covers generally have a clean aesthetic appearance, without the need for additional coatings.

Reduced costs. For new applications, concrete covers are typically less expensive to construct than their steel counterparts, primarily due to the absence of expensive coatings on the underside of the cover.

Reduced corrosion potential. The oxygen-free environment inside the digester provides an advantage to the concrete over steel in regards to reduced corrosion potential.

2.4.1.3.2 Disadvantages

Extended construction period. The construction period of the digester will increase due to the length of time associated with forming and curing the concrete cover.

Requires support columns. In order to support a concrete cover, intermediate concrete columns may need to be installed inside the digester. Along with an increase in cost, introduction of these obstructions may slightly affect mixing efficiency, although the affect may be too trivial to quantify.

2.4.1.4 Alternative 4 – Fixed Concrete Dome Covers

Pictured in Figure 2-9 is an example of a fixed concrete dome cover. The picture is of a digester installation in San Antonio, TX. As mentioned previously, concrete covers are normally installed on new digesters because it is more cost-effective to tie-in and form the cover while forming the digester walls. Concrete dome covers differ from flat covers in that because of the inherent structural strength of the dome, no internal support columns are required.

FIGURE 2-9
FIXED CONCRETE DOME COVER

2.4.1.4.1 Advantages

Clean appearance. Concrete covers generally have a clean aesthetic appearance, without the need for additional coatings.

No internal support columns. The structural characteristic of a dome cover keep it in compression, and eliminate the need for internal support columns (i.e., it is self-supporting).

More cost effective than a concrete flat cover. As a result of eliminating the internal support columns, along with a thinner concrete depth, the concrete dome cover is a more cost effective option than Alternative 3. However, for this project, due to the 6 – 8 foot rise from the edge to center of dome, extra excavation will be required to meet the environmental height requirements.

2.4.1.4.2 Disadvantages

Extended construction period. The construction period of the digester will increase due to the length of time associated with forming and curing the concrete cover. However, because the dome cover has less concrete and because no internal support columns are needed, the construction time may be slightly less than Alternative 3.

2.4.1.5 Recommended Alternative

Operationally, for this application, there are no significantly distinct advantages or disadvantages in selecting any of the cover alternatives. Economically, the Concrete Flat Cover offers the most cost effective advantage, and reduction in likelihood for long-term corrosion issues. Also, this alternative provides the District with a cover system that closely mimics their existing digesters, while helping to meet the stringent environmental constraints (overall structure height). Pictured in Figure 2-10 is a Fixed Flat Concrete Cover in Daly City, CA.

FIGURE 2-10
FINISHED FIXED FLAT CONCRETE COVER

2.5 Interior Coatings

A recommendation for interior coatings is somewhat dependent upon the selection of the digester cover. For example, for a fixed steel cover, Kennedy/Jenks recommends the use of a robust interior coating to counteract the destructive characteristics of the harsh environment inside the digester. The use of 80 to 120 mils of elastomeric polyurethane on the underside of the steel digester cover is recommended for application. We have had experience with this durable protective coating staying intact for several years. For example, we recently investigated the interior of a digester located in San Leandro, CA, which applied the elastomeric

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polyurethane coating system over 17 years ago; the results of the investigation showed the coating was still in-tact, with only minor repairs needed.

However, if the recommended cover alternative (concrete flat cover) is selected for this project, the District can then forgo the application of an interior coating, resulting in a savings of approximately $400,000.

2.6 Foam insulation (Steel Cover)

For use with steel covers, Kennedy/Jenks recommends the use of a foamed insulation system to minimize heat loss, comprised of the following:

- Primer – epoxy coating designed to bond roofing system components to steel substrates.
- Spray Urethane foam (insulation) – two component, high density, liquid applied, sprayable type.
- Elastomeric coating (waterproof membrane and protective coating for the insulation) – 100 percent elastomer coating with reinforcing laminar pigments.
- Walkways – Walkways are made integral to the foam roofing system. This involves the use of polyester fabric embedded in the waterproofing membrane, mineral surface granules embedded in the surface of waterproofing membrane and application of a thin coating over the granules of a color different from the remainder of the cover.

2.7 Digester Gas Handling Equipment

Digester Nos. 1 and 2 currently utilize a gas management system which consists of a series of valves and piping which ultimately conveys gas generated in those digesters to the cogeneration engine and/or flare. Digester 3 will have similar gas handling equipment, consisting of the following components:

- Pressure relief and vacuum relief valve
- Sediment/condensate trap
- Flame arrestor assemblies
- Thermal shutoff valve
- Gas flowmeter
- Gas piping and miscellaneous valves

2.8 Digester Pump Building Design

A new digester building is recommended to house the proposed mixing and heating systems. The new digester building will closely mimic the existing building in between Digester Nos. 1 and 2. It will consist of one main level will stair access to the roof. The two new mixing pumps, suction piping, discharge piping, heat exchangers, associated valves and fittings and Motor Control Center would be located on the main level.

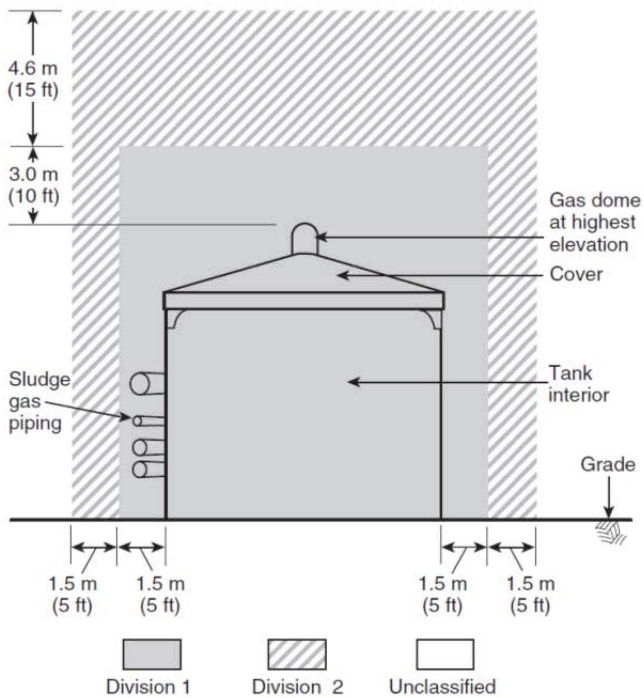
Regarding heating, ventilation and cooling (HVAC) for the building, District staff has indicated that since the building will be occupied for intermittent time periods, HVAC is not needed for facility staff. The existing building for Digesters Nos. 1 and 2 has two vent fans on top of the roof that serve ventilation purposes and provide for the required air changes. It is currently anticipated that a similar ventilation system will be provided for the new building.

2.9 Fire Protection

The National Fire Protection Association (NFPA) 820 is the Standard for Fire Protection in Wastewater Treatment and Collection Facilities. The NFPA 820 was recently updated to include a 2012 edition, which contains information pertinent to this project, Specifically, Classifications are designated for “anaerobic digesters with fixed or floating covers above grade not enclosed in a building”, as illustrated in Figure 2-11 below.

FIGURE 2-11

NFPA 820 FIGURE A.6.2(a)



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Section 3: Digester Heating System Evaluation

3.1 Digester Heating System

Heat applied to an anaerobic digester maintains an environment conducive to a methane-forming population, thereby increasing the metabolic rate of these organisms and reducing digestion time. Additionally, it ensures that greases and fats present within the digester remain in an emulsified state thereby enabling biological reduction of these materials.

Digester heat requirements can be broken down into two components:

1. Heat required to raise the temperature of the incoming raw sludge flow to the digester operating temperature.

2. Heat required to maintain the digester operating temperature (to compensate for radiant heat losses).

The temperature of the incoming sludge is seldom at the operating temperature of the digester and, therefore, heat must be added. A reduction in sludge volume by thickening directly reduces the amount of heat required to raise the incoming sludge to the digester operating temperature.

The digester operating temperature impacts the rate of volatile solids destruction, and hence gas production, as well as pathogen deactivation. Typically, digester operating temperatures drop in the winter months. At 95 degrees F, the volume of gas produced is about 20 cubic feet per lb of volatile solids destroyed. If the temperature drops to 85 degrees F, the gas production will correspondingly drop to about 14 cubic feet per lb of volatile solids destroyed (see Figure 3-1). If the gas is utilized for power production, that would represent a decrease of 30 percent in generating potential.

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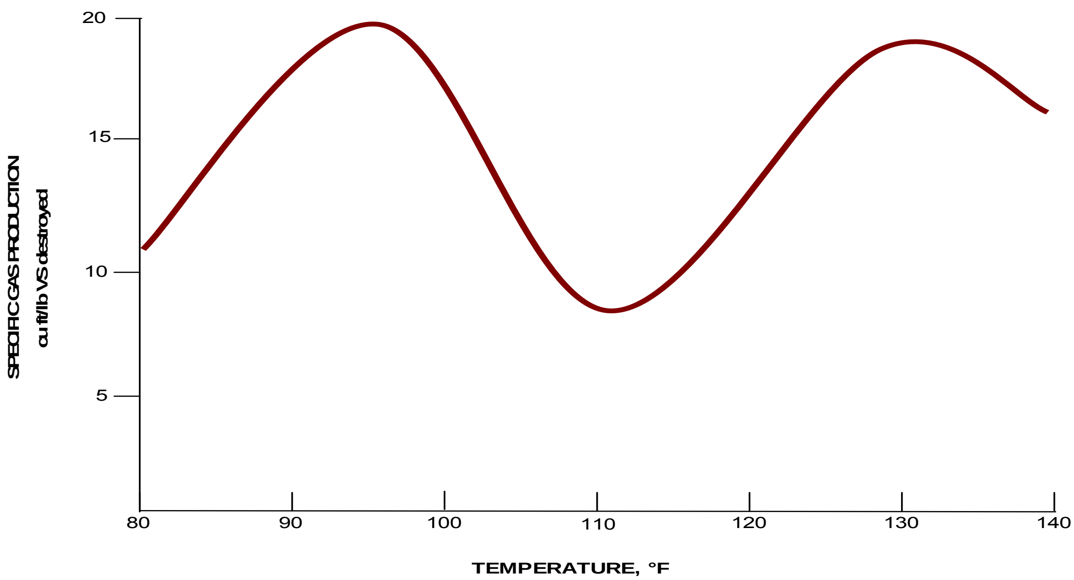
FIGURE 3-1
EFFECT OF TEMPERATURE ON GAS PRODUCTION



It is essential in order to meet EPA 503 regulations for Class B biosolids, as well as maximize the effectiveness of a cogeneration system, that the digester temperature be maintained in the range of 95 to 100°F.

3.1.1 Existing Digester Heating System

The temperature in the existing digesters is maintained by injecting steam into the digesters. Steam is produced by a Cleaver Brooks, Model No. CB-700-100, 100 Hp, low pressure, horizontal, four pass, fire-tube boiler. The boiler is rated for 3,450 lb/hr of steam at 15 psig and 250°F. The boiler is equipped with dual independent burners which burn either digester gas or natural gas, with digester gas being the preferred fuel. The existing digester heating system is shown in Figure 3-2.

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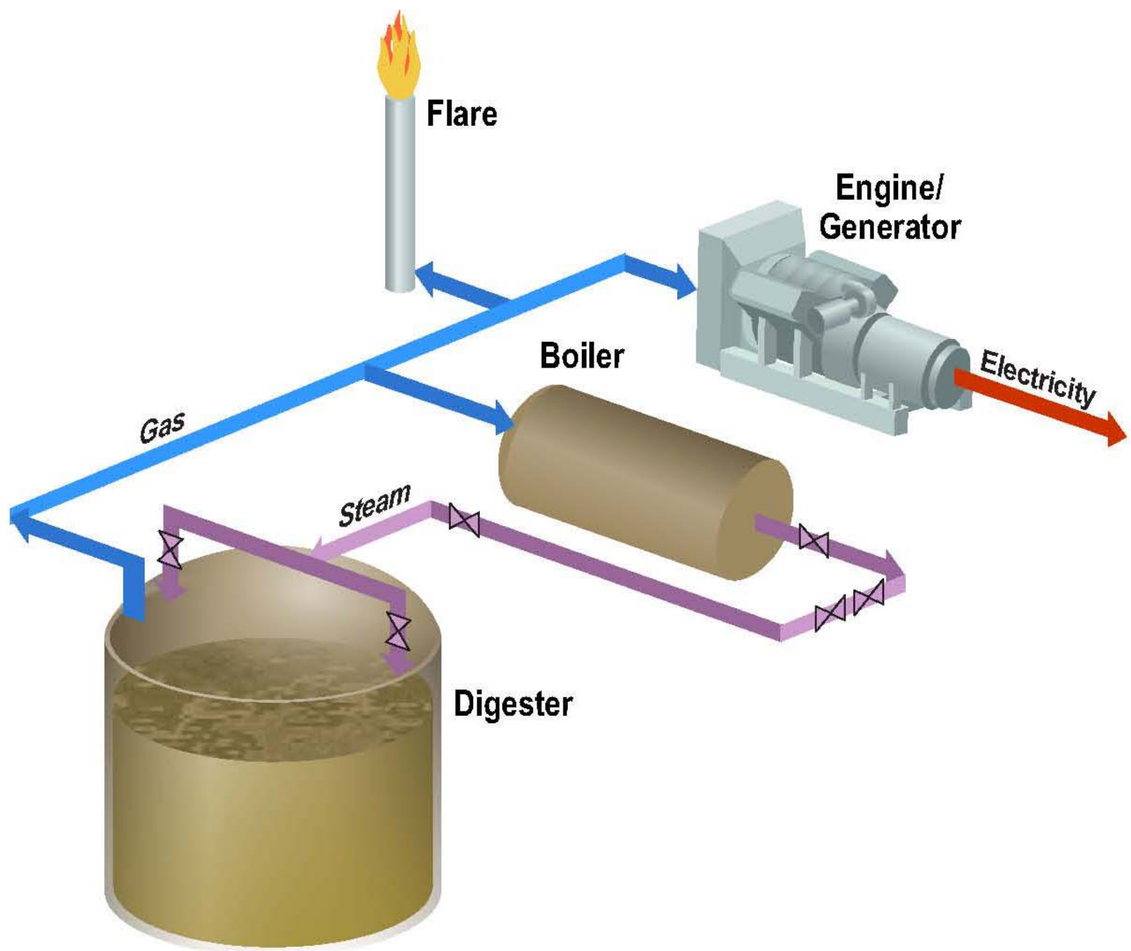
FIGURE 3-2
EXISTING DIGESTER HEATING SYSTEM SCHEMATIC



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A physical evaluation of the steam system was performed in November 2011. The boiler appeared to be in good working order. The exhaust temperature during the site visit was 240^{o}F which is consistent with a boiler operating above 80 percent efficiency. A check of the insulation on the boiler using an infrared thermometer showed that the insulation is adequate. A faint digester gas smell was noted near the burner end of the boiler. Some white residue was noted in the burner sight glass, just below the flame. These deposits may be siloxanes, which can damage the internal heat transfer surfaces and reduce the efficiency of the boiler.

The boiler is fed from the boiler feed water system which treats potable water to minimize corrosion in the boiler. Potable water is heated prior to entering the tank using a plate and frame heat exchanger. This heat exchanger is heated by the jacket water and exhaust heat from the cogeneration engine. This is the only place that the heat from the engine is utilized in the plant. The heat exchanger was not in service during the site visit. The feed water tank is also heated by condensate from the steam header, which drains to the tank.

Steam from the boiler is conveyed to the digesters by an 8 inch steam header, which splits to two (2) 4 inch lines at the digester pump station. Each digester is equipped with two steam injection lances, located on opposite sides of the digesters. Steam enters the digester at approximately 230^{o}F and 4 to 8 psig. Steam flow into the digesters is controlled by throttling the vent line, shown in the picture below. The original design recommended that the steam be controlled by throttling the inlet valve, based on operator experience, to maintain the digester temperature at 95^{o}F. The throttling valve is no longer used due to plugging of the valves. The steam is vented to allow the boiler to operate at a higher load than needed, effectively using the boiler in the place of the waste gas flare, which has an approximate capacity of 75 scfm. Venting steam in this fashion wastes approximately 6 scfm of digester gas per vent.

Steam is injected into the digesters where it is condensed as it gives up both the heat from 230^{o}F to 95^{o}F as well as the heat of vaporization. The boiler is capable of providing 3,450 lb/hr of steam. This amount of steam equates to adding over 400 gallons per hour or 10,000 gpd.

One of the steam lances has failed and is currently out of service. The lance apparently failed due to corrosion and is reportedly lying on the bottom of the digester. The failed lance is shown in the picture below.

The portion of the steam heating system on top of the digester appears to have significant corrosion issues. District staff reported during the site visit that they have been replacing the hardware on the exposed flanges with 316 SS hardware, which is more corrosion resistant than the galvanized steel currently used. We recommend continuing to replace the hardware when maintenance is performed.

The steam piping on top of the digesters has portions which are uninsulated, one example is shown in the picture below. Uninsulated steam piping is a personnel hazard, wastes energy, and exposes the piping to conditions which it was not designed to withstand.

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The piping on the digester roof has several steam leaks, one example is shown in the picture below. These leaks should be repaired at the first opportunity, but should not jeopardize the ability to heat the digesters.

The boiler is capable of providing 4,000 MBH (Thousand Btu per hour) which is significantly more than the required heat for the two digesters, approximately 2,800 MBH.

As part of the system evaluation, we investigated the ability of the system to heat the digesters with more than one of the lances out of service. This evaluation includes the ability to transfer biosolids between digesters using the digester mixing system. Our calculations determined that the boiler is capable of providing enough steam to heat to both digesters and the mixing pumps (at 4,700 gpm) provide enough flow to ensure that the digesters are heated evenly.

It is our opinion that the current digester heating system is not in danger of immediate failure and barring any unforeseen catastrophe, is capable of providing heat to the digesters until the 3rd digester is completed and a new hot water system is installed. For the near term, we recommend that the District repair the existing steam leaks and replace the missing pipe insulation.

3.1.2 Proposed Digester Heating System

The recommended improvement for the digester heating system is to replace the steam injection system with spiral heat exchangers and a common boiler. At a minimum, the new heat exchangers would be sized to transfer sufficient heat to keep the digesters at 98ºF throughout the winter at design loading rates. This is a conservative approach, as the required temperature for viral deactivation of biosolids that are detained for 15 days is only 95^{o}F. Heating system design criteria, along with heating requirements for typical winter and summer temperatures at Rancho are shown in Tables 3-1 through 3-3. It should be noted that the heating system analysis was based upon the 2030 design horizon with “max-month” flows and loading.

TABLE 3-1
DIGESTER HEATING ASSUMPTIONS

Digester Heating Assumptions			
	Units	**Winter**	**Summer**
Sludge Mass (2030 max-month)	lb/d	39,000	39,000
Solids Concentration	%	2.8%	2.8%
Digester Sludge Temperature	Deg F	98	98
Raw Sludge Temperature	Deg F	68	74
Ambient Air Temperature	Deg F	45	90

TABLE 3-2
DIGESTER HEATING REQUIREMENTS

Digester Heating Requirements			
	Units	**Winter**	**Summer**
Raw Sludge Heat Requirement	MBH (10^3 BTU/hr)	1,741	1,393
Digesters 1 and 2 Heat Loss (ea)	MBH	533	137
Digester 3 Heat Loss	MBH	533	137
Combined Demand (2 digesters)	MBH	2,808	1,667

TABLE 3-3
HEAT EXCHANGER CAPACITY NEEDED

Heat Exchanger Capacity Requirements		
Digesters 1 and 2 (combined)	5,105	MBH
Digester 3 only	2,275	MBH

The heating demands shown for winter cover the range from 30 to 75ºF. To be conservative, and for the purposes of design, it was determined that 45ºF would be a typical winter temperature for which to size the heat exchangers. Although the corresponding heating demand for two digesters (the worst-case scenario considered is for one digester to be out of service and two in operation) is approximately 2,800 MBH (thousand BTUs per hour) the spiral heat exchangers would be sized for close to twice the demand, or roughly 5,105 MBH.

This is based on experience with heat exchangers at multiple treatment plants, where the heat exchangers are found to be severely overrated in heating capacity. Proteins from the sludge tend to build up along the inside of the heat exchanger, thereby reducing heating efficiency by up to 40-50 percent. In addition, installing slightly larger heat exchangers than are technically necessary is cost effective as the incremental cost for the larger units is much less than the additional capacity obtained. The larger units provide additional flexibility in operating the system and an additional safety factor for when the heat transfer efficiency decreases over time.

To meet the design conditions during winter weather with at least two digesters in operation, and a 45 percent safety factor, it is recommended that the existing steam heating system be

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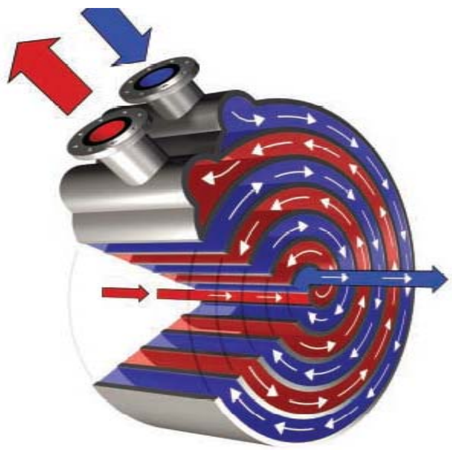
replaced with two (2) 2,500 MBH units for Digesters Nos. 1 and 2, and a new unit with similar capacity be installed for Digester 3.

3.1.2.1 Spiral Heat Exchanger

A spiral heat exchanger is a circular heat exchanger with two concentric spiral channels, one for each fluid. The curved channels provide optimum heat transfer and flow conditions, while minimizing the overall size of the unit. Figure 3-3 illustrates the mechanics of a spiral heat exchanger. Hot water (shown here in red) enters the unit at the mid-point and circulates through the spiral channel until it exits through an outlet on top. The sludge to be heated (shown here in blue) enters a top inlet and circulates in a countercurrent direction in its own channel until it exits through the center of the unit. The hot water and sludge do not come into direct contact with each other.

FIGURE 3-3
CROSS-SECTION OF A TYPICAL SPIRAL HEAT EXCHANGER

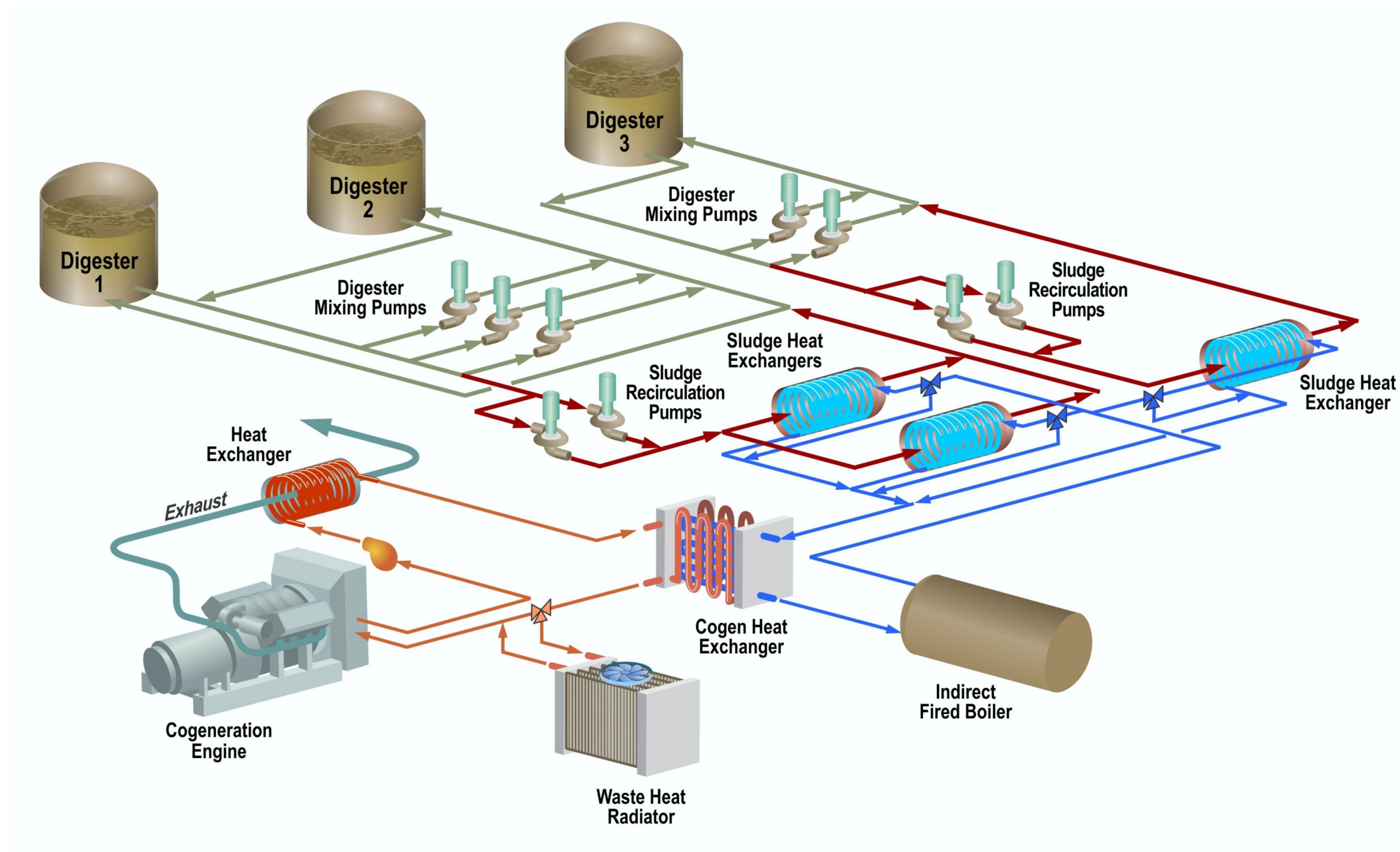


<u>Source</u>: Alfa Laval

3.1.2.2 Heating System Components

The proposed heating system would work in conjunction with the proposed mixing system, and consist of three new heat exchangers, three new hot water recirculation pumps, four new sludge recirculation pumps, one new boiler, and associated piping and instrumentation. A proposed mixing and heating schematic is included as Figure 3-4.

FIGURE 3-4
PROPOSED DIGESTER HEATING SYSTEM SCHEMATIC



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The hot water loop would be heated primarily by the cogeneration engine, specifically through the plate and frame heat exchanger currently used to pre-heat feed water. The heat exchanger will need to be evaluated to determine if the capacity is correct. This would allow the engine to maximize the power production while meeting the system heat demands.

An indirect fired boiler will be included to provide heat when the cogen system is down for maintenance, and to supplement make-up heat. Indirect fired boilers are utilized in sludge heating systems due to the relatively low temperature of the hot water loop, approximately 150°F to 160°F. Condensation can occur when a conventional fire tube boiler is operated at a water temperature below 180°F, causing corrosion in the firebox and exhaust, especially when operating on untreated digester gas.

An alternative to this approach would be to modify the existing steam boiler to operate as an indirect fired boiler by installing an internal hot water loop which operates above 180°F with a heat exchanger to transfer heat to the hot water loop. The water temperature is maintained below 160°F to prevent a skin of cooked sludge along the heat transfer interface, greatly reducing the efficiency and potentially clogging the system. A higher recycle flow rate of lower temperature return water is needed to maintain the target temperature of 160°F. Hot water circulation pumps are used to convey the hot water from the cogen heat exchanger and boiler to the sludge heat exchanger. An automated three way heat-control valve would be used to maintain hot water feed to the heat exchangers at the proper temperature.

To maintain proper temperature in the digesters, four sludge recirculation pumps would be used to maintain adequate flow through the heat exchangers. Two of the pumps will be dedicated to Digesters Nos. 1 and 2, and two of the pumps (1 duty, 1 standby) will be dedicated to Digester 3 and a future Digester 4. Two-hundred (200) to 300 gpm of sludge flow through the Model 2,500 MBH units is recommended to maximize heat transfer efficiency for heat exchangers Nos. 1 and 2. Similarly, two-hundred (200) to 300 gpm of sludge flow through the Model 2,500 unit is recommended to maximize heat transfer efficiency for heat exchanger 3. The system would be piped so that sludge from either Digesters Nos.1 and 2 can be heated using either of the two heat exchangers that are dedicated to those digesters; and similarly, for Digester 3 and a future Digester 4.

Sludge to be heated is removed from a common header on the suction side of the mixing pumps, travels through the heat exchangers, and then is discharged back into the mixing system through a common header on the discharge side of the mixing pumps. The recirculation pumps would be high head, low flow pumps capable of overcoming the low pressures produced by the mixing pumps. Cool primary sludge and WAS that is fed to the digesters would be mixed with the warmed sludge downstream of the heat exchangers before being introduced into the high velocity stream of the mixing system. Preheating of the feed sludge will occur in the mixing system prior to entering the digesters.

Changing the digester heating method to a hot water system will give the District several benefits:

- The hot water system will allow the District to take advantage of the currently installed cogeneration unit.

- The hot water system operates at a temperature which allows the heat from the jacket water and exhaust heat exchanger to be utilized as the primary heat source, allowing the engine to have priority when burning digester gas.

- Maximizing the cogen units operation could potentially save the district over $170,000 per year in offset power costs.

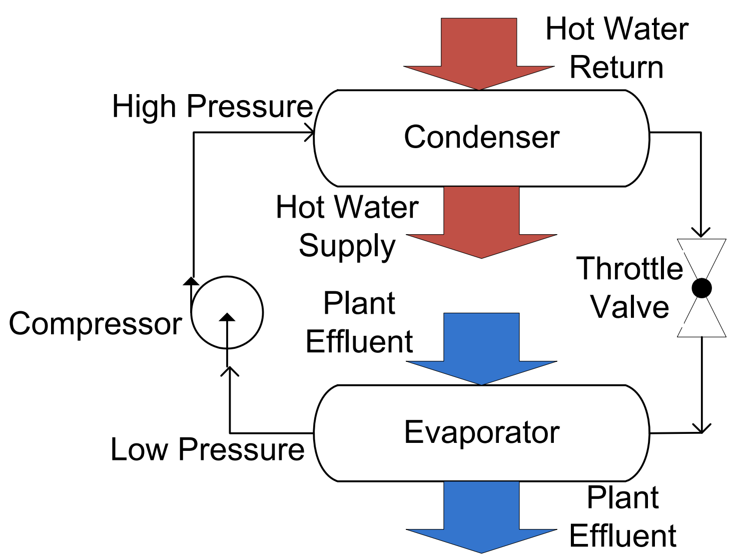
- Removing the steam system prevents adding 10,000 gallons of water per day in condensed steam to the digesters, and lowers the amount of potable water the plant has to use. The water softening system can also be removed.

3.1.3 Alternative Heating Technologies

The proposed heating system identified in this section is the preferred heating technology. An alternative technology which could potentially be utilized to provide heat to digesters and other heat demands is high temperature heat pumps. Heat pumps operate on a mechanical refrigeration cycle. When utilized at a wastewater treatment plant, a heat pump takes advantage of the heat available in the plant effluent stream to produce hot water. The refrigerant is vaporized by the effluent of the treatment plant in the evaporator, shown in Figure 3-5. The refrigerant is compressed and passed through the condenser, heating the hot water while condensing the refrigerant. The refrigerant is then returned to the evaporator.

A heat pump can be used to reduce or offset the amount of digester gas needed to heat the digesters or to provide space heating for plant buildings. This technology is not recommended due to high power costs and the effluent solids concentration.

FIGURE 3-5
HEAT PUMP SCHEMATIC



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3.2 Digester Heating and Cogeneration Heat Balance Considerations

Optimized operation of the digestion/co-generation system at the Rancho site involves consideration of several key factors:

- The quantity and quality of organic feed stocks sent to the digesters to make gas
- The heat needed to run the digesters at ideal temperatures
- The power output from the cogeneration system
- The waste heat recovered from the cogeneration system

The following optimization analysis focuses on the near term using 2011 data as a baseline.

3.2.1 Heating Needs for Digesters

The heating needs for the digestion system for the maximum month in 2030 are quantified in Section 3. Thickening of the sludge feed from Tapia could be considered as a future option. Thickening would reduce the heat needed to raise the temperature of the sludge feed from Tapia. The heating needs for average sludge flows in 2011 are as follows:

1. Wastewater sludge feed	930 MBTU/hr (unthickened) 522 MBTU/hr (thickened to 5%)
2. Environmental heat loss	533 MBTU/hr per digester in operation
3. Total heating need	1460 MBTU/hr (unthickened) 1055 MBTU/hr (thickened)

3.2.2 Cogeneration Potential Power Output

The power output from the cogeneration system is dependent on the rate of digester gas fed to the engine. The rate of gas production in the digesters is directly related to the solids that are destroyed by the digestion process, liberating methane. Following are the potential power outputs that could be derived from each of the three feed stocks mentioned above:

Feed Stock	Gas Flow (cu ft/hr)	Potential Generator Output (kw)
1. Wastewater (WW) sludge	5200	225
2. FOG	1600	70
3. Food waste (FW)	330	15
Total		310

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3.2.3 Waste Heat Recovered from Cogeneration

The co-generation engine specifications indicate that about 40% of the input heat value of the gas sent to the engine can be recovered as waste heat. Following is an estimate of the waste heat that can be recovered for each of the operating levels developed by possible combinations of the feed stocks listed above:

Feed Stock	Generator Output (kw)	Potential Waste Heat (MBTU/hr)
1. WW sludge	225[(a)]	1150[(a)]
2. WW & FOG	295	1500
3. WW, FOG & FW	301	1575

Note: (a) If the sludge feed from Tapia is not thickened, the waste heat available at the 225 kw operating level is insufficient (1460 MBTU/hr needed, see above) so some the digester gas would need to be diverted directly to a boiler, reducing the potential cogeneration engine output to about 197 kw.

3.2.4 Increased Cogeneration Output through Heating Improvements

Hot Water Heating

The proposed new digester heating system provides for recovery of waste heat from the co-generation engine. The existing heating system cannot utilize the low temperature heat from the engine water jacket. As a result, digester gas must be diverted from cogen to a steam boiler to provide all the heat needed for digestion. A comparison of possible output from the cogeneration system follows. This comparison is for two-digester operation.

Heating System	Available Waste Heat (MBTU/hr)	Potential Generator Output (kw)
1. Steam	0	105
2. Hot water	1150	197

The existing steam heating system has reached the end of its useful life and must be replaced, regardless. However, the proposed steam heating system saves digester gas for use in the co-generator equivalent to about 92 kw. Assuming a savings of 8 cents for every kilowatt generated the hot water heating system will **save about $60,000 per year in power costs.** With an estimated construction cost of a new heating system for all three digesters in the range of $1 million dollars, the hot water system will have a payback of about 15 years.

Recovery of Digester Exit Heat

The digested sludge exits the digesters at about 98 degrees. It is proposed that a portion of that exit heat could be recovered in a tube-in-tube heat exchanger which could recover about 300 MBTU per hour (equivalent to 27 kw of cogen output), which will **save about $17,000 per year**. The estimated construction cost for an installed heat exchanger to recover exit heat is about $50,000; therefore, the estimated payback period is less than 3 years.

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3.2.5 Future Favorable Digester and Cogeneration Operating Options

Two future options are available to the District to bring the digester heating needs and waste heat production from cogeneration into balance while maximizing power production from cogeneration;

1. Provide thickening of the feed sludge from Tapia to reduce the sludge volume and heating required.
2. Enhance the organic feed to the digesters to increase gas production by implementing a FOG and food waste program.

Thickening (Option 1) of Feed Sludge

If the District decided not to implement a FOG and food waste program in the future, a favorable operating level for the cogeneration unit could be reached by thickening the feed sludge to the digesters. With the reduced heating needs, the wastewater solids would produce sufficient gas to run the cogeneration unit at about 225 kw, and yield sufficient waste heat for the digesters most of the time.

The additional production capability created by thickening the sludge feed is about 28 kw (225 – 197, see above). The value of the additional power that could potentially be generated if the sludge feed is thickened would be about $18,000 annually. The lowest estimated construction cost for a thickening installation is about $500,000. So, the payback period for thickening of the feed sludge would likely exceed 25 years. Future thickening of the feed sludge might, in the future, be implemented to provide additional digester capacity (see Section 1); **however, thickening is <u>not</u> justified based on heat savings and cogeneration output.**

Implementation of a FOG and Food Waste (Option 2) Program

If the District decides not to install a thickener, a favorable operating level for the cogeneration unit could be reached by establishing a FOG and food waste program to increase feed stocks to the digesters. By receiving one 3,000 gallon load of FOG and 1.5 tons of food waste from Pepperdine, the District could produce sufficient digester gas to operate the co-generator at an average of 310 kw, which will produce sufficient heat for the digesters most of the year.

The additional production capability created by implementing a FOG and food waste program is about 113 kw (310 – 197, see above). The value of the additional power that could potentially be generated if the sludge feed is thickened would be about $72,000 annually. The estimated construction cost for a FOG and food waste receiving facility is about $750,000. So, the payback period for a FOG and food waste program, considering only the value of the additional power and not considering the revenue from tipping fees, would be about 10 years**. A future FOG and food waste program will likely be cost-effective, will offset most of the current power load at the Rancho site, and should be considered.**

3.2.6 Summary

By implementing a hot water heating system and exit heat recovery, but not providing for thickening of the feed sludge or a FOG and food waste program the **average potential cogeneration output will be 197 kw.**

By implementing a hot water heating system and exit heat recovery and providing for thickening of the feed sludge but not implementing FOG and food waste program the **average potential cogeneration output will be 225 kw.**

By implementing a hot water heating system and exit heat recovery and the implementing FOG and food waste program but not thickening, **the average potential cogeneration output will be 310 kw.**

Section 4: Mixing System Evaluation

4.1 Digester Mixing System

Following are three key requirements for effective digester mixing systems:

1. Sufficient mixing energy and efficient energy transfer to the liquid.
2. Effective distribution of the mixing energy within the tank.
3. Reliable operation.

Each requirement is discussed in more detail in the following subsections.

4.1.1 Sufficient Mixing Energy

Sufficient mixing energy needs to be added to a digester to mix the entire tank volume, prevent the accumulation of grit on the floor and minimize the creation of a scum blanket on the surface. The amount of mixing energy needed depends on the method of mixing that is used. Mechanical mixing systems that transfer energy directly to the liquid by a wastewater pump or mechanical mixer tend to require less input energy than systems that rely on compressed digester gas for mixing, for example.

A second energy factor that also needs to be considered when evaluating mixing systems is the non-mixing energy associated with system operation. External mixing systems such as pumped systems have higher friction losses than internally mixed systems due to the extra length of external piping. Compressed gas systems have energy losses due to the waste heat that is produced when the gas is compressed that mechanically mixed systems do not have. Although each type of mixing system has advantages and disadvantages regarding energy use, most of the common digester mixing systems on the market today have relatively similar total energy requirements.

4.1.2 Effective Energy Distribution

Effective distribution of the mixing energy throughout the digester is a critical mixing requirement. Mixing energy is represented by the velocity of the liquid at any particular location in the tank. To be efficient, the mixing system should provide relatively uniform velocities throughout the tank. Otherwise, some areas of the tank may have velocities well in excess of what is required while other areas remain poorly mixed.

When the tank contents are not effectively mixed, the overall digestion capacity of the tank is compromised. Localized high velocities, above those required for good mixing, do not increase the capacity of the digester. However, localized low velocities throughout the digester will decrease the capacity. A mixing system that creates a swirling motion throughout the entire tank provides the best assurance of reasonably uniform mixing.

4.1.3 Reliable Operation

Reliability is an important trait of any mechanical system. In the case of an anaerobic digester, reliability is especially important for components that require the digester to be taken out of service for maintenance. Thus, mixing systems that can be maintained without emptying the digester have preference over those that require the digester to be dewatered for maintenance. Likewise, systems that have backup equipment that can be used to keep the digester in operation during maintenance have preference over those that require the digester to be shut down, or at reduced efficiency, for maintenance.

Rags are a recognized component of municipal wastewater. Measures have been taken at the Tapia facility to remove rags from the plant influent. However, it is inevitable that some rags will be discharged to the digestion system. The agitation of the digester contents due to mixing dynamics can agglomerate small rags into larger rags. Thus, the mixing system must be able to operate reliably without plugging in an environment that contains rags.

Foaming is also an important reliability issue for digester mixing. If the mixing system contributes to foaming or if it is adversely affected by foaming, then this can interfere with reliable operation. A properly designed externally pumped mixing system does not contribute to foaming and is minimally affected if foaming occurs. Mixing pumps that are located at a low elevation relative to the digesters, and that are minimally affected by entrained gas, are preferred. Gas mixing is not favored because it involves the creation of bubbles and tends to bring foam to the top of a digester.

4.1.4 Proposed Digester Mixing System

Rancho currently utilizes an externally pumped mixing system for Digesters Nos. 1 and 2. Rancho staff have indicated that the existing mixing system has been working satisfactorily, and that they would like to utilize the same design approach for Digester 3. As discussed earlier, the three key elements for an effective mixing system include (1) sufficient energy input, (2) uniform energy distribution, and (3) reliable operation. The proposed mixing system that satisfies these three key elements is an externally pumped system.

With an externally pumped mixing system, sludge is drawn through a pipe from the center of the digester to a pump that discharges the sludge back into the digester through a nozzle along the exterior wall. The discharge nozzle is installed at the proper angle to create a circular swirling motion within the digester. Dual suction and discharge pipes are provided to allow draw-off from either the top or bottom of the digester and discharge to either the top or the bottom of the tank. The upper and lower suction and discharge piping is periodically alternated to prevent the buildup of grit on the bottom and scum on the top.

4.1.4.1 Spiral Vortex Mixing Mechanism

The mixing mechanism associated with the proposed externally pumped mixing system is illustrated in Figure 4-1. As shown, externally pumped mixing systems are characterized by highly uniform mixing. The high velocities that are developed at the discharge nozzles create a swirling motion, or spiral vortex. A considerable amount of shear is experienced by the solids in an externally pumped mixing system. This shearing action reduces the size of the solids

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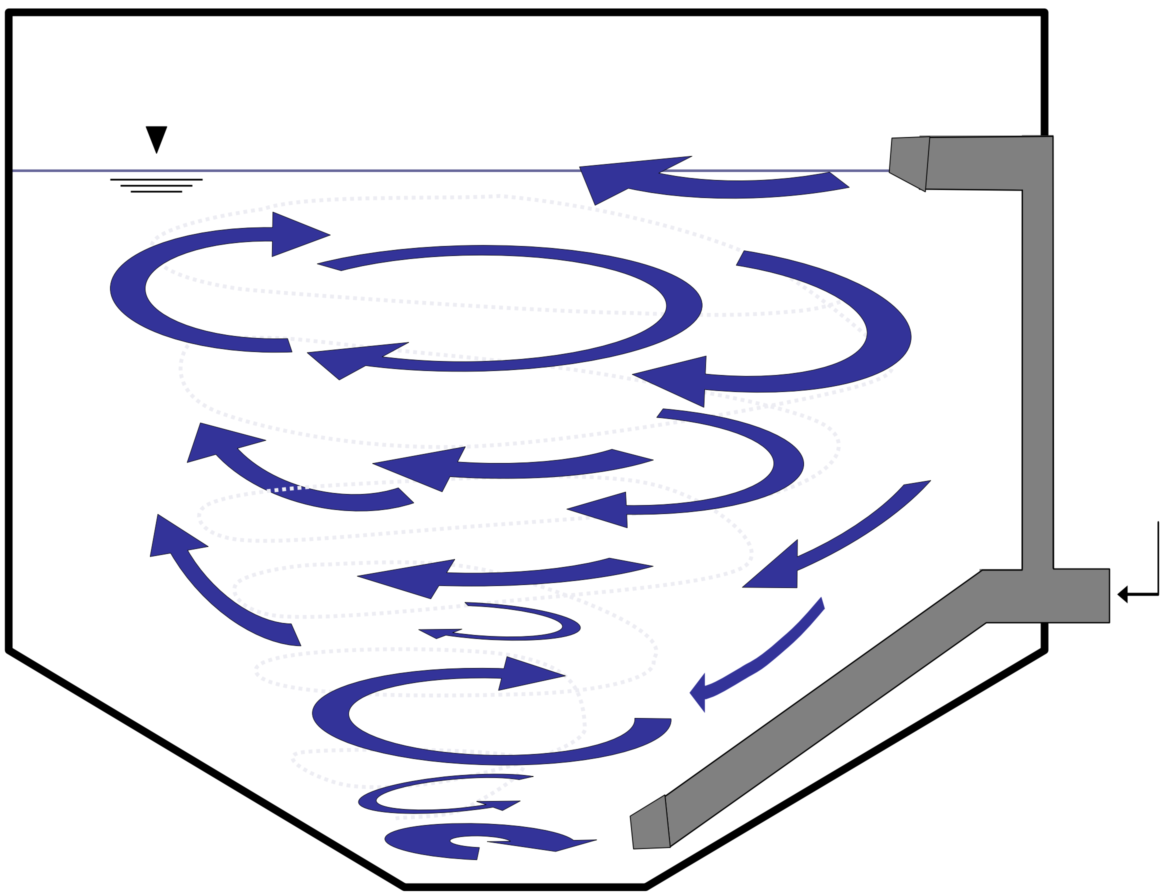
particles, and subsequently increases the surface area exposed to the microbial culture in the digesters, resulting in higher volatile solids destruction and increased gas production.

FIGURE 4-1
EXTERNALLY PUMPED MIXING MECHANISM



4.1.4.2 Benefits of Effective Mixing

Efficient digester mixing is required for exposure of the active biomass to the digester food source. Efficient mixing translates directly to swift exposure and rapid destruction of volatile solids, which reduces the required detention time and effectively increases digester capacity. Some of the benefits that can be realized from a more efficient, externally pumped digester mixing system include the following:

1. Increased gas production - Improved digester mixing can result in higher digester gas production as a result of better volatile solids destruction. Increased gas production could result in reduced purchase of natural gas.
2. Increased effective digester capacity - Improved digester mixing can result in shorter digestion periods, which equates to increased digester capacity for future flows.

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3. Better digestion of grease and septage - A well-mixed digester is better able to handle the shock loading from a direct discharge of high BOD grease and septage into the digester.
4. Reduced grit and scum buildup - A thick scum blanket can accumulate in poorly mixed digesters. This blanket reduces the active volume of the digester. A well-mixed digester tends to have less buildup of scum and grit which can prolong the period between digester cleanings and increase active volume.
5. Improved heat distribution - Improved digester mixing results in a more rapid distribution of the heat that is added, and thus, a more uniform temperature throughout the digester.

Pumped digester mixing provides reliable, complete mixing, resulting in enhanced digestion with shorter detention times.

4.1.4.3 Mixing System Components

The proposed mixing system consists of two mixing pumps (one dedicated and one standby), large diameter upper and lower suction and discharge piping, and associated valves and fittings. A common header is used so that the standby pump can be utilized for either Digester 3 or a potential Digester 4. Discharge to each digester is through one of two nozzles located near the top and bottom of the digester. Alternative suction and discharge pipes are provided so that the mixing patterns in the digester can be rotated periodically.

Currently, Digesters Nos. 1 and 2 are interconnected for both mixing and sludge transfer. That is, either digester can be mixed with either one of the three existing mixing pumps, and sludge can be transferred by the mix pumps between digesters. District staff has indicated that they would like the ability to transfer digester contents to and from Digester 3 to both the existing digesters. However, mixing will be exclusive for Digester 3; that is, Digester 3 will only be mixed by its dedicated mix pump.

4.1.4.4 Mixing System Design Criteria

For the purposes of detailed design, the mixing pumps will be sized (capacity in gallons per minute) to generate approximately 8 to 10 turnovers per day. A turnover is defined as one full movement of digester contents through the mixing equipment. Recommended values for mixing energy are in the range of 3.3 to 4.2 horse power (HP) per MG of digester volume. Mix piping will be sized to limit maximum pipe velocities to 8 feet per second, due to the solids content of the sludge. Recommended nozzle velocities are in the range of 12 to13 feet per second (fps); the nozzles will be sized accordingly. Kennedy/Jenks recommends utilizing only one set of upper and lower mixing nozzles, as opposed to the two sets of nozzles on the existing Digester Nos. 1 and 2. Our experience with other installations that have been in service for several years is that one set of nozzles is efficient in providing the necessary mixing energy required for anaerobic digestion, while being more cost effective.

Section 5: Fats, Oils, Grease and Foodwaste

5.1 Background

Fats, oils, and greases (FOG) are a significant and problematic component of domestic wastewater. There is some FOG in residential wastewater; however, the main sources are commercial and industrial wastewaters. In a typical community, restaurants are generally the largest source of FOG.

In 1998 the National Renewable Energy Laboratory sponsored a study titled Urban Waste Grease Resource Assessment which investigated the sources and quantities of grease in 30 metropolitan areas across the United States. The communities included in the study ranged in size from a population of 83,000 to nearly 4 million. Based on the results of this study, the average annual grease production of trap grease is 13.37 lbs per person.

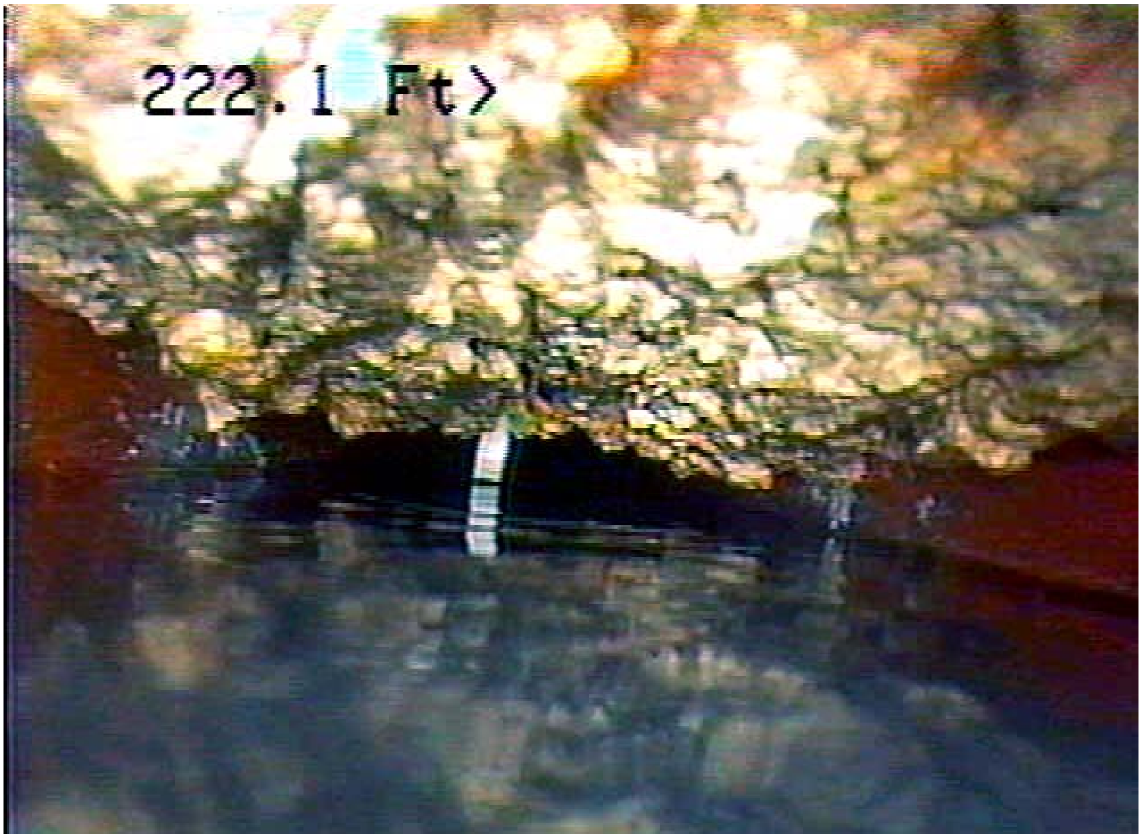
Most communities have adopted requirements for the installation of grease traps on laterals for restaurants and other commercial and industrial establishments that have greasy waste. The traps hold much of the waste grease and prevent it from entering the collection system. However, grease traps must be periodically emptied to remove the accumulated grease or the traps will start to pass grease into the collection system.

Most communities are served by private septic and grease haulers that will charge a fee for pumping out the contents of the grease traps. The contents of the grease traps are very difficult to dispose of. Many landfills and wastewater treatment plants are not equipped to handle it and will not accept grease waste. The inconvenient and costly disposal of grease contributes to untimely pumping of the grease traps and environmentally unsound disposal of the contents.

5.1.1 Collection System Problems

FOG separates and floats on the surface of the wastewater where it tends to form stubborn deposits on the upper surfaces of the sewer lines. These deposits can significantly reduce the capacity of the lines. Most collection system operators have a program for routinely flushing these FOG deposits out of the most susceptible mains in their systems. The annual cost of these flushing programs is considerable. The result of infrequent flushing is reduced collection system capacity as shown in Figure 5-1.

FIGURE 5-1
GREASE IN COLLECTION SYSTEM



5.1.2 Problems Caused by FOG in Wastewater Treatment Plants

FOG entering a treatment plant with the wastewater from the collection system is difficult to handle and treat. It floats and must be skimmed off the surfaces of the tanks and collected in pits for disposal or it can be pumped to the solids processing system. It also collects on surfaces of tanks, pits and equipment where it must be periodically removed. FOG also tends to be very odorous.

FOG can be digested in anaerobic digesters. However, because it's lighter than water, it can accumulate in a mat on the liquid surface inside digesters that are not well mixed. The contents of this mat do not mix with the digester biomass and therefore do not digest. Over a period of years, poorly mixed digesters can accumulate FOG mats that are several feet thick. These mats compromise the active volume of the digester.

5.2 Requirements for a Successful FOG Program

As noted above, it is beneficial to keep FOG out of the collection systems. The best way to accomplish that is through regular pumping of grease traps combined with convenient and environmentally sound disposal of the FOG by the haulers. Facilities can be designed and constructed that will provide for receipt and treatment of FOG at wastewater treatment plants. A wastewater treatment facility should only consider accepting loads from grease haulers if a formal program for regulating the haulers has been established and the specialized facilities for receiving and treating FOG have been provided.

5.2.1 Regulating the Haulers

It is critical that the treatment plant operators be able to regulate the contents of the loads received from grease haulers. Successful programs include provisions for permitting the haulers, tracking the source of the loads, monitoring the contents of the loads and determining the quantity.

- Annual Permitting of the Haulers: Haulers should be required to apply for permits, usually on an annual basis. These permits are used to establish and convey the source criteria, verify appropriate licensing, and establish the fee schedule. An annual licensing fee can be used to help offset administrative costs for the program.

- Source Tracking: Since the contents of the loads from the haulers will be treated in a digester and be mixed with the plant's biosolids, quantities of toxic or regulated substances must be controlled. One method is to track the sources of each load with a Bill of Lading. With the Bill of Lading the source and quantity of each portion of the load is clearly identified and verified. A Bill of Lading should be turned in with each load before it is dumped.

- Random Quality Monitoring: The treatment facility should conduct random, unannounced sampling of the loads. The analysis of the samples should include grease content, several heavy (particularly regulated) metals, pH and other organics that may be of concern.

- Quantity Tracking: The haulers are generally charged on the basis of quantity. A reliable method of determining the size of each load should be implemented. Some haulers have volume scales on their trucks. Recording the weight of the trucks before and after dumping is probably the most reliable and defensible method of determining dump quantities.

5.2.2 FOG Receiving Stations

FOG receiving stations that function well resemble typical septic receiving stations. Some key features are:

- Convenient truck access
- A means of logging in the haulers and sampling their loads
- A method of measuring the quantity of the load
- A dump location that includes coarse screening and a washdown slab
- Covered storage of at least five loads or about 15,000 gallons
- Appropriate pumping for supply to a digester
- Provision for odor control

- Hot water for cleanup

Figures 5-2 and 5-3 are a plan and section, respectively of a typical facility that has functioned well for grease receiving.

5.2.3 FOG Treatment

Once the FOG is received at the treatment facility, it must be treated and stabilized so that it does not compromise other treatment processes and is rendered acceptable for regulated disposal. The two key issues related to treatment of FOG are:

1. Mixing FOG and water is difficult
2. FOG is quite stable and difficult to decompose.

FOG has been shown to be degradable through anaerobic digestion. Full-scale grease digestion programs have been in existence for nearly 20 years. It takes at least ten steps to break down a complex fatty acid like peanut oil into acetic acid and finally carbon dioxide and methane. Each step requires a specialized bacterial culture. The cultures can be formed by gradually adding grease to an anaerobic digester over a period of weeks. Once they have become established, the cultures will respond relatively quickly (within an hour) to the addition of grease to a digester. This reaction is exhibited by a significant increase in the rate of gas production.

Substantial turbulence on the surface of the digester contents is required to keep the FOG mixed in with digester biomass. If FOG is added to an inadequately mixed digester, it will accumulate on the surface and not de-grade. After several years of service, some digesters have accumulated several feet of undigested grease floating on the surface.

FIGURE 5-2
PLAN VIEW OF FOG RECEIVING STATION

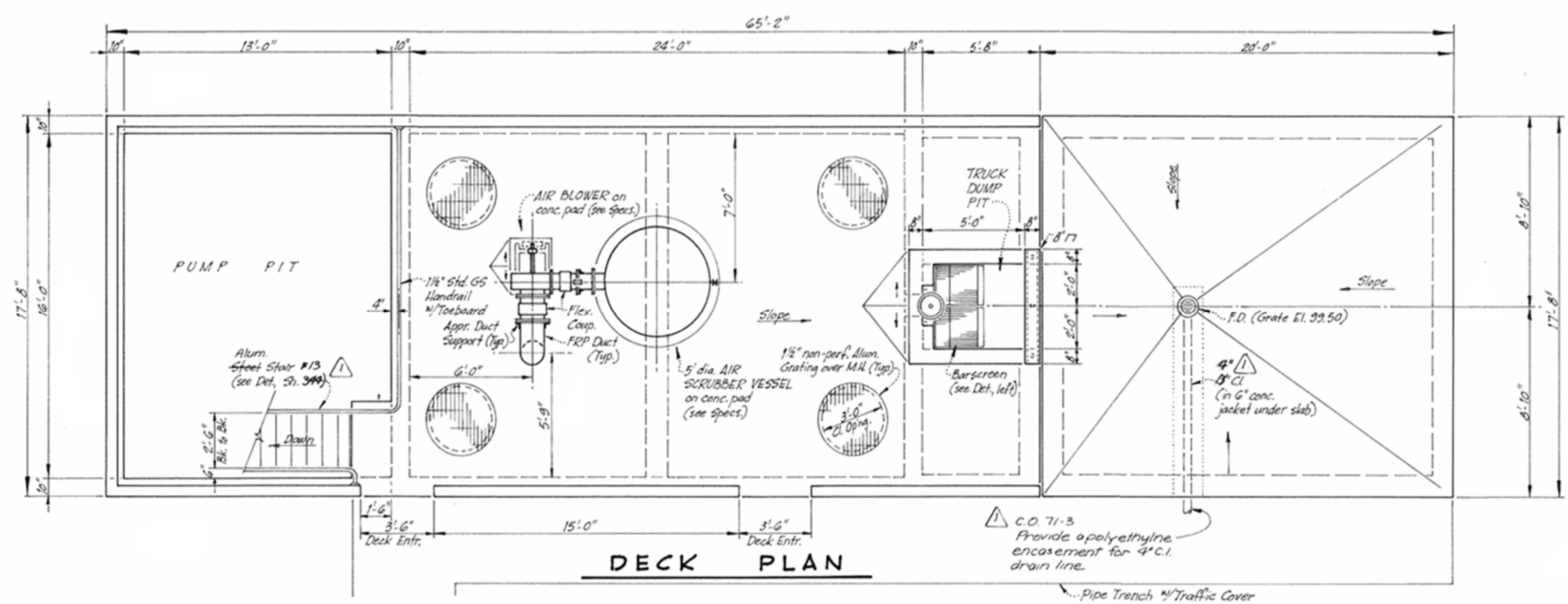


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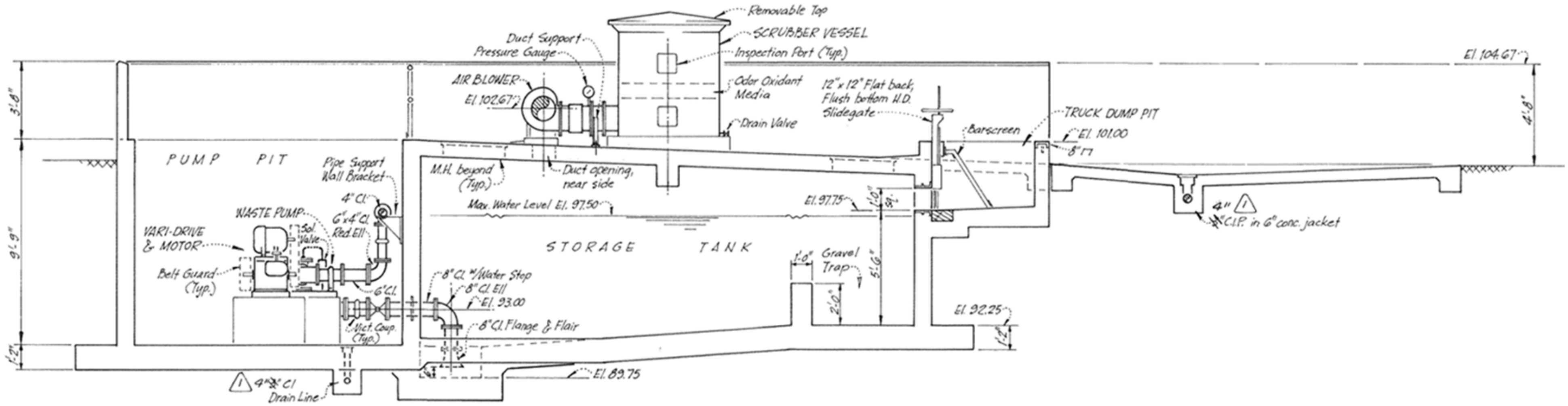
FIGURE 5-3
SECTION VIEW OF FOG RECEIVING STATION



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It has been demonstrated that a mixing nozzle located just below the liquid surface inside a digester and pointed slightly upward will create sufficient turbulence to keep the FOG mixed in with the biomass. After several years of service, despite receiving regular FOG loads from haulers, the digester at one facility in California has essentially no accumulation of grease.

5.3 Potential Benefits of a FOG Program for the JPA

The benefits of a FOG program can be categorized as either environmental or economic.

5.3.1 Environmental Benefits

FOG is a very environmentally unacceptable substance when placed on the land or in a typical water course. It is odorous, toxic to marine life, potentially lethal to birds, and very slow to degrade, even when placed on the soil.

By establishing a convenient FOG dumping station at Rancho, it will help keep grease out of the environment. Currently, the haulers must travel a significant distance to legally dump loads of grease, which is very inconvenient and expensive. If a grease receiving location is established at Rancho, it will be very convenient and less costly for haulers from the area to unload.

FOG consists primarily of long chain fatty acids. These fatty acids break down very slowly in the natural environment. In a well-mixed anaerobic digester the complex carbon/hydrogen chains are broken down into simpler compounds with the final products being carbon dioxide, methane and organic cell mass. The volume of solids is reduced by more than half, and the residual solids resemble soil after dewatering.

An additional environmental benefit is the renewable energy source that is produced from the FOG in the form of methane gas. This gas can be used for power generation or space heating in place of non-renewable fossil fuels.

5.3.2 Economic Benefits

The economic benefits of a FOG program result from the reduced cost of maintaining the collection system along with the revenue from tipping fees and power generation.

If grease traps are not regularly pumped out, they will fill up and the grease will spill into the collection system where it deposits on the walls of the pipes. In order to maintain the capacity of the pipes, the grease deposits must be periodically removed by the maintenance crews. If the grease traps are pumped out more frequently, because it is convenient to do so, the grease deposits will not form as fast and the pipes will require less frequent cleaning.

Most FOG receiving facilities charge a tipping or dumping fee for unloading at their facility. A typical charge is $0.10 per gallon. For a 3,000 gallon load the tipping fee would be $300. In an appropriately mixed anaerobic digester, the decomposing grease yields methane gas that can be used to produce electrical power with an engine generator. Generally speaking, FOG from haulers will typically yield between $0.03 and $0.04 worth of power per gallon.

5.4 A FOG Program in JPA Service Area

The only known FOG receiving facility within a 30 mile radius of the Rancho Composting Facility is the Hill Canyon Waste Water Treatment Plant, located in Thousand Oaks, CA. The new digester improvement project could potentially provide facilities that will be capable of treating FOG.

5.4.1 FOG Quantities

The Urban Waste Grease Resource Assessment study referenced above found that the average annual grease production is 13.37 pounds per capita (ppc). The estimated population of the LVMWD and Triunfo Sanitation District Service Area (Service Area) is approximately 95,000 residents. If 75 percent of the trap grease could be recovered by haulers, that would yield an annual amount of about 635 tons from the service area. Grease loads are usually only 15 to 20 percent grease, with the rest being wastewater. Therefore, the potential volume of the grease loads hauled to the receiving station is estimated to be as much 0.87 MG annually from the Service Area, or roughly 73,000 gallons per month.

An initial study was conducted as part of this preliminary design phase to perform phone interviews of grease and septic haulers within driving range (50 to 60 miles of Rancho). The objective of the study was to identify the following:

- Grease haulers within the region
- The quantity of grease they typically haul
- The locations of grease sources and disposal areas
- The current tipping fees for their loads
- And whether haulers would be interested in directing their loads to a future Rancho receiving station

Several grease haulers were identified, contacted, and interviewed. Although more detailed discussions with potential grease haulers will be required subsequent to this report, there was interest expressed on the part of a few haulers, which would be willing to take their grease loads to a receiving station at Rancho. The quantity of grease could be upwards of 100,000 gallons per month (gpm), with tipping fees in the range of $0.03 to $0.05 per gallon. It should be noted that the 100,000 gpm estimate is from sources outside of the Service Area.

Given that the numbers presented in this section are both theoretical and preliminary in nature, and for the purposes of this report, a conservative estimate of the quantity of FOG available for disposal at a Rancho receiving station is 50,000 gpm, with tipping fees of $0.03 per gallon.

5.4.2 FOG Receiving Facilities

FOG receiving facilities for Rancho would include the features described in Paragraph 5.2.2, above. The receiving facility would be located so that the hauler could access it without obstructing the normal traffic and operations at the plant.

Possibly the easiest method of recording the load quantities would be with a truck scale. The scale could be located where it is accessible not only for the grease haulers but also for the sludge haulers. The grease haulers would log and weigh in prior to unloading.

5.4.3 FOG Treatment Facilities

No special digestion facilities would need to be provided in order to digest FOG at Rancho provided the District implements the digester mixing and heating recommendations for Digester No. 3 provided in this report. The recommended digester mixing design would provide for sufficient mixing energy along with the capability of breaking up any mat or grease accumulation on the surface.

Facilities would be provided to pump the grease from the storage tank at the receiving station directly into the mixing lines for the digesters where the high velocities would immediately incorporate the grease into the biomass.

5.5 Economic Model of a JPA FOG Program

The following economic model considers the estimated capital and O&M costs of the facilities required for implementation of a FOG program along with the projected revenue stream that could be realized.

5.5.1 Cost of FOG Receiving and Treatment Facilities

5.5.1.1 Capital Costs

The estimated construction cost of the facilities is as follows:

1.	FOG receiving	$ 500,000
2.	Scale and log-in	$ 130,000
3.	Site piping	$ 20,000
	Total Capital Cost	$ 650,000

5.5.1.2 Operation and Maintenance Costs

The estimated operation and maintenance (O&M) requirements are as follows:

Administration (permitting, logging, sampling, etc.)	1 hour per load
Cleanup and maintenance	½ hour per load
Total labor hours per load	1 ½ hours per load

Assuming a 3,000 gallon load and a labor cost of $40 per hour, **the O&M cost per gallon would be $0.02 per gallon.**

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5.5.2 Projected Revenue

The potential sources of revenue for a FOG program in the Joint Power Authority (JPA) Service Area are:

- Tipping fees
- Generated power

5.5.2.1 Tipping Fees

Although tipping fees vary from application to application, for the purposes of this evaluation, a conservative estimate of potential tipping fees paid by haulers to the JPA is $0.03 per gallon. For a 3,000 gallon load, that would equal approximately $90 per load.

5.5.2.2 Value of Generated Power

It is estimated that about 60 percent of the volatile solids fed to a well-mixed digester are destroyed or digested. FOG waste has high volatile solids content; one pound of digested volatile solids yields about 9 cubic feet of methane gas. Each cubic foot of methane gas has a heating value of 1,000 BTU, which is equivalent to a power value of 0.293 kilowatt hours (kwh). Assuming a generating efficiency of 30 percent, each pound of grease could yield about 0.5 kwh of power.

Each gallon of grease waste contains, on average, about 1.5 lbs of volatile solids of grease. Therefore each gallon of grease waste will yield about 0.75 kwh of power.

Rancho currently pays $0.15/kwh of power purchased from their utility, Southern California Edison. However, for power purchased through the Power Purchase Agreement (PPA) that is generated by the cogeneration engine, Rancho pays $0.069/kwh. Therefore, the value of power generated through utilizing cogeneration capacity (i.e., digester gas) is $0.081/kwh, which is a direct savings to the District.

5.5.3 Predictions from Economic Model

The estimated costs and revenues from a FOG program for the JPA can be summarized as follows:

Costs

Capital Cost	$	650,000
O&M Cost	$	0.02/gal

Revenues

Tipping Fees	$	0.03/gal
Power	$	0.081/gal

The capital cost for the receiving station and scale facility is a fixed cost and is independent of the amount of grease that might be handled. The other three economic factors: 1) O&M costs, 2) revenues from tipping fees, and 3) generated power are all related to the quantity of grease

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handled. Since the revenues per gallon of grease received exceed the cost by $0.091 per gallon, it would be advantageous for the JPA to take in as much grease as is practical.

An economic evaluation was performed to estimate what the potential payback (or breakeven) period for constructing a FOG receiving station at Rancho would look like. Although the economic projections are sensitive to the amount of grease actually received, the initial capital cost of the facilities, and the O&M cost of operating the grease receiving and handling facilities, using the conservative estimates presented in this section would yield a payback period of just under 5 years.

5.6 FOG Program Recommendations

In light of the foregoing analysis, it is recommended that the JPA consider implementation of a FOG program, including construction of receiving facilities at Rancho. A FOG program would likely yield substantial economic and environmental benefits.

5.6.1 Economic Considerations

Based on the economic evaluation presented, the payback or breakeven point for the new FOG facilities would be approximately 5 years depending primarily on the amount of grease collection or population served. After the new FOG facilities are paid off and assuming a 20-year project life for the FOG program and facilities, the additional revenue accumulated over the remainder of the 20-year period could be significant. This could help offset the cost of the other parts of the project that do not directly generate a revenue stream.

The potential revenue from septage haulers has not been considered in this economic model. Some septic waste would most certainly be delivered if the FOG facilities were provided, resulting in additional revenue; however, the tipping fees for septage is usually lower.

5.6.2 Environmental Considerations

The implementation of a FOG program for the JPA would provide for a very effective means of treating an extremely difficult and environmentally unacceptable waste. The recommended FOG treatment system would help keep a large portion of this grease waste out of the natural environment. One by-product of the treatment process would be a renewable energy source that could be used to produce electrical power. The stable long chain fatty acids would be broken down and reduced in volume resulting in a final product that is very stable, smells like earth, and is enriching if applied to soil.

Additionally, a local receiving station for FOG will help reduce the truck traffic on certain Southern California highways.

5.6.3 Food Waste

In addition to FOG, there are additional fuel sources that the JPA may want to consider to receive at Rancho. For example, several communities have developed food waste programs that discharge food waste from commercial sources directly into anaerobic digesters. Food waste is a high-carbon waste stream that has been identified and tested full-scale as a digestible waste that can increase gas production from a digester.

Sources for food waste in typical communities can be restaurants, food production facilities, corporate cafeterias, and schools. A brief evaluation was performed to identify potential sources of food waste in the JPA Service Area; below is the results of the evaluation, identifying the source and its distance from Rancho.

1. Las Virgenes Unified School District (enrollment approx. 11,000)
   - Calabasas High School, enrollment: 1,827, 7.7 miles from Rancho
   - Agoura High School, enrollment: 2,193, 4.1 miles from Rancho
   - AC Stelle Middle School, enrollment: 885, 8.8 miles from Rancho
   - A.E. Wright Middle School, enrollment: 913, 0.6 miles from Rancho
   - Lindero Canyon Middle School, enrollment: 1,080, 6.6 miles from Rancho
   - Bay Laurel Elementary School, enrollment: 463, 6.8 miles from Rancho
   - Chaparral Elementary School, enrollment: 544, 8.4 miles from Rancho
   - Lupin Hill Elementary School, enrollment: 454, 3.4 miles from Rancho
   - Round Meadow Elementary School, enrollment: 460, 3.9 miles from Rancho
   - Sumac Elementary School, enrollment: 622, 5.5 miles from Rancho
   - White Oak Elementary School, enrollment: 407, 7.4 miles from Rancho
   - Willow Elementary School, enrollment: 586, 5.4 miles from Rancho
   - Yerba Buena Elementary School, enrollment: 489, 7.1 miles from Rancho
   - Mariposa Elementary School of Global Education, 5.5 miles from Rancho
   - Buttercup Preschool, 7.1 miles from Rancho
2. Cheesecake Factory Bakery Production Facility, 1.2 miles from Rancho
3. Viktor Benes Continental Pastries, Inc, 8.9 miles from Rancho
4. The Baker Café, Inc, 8.3 miles from Rancho
5. Olive Genco Oil, Inc, 8.6 miles from Rancho
6. Stoneground Baking Co, 4.3 miles from Rancho
7. True Natural Taste Products, 6.2 miles from Rancho
8. Dez Foods, 7.1 miles from Rancho TP
9. Paradise Bakeries of Tulsa, Inc, 9.2 miles from Rancho
10. Oroweat, 4.3 miles from Rancho

Pepperdine University, 10 miles from Rancho

Pepperdine University was contacted regarding their interest in potentially participating in a food waste program with the District. The University staff indicated that they have a food waste separation program in place. The food waste is separated from paper and plastics and collected separately. The food waste is currently hauled about 40 miles to a landfill where it is composted. They currently collected about 1.5 tons/day of food waste on the campus. They indicated that they would be very interested in discussing a potential food waste program at the Rancho site.

It should be noted that the rest of the facilities identified above were not contacted directly to discuss what food waste programs, if any, they are currently involved with.   Should the District elect to move forward with constructing a receiving facility at Rancho, we recommend that contact be made with the facilities to gauge their interest for developing a program with Rancho.

Section 6: Instrumentation and Controls

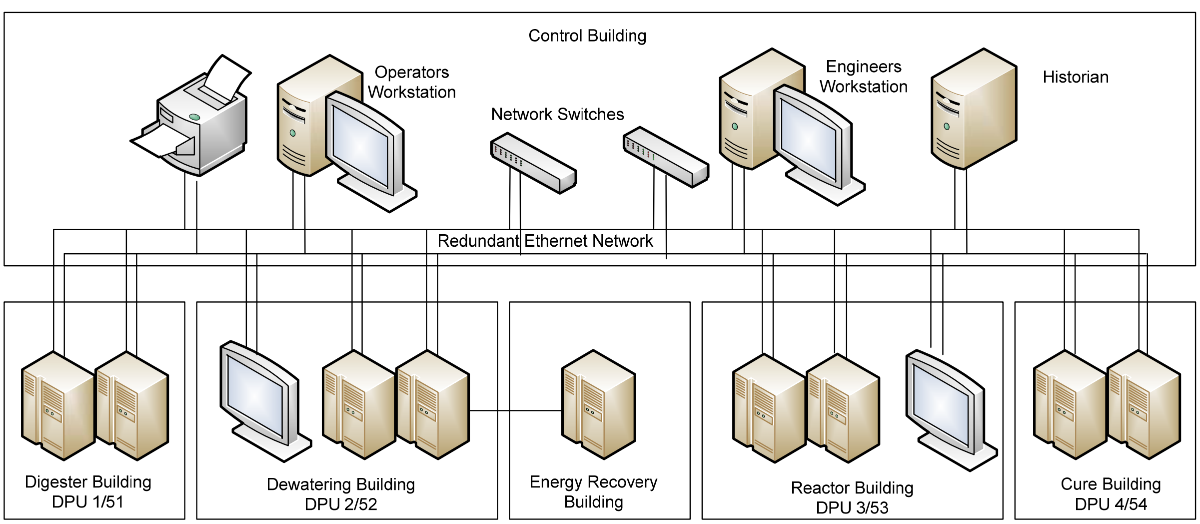
6.1 Existing Digesters

6.1.1 Control System

The Rancho facility control system is a distributed system with redundant field processors, redundant power supplies, redundant communications, and multiple workstations. The original system, a Westinghouse WDPF, was installed in the early 1990s. In the late 1990's, Westinghouse corporation was disbanded and the process control portion sold to Emerson. The system was upgraded in 2005 with an Emerson Ovation system, replacing redundant field controllers, redundant power supplies, operator interface computers, and an engineering workstation. The remaining core field equipment and the input/output modules remained the same. The system was organized into five redundant drops located at each of the main process control buildings. The existing Westinghouse co-axial communication system was replaced with redundant multimode fiber optic cables. The new fiber optics provides redundant communications to each processor and each operator interface.

The existing control routines and graphics on the Westinghouse system were upgraded for the Ovation system but were not enhanced. There were some issues with the new logic because the new processors did not implement some of the totalization or peak picking functions that were available in the Westinghouse system, requiring additional coding in the Ovation system. Figure 6-1 shows a schematic of the Ovation Control System architecture.

FIGURE 6-1
OVATION CONTROL SYSTEM ARCHITECTURE



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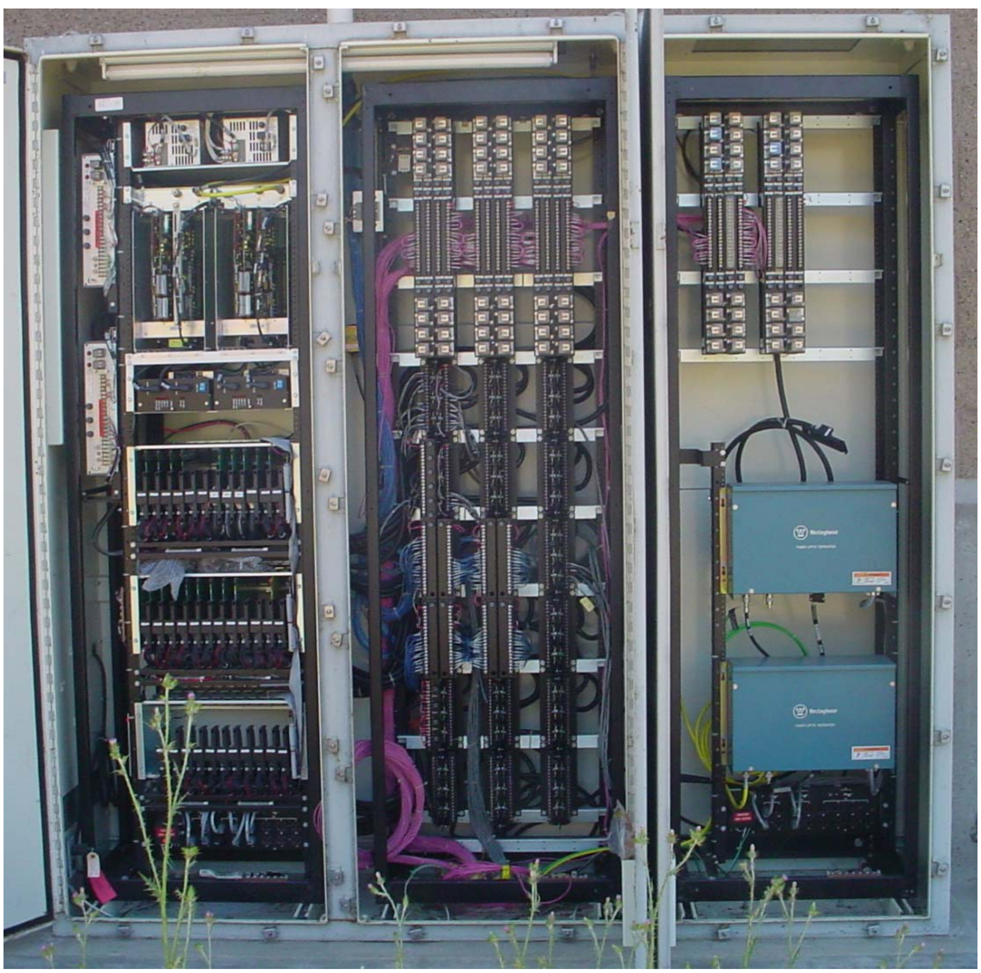
The then new Ovation system has not been upgraded because the district did not sign up for the $50,000 annual upgrades fee. The existing Ovation system does support external Modbus communications through the QLC card, but is very limited in the number of data connections. The new Ovation software version supports external communications to other programmable controls manufacturers through open protocol servers, field communication servers, or field communication cards.

6.1.1.1 Digester Control Equipment

The Digester drop had redundant processors and power supplies. The original input and output cards are still used in the card chassis. There are eight (8)16-point digital input cards, four (4) 16-point digital output cards, four (4) 6-point analog input cards, and one (1) 4 point analog output card. There are sufficient available slots in the chassis for additional cards to support the future digesters. New cards are not available for the system, but rebuilt cards are. However, the cards are still twenty years old, which are well beyond their electronic service-life.
Figure 6-2 is a photograph of the Digester Building controls equipment.

FIGURE 6-2
DIGESTER BUILDING CONTROL EQUIPMENT



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The temperature control process does not seem to be part of the distributed control system, because there are no outputs controlling the steam valves to the digester. The temperature sensors are wired to some local displays in the local field panel but it does not appear to be a single loop controller. The operations staff currently has been manually adjusting the steam valves on top of the digesters to adjust the digester temperature.

6.1.1.2 Digester Field Equipment

The existing level sensors are the original pressure sensors, which operate in a relatively inhospitable environment. Two existing temperature sensors are mounted from the top of the digester but are not long enough to measure the temperatures when the digesters are filling. The sludge magnetic flow meters are the original equipment and are still operating but should be calibrated due to the aging electronics. The mixing pumps have been rebuilt several times but are still operational. The mixing pumps have mercury pressure switches and mechanical flow switches for control permissives. The digester gas pressure is monitored and used for enabling the operation of the boiler and the flare through a process relay in the energy recovery building.

6.2 Digester Processes

6.2.1 Digester Feed

The digester is fed from the raw sludge tank several times a day with a set total volume pumped into the digester over a set number of cycles. The control processor divides the total volume amount by the number of cycles to calculate the required cycle pumped volume. The control processor also calculates the number of cycles per day to determine the start times for each feed cycle. The control processor is set up to pump from the raw sludge wet well at a set flow rate at the calculated cycle times. The pump flow is totalized to calculate how much is pumped to each digester and used to end each cycle to each tank. There is only one feed valve in the digester.

6.2.2 Digester Draw Off

The draw off procedure uses a similar algorithm of the volumetric discharge from the digester as in when feeding the digester. There are five open/close draw off valves but one modulating valve performs the flow control. A downstream flow meter provides the flow information for the volumetric totalization. Each cycle’s volumetric setpoint is distributed across the five draw off valves that are in automatic control.

6.2.3 Temperature Control

There are two temperature sensors mounted on the top of the digester on the center and the wall of the digester that provide temperature information for the control system. It does not appear that the control system provides temperature control but is performed by manual operation of the steam injection valves. The steam is introduced into the digester from the manual injection valves on the top of the digesters. The lack of automated temperature control for the digesters seems ironic because that is why distributed control systems claimed automatic routines, such as PID temperature control, were better than PLC based systems.

The steam is created by a boiler in the energy recovery building, which runs on natural gas or digester gas. The digester gas is a byproduct of the digesters and it is scrubbed prior to use in the boiler. The digester gas was also used in the cogeneration engine, which provides 300 kilowatts of electricity. In addition, a recently refurbished flare is used to burn off the extra digester gas that is not used by the cogeneration or the boiler. The flare starts when the gas pressure is around 18 inches of water and stops when the pressure is less than 12 inches of water.

6.2.4 Mixing

There are three mixing pumps that are used for mixing the digesters. Normally two outside mixing pumps are used for sludge recirculation in each individual digester. The center mixing pump can be used as a standby mixer if either outside mixing pumps fails. There are manual isolation valves used to select which mix pump is used for each digester tank. The manual valves can be arranged to transfer sludge between the two digesters as well.

6.3 New Control System

There are two options for the new digester; expand the existing Ovation distributed control system or install a standard PLC for the control. The following sections review the two options and what requirements they would have on the control system.

6.3.1 Expand Existing Ovation System

There are sufficient spare slots in the chassis and wiring terminals in the existing drop for the additional input and output cards at the existing digester-building control drop. However, the required cards would be rebuilt cards and not new, since the Westinghouse WPDF system is long obsolete. The cards that would be obtained would have twenty-year-old technology and longevity would be questionable. Emerson does make new cards but they are a different form factor and would require additional communication cards.

The existing logic and screens could be copied and modified for the new processes. Communications between the different field processors is required for starting and stopping the transfer pumps from the raw sludge well. Since the new processes are part of the Ovation system, the communications would be internal to the ovation system.

The existing Ovation drop is located on the North side of the digester building. The new site would require adding numerous conduits from the old digester building to the new digester location. There is a pull box in front of the digester building with some spare conduits but probably not enough for the required power, control, and instrumentation signals. The cost of the programming can be quite expense because Ovation normally charges about $2,400 per day per technician. It is expected that the software development for the controls and the operator interface graphics would take about two to three man months. District staff is learning some of the programming skills for the Ovation system but this is a large programming and graphics task.

A detailed cost estimate for the additional cards is available in the cost estimate. The programming could be assumed equal or greater to the programming estimate for the PLC system for the additional control functions.

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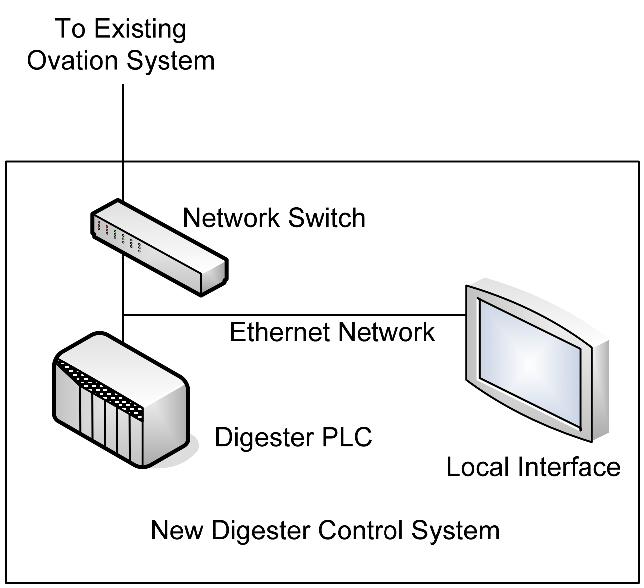
6.3.2 New PLC Based System

The new digester control system could be implemented with standard PLC products that support Ethernet communications. Programmable logic controllers have evolved significantly to provide multiple programming languages having numerous functions aiding in all aspects of control functions. The programmable logic controllers also provide higher-level functions such as structures and arrays, aiding program development and providing uniform code generation. The PLC hardware components are cost effective and readily available from numerous suppliers.

Normally, a local operator interface can be located with the control panel that displays current digester operations and control functions. The local operator interface is an industrial panel mounted computer running standard operator interface software such as Wonderware or Panelview. The local interface would be programmed just for the local digesters that the PLC is controlling and the related external control equipment. Figure 6-3 is a representation of a potentially new PLC based system architecture.

FIGURE 6-3
NEW PLC BASED SYSTEM ARCHITECTURE



The routines required for the process control are not extremely complicated and can be easily implemented in the PLC logic. The input and output point processing can also be implemented like the Ovation system but with much more definitive clarity. Currently the potable and the reclaimed system use programmable logic controllers, and District staff are capable of supporting the required maintenance and programming for the PLCs.

The only concern using a PLC based controller is how to connect the new PLC to the existing Ovation system. The current installed version of Ovation does not readily support external

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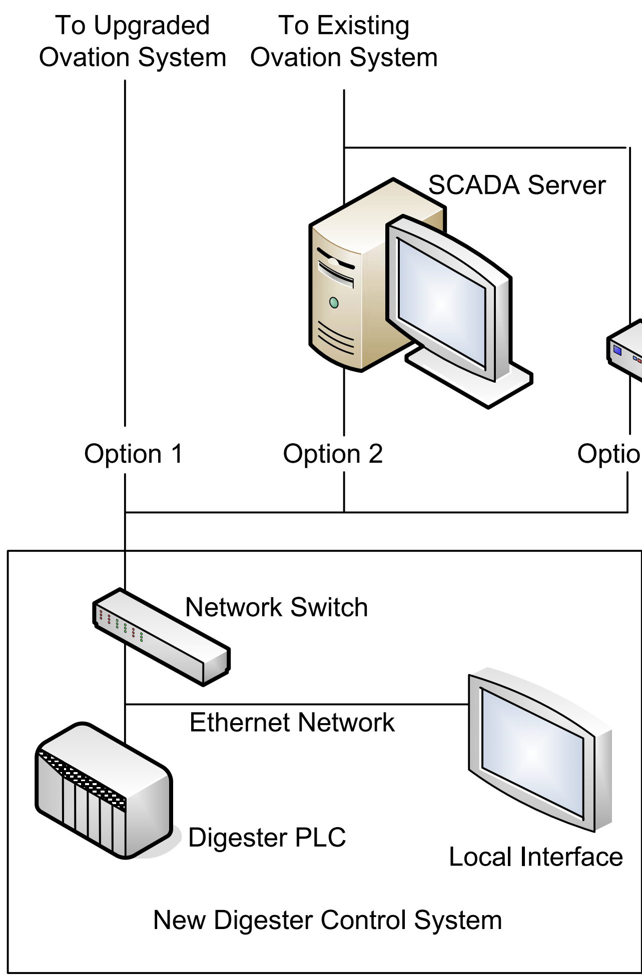
Ethernet communications to third party equipment. However, there are several approaches to implement this connectivity. The following sections describe the options for connecting a PLC system to the existing Ovation system, and Figure 6-4 is a schematic diagram of the three options.

FIGURE 6-4
OVATION CONNECTION OPTIONS DIAGRAM



Emerson who owns ovation recently purchased Bristol Babcock, which makes PLC type controllers and RTUs for water, wastewater, and the power industry. The Bristol does have a PLC based system called Control Wave that would work with the existing Ovation system but would still require a SCADA server as described in Section 6.3.2.2. The equipment costs for this PLC equipment is equivalent to the more predominant Allen Bradley ControlLogix platform but the Allen Bradley is much more readily available.

It is recommended that the selected control system for the new digester be PLC based on the Allen Bradley ControlLogix platform. The existing degester would remain on the Ovation

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equipment. The new thermal control will be on a similar PLC but installed in the Digester control panel just to handle the additional inputs and outputs for the thermal control.

6.3.2.1 Option 1: Upgrade Ovation

The latest version of Ovation does support external Ethernet communications to third party control equipment, like PLCs, but the installed system does not support this feature. This upgrade would require upgrading the existing workstations, the engineer's workstation, the control software, the historian, the network switches, and the field controllers. There was an update program that the District could have been purchasing, but it would have been a $50,000 per year cost. Since they did not subscribe, the District would have to pay for the approximately $160,000 upgrade.

6.3.2.2 Option 2: SCADA Server Software

This SCADA server software can be installed on an existing or a new workstation and second network card can be installed on the workstation. The second network card would be connected to the new PLC through a separate Ethernet network using the spare fiber optic fibers, new fiber optic transceivers, and network switches. This SCADA server computer would query the data from the new PLC control equipment and provide the information to the Ovation system. The Ovation system could be modified to display the new digester control equipment and then could link the different processes together. The ovation would read and write information to the new PLC as required for the processes.

6.3.2.3 Option 3: Field Servers

There are devices that can be added in the field that act as protocol converters between the Ovation system and the desired PLC system. The device is basically a small-specialized computer that is configured to act as a translator between the two controls systems. The field server is configured to know what points to read from or write to the new PLC system. Then the field server has to be configured for the Ovation points to match the PLC points. The field server basically acts like a look up table so if the Ovation wants to know what value is the digester level, it knows what address to request. This would still require screen development on the Ovation system.

6.3.3 Communications

The communications back to the control building can use the recently installed fiber optic spare fibers. There are four spare fibers in the existing fiber optic cable from the control room to the digester building. A new fiber cable can be installed between the old and new digester building and the two can be linked together. Alternatively, a new cable can be run from the new digester building back to the control building, but this would cost significantly more; however, this would also provide additional fiber optic cable.

Another communications option is spread spectrum Ethernet radios, but the radios have limited bandwidth compared to the fast Ethernet that the Ovation system uses. It is suggested that some radios be installed to support the recently updated flare, reclaimed water pump station, and weather station equipment.

The communications between the Ovation systems will be based on Ethernet TCP/IP communications. This is the current industrial communications methodology for industrial control systems. The Ethernet TCP/IP data packets allow multiple protocols to share the same media, providing a common communications media for current and future equipment.

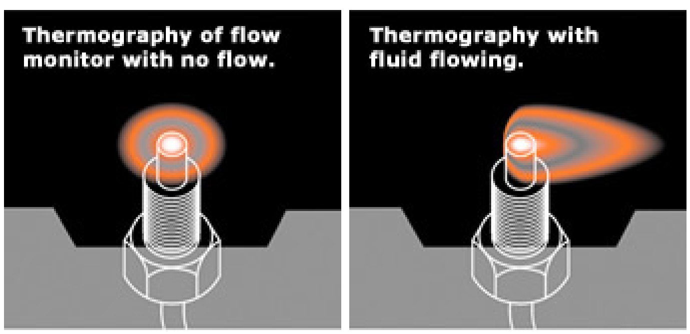
6.3.4 New Field Equipment

The new field equipment would be similar to the existing equipment except for more modern versions. The following sections describe the different measurement equipment options and the application of sensors.

6.3.4.1 Flow Sensors

The sludge flow meter would use a magnetic flow meter, but with self-cleaning probes common in sewage applications. The District is trying to standardize on the Krohne Environmag or Sparling Tigermag for its sewage applications.

The sludge mixing pumps also have water flow switches used to protect the pump seals if there is no water flow. If the new mixer pumps do have seals that require seal water, electronic flow switches should be used instead of the mechanical seal flow switch. The mechanical seal flow switch needs frequent servicing to protect from failing. The electronic flow switches use a thermal sensing principle, so there are no moving parts in the seal water. The thermal sensing principal used in electronic flow meters is shown below.



6.3.4.2 Level Sensors

The current level sensor is a differential pressure sensor which would be problematic unless on a bubbler system. Bubbler systems work well in this application but do require frequent maintenance. Recently radar level sensors have been installed in the Centrate tanks at the farm site and have worked quite well in warm and moist environments. The radar level sensors are non-contact and are not susceptible to temperature and moisture environments. The radar level sensors costs are similar to the ultrasonic level but are less susceptible to temperature and humidity variations.

The existing Digesters Nos. 1 and 2 use a differential pressure sensor to measure the digester level. Since there is a gas pressure on the digester, the differential sensor works well to measure the weight of the media. However, the differential pressure sensor does have small

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ports, which can be clogged with debris. A built-in purging system could be added by flushing reclaimed water through the process ports of the differential pressure sensor.

It is recommended that there be two level sensors; one radar and one differential pressure with built-in manual flushing systems.

6.3.4.3 Temperature Sensors

The new digesters temperature pressure sensors could be placed on the heat exchanger inlet and outlet piping providing a good measurement point since the heat exchanger is downstream from the mixers. This will provide a good measurement of the pre and post heating process.

However, it is commonly suggested to put in additional temperature sensors for the sides of the digester providing an accurate representation of sludge temperature. The current digesters have temperature sensors attached to the roof of the digester, which work well, but are not quite long enough when filling the digester. However, the wall penetrations for the temperature sensors may create structural and leakage issues.

It is recommended to have a temperature sensor before the heat exchanger, after the heat exchanger, and two sensors mounted from the roof of the digester. It is also suggested that the temperature sensors have some form of maintenance cleaning methodology.

6.3.4.4 Pressure Sensors

The digester gas pressure should be measured using appropriate Class 1 Div 1 explosion proof sensors. The gas pressure sensor should be physically mounted on the discharge line from the digester. Similar to the existing digesters, there should over pressure pop-off valves that open when the digester gas pressure exceeds the design pressure rating.

The mix pumps have suction and discharge pressure switches used for control permissives in the operation of the pumps. The existing system used Mercoid pressure switches that are not favorable because the switching element is mercury. The new pressure switches could use modern electronic pressure switches that are pressure transmitters with adjustable process relays. The electronic pressure switch has a gauge face, an analog output, and a programmable relay. The District has been trying to standardize on the IFM Efector instrument pressure switches/gauges for all control functions.

6.3.4.5 Control Valves

There are two types of valves to be used in the control of the digester: open/close and modulating valves. The open/close valves are the standard valves that are either open or closed, that can be controlled either locally through the valve control functions or through the control system. The valve should have remote status, open limit status, close limit status, and failure status. The modulating valves would use an analog current signal that will set the position of the valve and provide an analog current feedback signal that represents the valve percentage of open. The modulating valve should have remote status, open limit status, close limit status, and failure status. Both of these valves should use 480 VAC three phase power sources to simplify power distribution from the motor control center. The District is trying to standardize on Limitorque, Auma, and Beck actuators for large control valves.

6.4 New Heat Exchangers on Existing Digesters

For the new heat exchangers with the existing digesters, there are sufficient existing spare inputs and outputs points on the existing cards to facilitate the control functions. The logic could be developed in the Ovation system for the graphics and control. However, to simplify the installation, a small PLC could be added to perform the control of the heat exchanger valve and the temperature monitoring.

The temperature sensors for the temperature control can be installed before and after the heat exchanger as in the new system. The existing temperature sensors still could be used or replaced as reference or actually used in the control of the temperature.

6.5 Electrical Service

The plant is currently served at 16.5 kV from Southern California Edison Company. The power is metered at 16.5 kV and is connected to an outdoor switchgear designated as Unit Substation 1. This unit substation consists of two separate 2,500 kVA transformers which step down the 16.5 kV service to 480 volts. The Unit substation is configured as double ended with two 4000A main circuit breakers; one on “Bus A” and the other on “Bus B” with a tie circuit breaker between the two (2) 4000A buses allowing each transformer to feed the entire plant.

Motor control centers located at various plant locations are fed from this Unit Substation 1. Some MCCs are connected to Bus A while others are connected to Bus B.

In addition to normal power, the plant includes an emergency distribution panel “EDP1” which allows certain critical loads to be served from an emergency generator. Individual feeders from EDP1 are routed to various MCCs. Loads requiring emergency power would be switched individually to emergency power if normal power fails.

The existing Digesters 1 and 2 are served from “MCC -1M” located at the Digester Pump Station 1. This MCC is served from a 400A circuit breaker from Unit Substation #1 and includes starters and feeders to pumps, valves and ventilation system. The lighting panel and ventilation includes an automatic transfer switch that transfers these loads to emergency power upon the loss of normal power. It is anticipated that minor electrical modifications are expected for this MCC as part of minor modifications to Digesters 1 and 2.

The existing Unit Substation 1 currently includes a 400A spare circuit breaker intended for use when Digesters 3 and 4 are constructed. Like existing Digesters 1 and 2, a new motor control center is to be located at the new Pump Station Building for Digester 3, and would be constructed and fed from the 400 A circuit breaker. There is existing spare conduit 7B available in the power pullbox near the planned new building that can be used to install a new feeder. In addition, an emergency feeder from the EDP1 panel would also be required to serve critical motor loads, the lighting panel and ventilation system. At the existing panel EDP1, an existing 70 A spare circuit breaker has been designated to serve the new Digesters 3 and 4 MCC. A spare conduit EDP1-3 is available for this purpose and currently terminates in a pullbox near the planned new building that can be used to install the new emergency power feeder.

Section 7: Opinion of Probable Cost of Construction

A planning level opinion of probable cost of construction was developed for this PDR for each major component of the project. Consistent with industry standard, at this (preliminary design) level of the project, costs are estimated to have an accuracy of plus 50 percent to minus 30 percent.

Mark-ups that are included in the itemized construction costs are as follows:

- Division 1 – 10%
- Taxes on materials – 8.75%
- Contractor mark-ups for Subs – 12%
- Contractor overhead and profit – 15%
- Estimated contingency – 20%
- Escalation to the midpoint of construction – 2%

TABLE 7-1
OPINION OF PROBABLE COST OF CONSTRUCTION

Project Component		Estimated Cost
Site Work	$	50,000
Digester Structure	$	1,360,000
Digester Gas Handling Equipment	$	130,000
Digester Heating System Improvements	$	1,130,000
Digester Mixing System	$	830,000
Digester Pump Building	$	700,000
Instrumentation and Controls	$	1,100,000
Total Project Cost	**$**	**5,300,000**

It should be noted that the costs tabulated above do not include a cost to construct the FOG and foodwaste receiving facility discussed in Section 5 of this report.

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Appendix A

Tapia and Rancho Process Flow Data

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Date	Tapia WWTP Effluent Flow	dry weather 30-day avg	Tapia WWTP Influent BOD_5	Total Suspended Solids	Tapia to RLV Sludge Total Solids	Tapia to RLV pumped	RLV Received	Raw Q to Digestor	max month (30-days)	
	MGD	MGD	mg/l	mg/l	%	GPD	GPD	GPD	GPD	
						brsfftp	bfi501	bfi120b		
01/01/10	7.77					39,456	34,200	69,552		
01/02/10	9.18					98,899	90,302	71,928		
01/03/10	8.61					74,131	67,536	71,957		
01/04/10	9.65					55,987	50,011	72,014		
01/05/10	8.24		310.00	229.00	3.10%	65,246	57,470	61,603		
01/06/10	8.49		250.00			84,269	76,018	65,160		
01/07/10	8.47					55,382	37,008	71,957		
01/08/10	8.37					82,570	74,405	71,914		
01/09/10	8.08					49,666	44,410	72,115		
01/10/10	8.91					90,835	82,382	65,693		
01/11/10	8.30					25,776	23,054	66,758		
01/12/10	7.95		220.00	256.00		52,358	47,362	58,680		
01/13/10	9.31		200.00			62,309	58,838	65,981		
01/14/10	9.84					125,770	112,248	71,899		
01/15/10	8.27					58,176	57,326	72,029		
01/16/10	9.50					65,333	59,357	71,842		
01/17/10	8.71					84,614	74,736	71,914		
01/18/10	13.80					67,320	62,294	72,029		
01/19/10	13.17		140.00	190.00		81,432	74,462	65,606		
01/20/10	17.82		170.00			72,994	66,715	61,934		
01/21/10	18.33					77,083	70,142	61,862		
01/22/10	16.33					29,419	68,688	61,891		
01/23/10	13.69					80,813	72,072	61,805		
01/24/10	12.54					84,528	76,421	61,906		
01/25/10	12.12					62,611	59,990	71,597		
01/26/10	12.01		220.00	256.00		80,078	69,739	77,054		
01/27/10	11.52		220.00			79,920	72,000	81,979		
01/28/10	11.10					85,075	77,083	87,034		
01/29/10	10.60					88,214	80,366	87,134		
01/30/10	10.38					85,925	82,685	87,106	70,398	
01/31/10	9.55					86,299	75,931	87,019	70,980	
02/01/10	10.35					76,378	70,114	87,019	71,483	
02/02/10	10.20		270.00	235.00	3.00%	89,496	81,259	87,077	71,987	
02/03/10	9.66					72,144	64,555	86,962	72,485	
02/04/10	10.54					73,066	66,211	87,091	73,335	
02/05/10	11.67					79,042	70,920	87,091	74,066	
02/06/10	13.29					85,061	76,262	87,091	74,570	
02/07/10	12.31					94,997	84,802	86,918	75,071	
02/08/10	11.88					82,354	74,563	86,890	75,563	
02/09/10	12.10		220.00			69,509	58,522	86,861	76,269	
02/10/10	11.50		200.00	260.00		75,182	65,765	84,744	76,868	
02/11/10	11.92					81,979	71,554	81,907	77,642	
02/12/10	10.88					84,355	74,362	81,907	78,173	
02/13/10	10.81					85,838	75,787	82,008	78,510	
02/14/10	10.15					83,880	74,592	81,850	78,838	
02/15/10	11.06					71,870	63,763	81,058	79,145	
02/16/10	10.93		230.00	253.00		83,894	74,318	81,893	79,477	
02/17/10	9.40					90,115	79,186	81,893	79,806	
02/18/10	10.79					90,878	80,194	81,950	80,351	
02/19/10	9.58					85,464	85,464	82,051	81,022	
02/20/10	10.63					82,685	82,685	81,878	81,689	
02/21/10	10.36					74,045	74,045	81,965	82,358	
02/22/10	10.09					73,238	73,238	74,002	82,764	
02/23/10	10.09		200.00	233.00		87,509	72,130	65,822	82,895	
02/24/10	10.32					77,976	63,720	62,021	82,576	
02/25/10	7.05					78,350	61,229	66,845	82,236	
02/26/10	10.07					76,925	59,054	66,830	81,731	
02/27/10	12.20					78,725	59,256	66,830	81,057	
02/28/10	11.31					78,034	58,939	66,787	80,379	
03/01/10	11.25					91,109	70,114	87,019	80,376	
03/02/10	10.45		190.00	225.00	3.00%	81,533	81,259	87,077	80,378	
03/03/10	10.51		210.00			80,323	64,555	86,962	80,376	
03/04/10	10.67					85,162	66,211	87,091	80,376	
03/05/10	10.03					88,661	70,920	87,091	80,381	
03/06/10	10.50					82,123	76,262	87,091	80,381	
03/07/10	10.32					88,042	84,802	86,918	80,375	
03/08/10	9.85					89,438	74,563	86,890	80,368	
03/09/10	10.60		230.00	247.00		81,821	58,522	86,861	80,366	
03/10/10	10.53		190.00			80,323	65,765	84,744	80,295	
03/11/10	9.38					84,442	71,554	81,907	80,130	
03/12/10	10.43					84,211	74,362	81,907	80,035	
03/13/10	9.21					82,714	75,787	82,008	80,039	
03/14/10	9.65					86,486	74,592	81,850	80,037	
03/15/10	9.73					86,659	63,763	81,058	80,005	
03/16/10	9.41		230.00	285.00		90,274	68,818	71,150	79,648	
03/17/10	9.07		260.00			87,077	69,206	71,986	79,346	
03/18/10	9.23					88,186	76,680	65,333	78,794	
03/19/10	9.15					91,238	78,149	72,202	78,471	
03/20/10	9.09					81,734	67,651	71,928	78,137	
03/21/10	9.76					81,979	67,291	71,957	77,800	
03/22/10	8.95					85,003	63,907	75,355	77,583	
03/23/10	9.42		250.00	262.00		85,162	68,544	77,040	77,419	
03/24/10	8.87		230.00			85,018	69,754	77,054	77,520	
03/25/10	8.96					87,869	71,683	77,040	77,894	
03/26/10	8.78					89,741	79,056	76,997	78,394	
03/27/10	8.39					88,502	77,400	77,011	78,732	
03/28/10	9.35					84,946	74,534	77,011	79,072	
03/29/10	9.02					93,758	82,138	77,040	79,412	
03/30/10	9.61		230.00	250.50		83,246	72,043	76,925	79,750	
03/31/10	9.59		220.00			43,027	32,530	77,054	79,418	
04/01/10	8.60					102,701	85,046	87,019	79,416	
04/02/10	8.76					88,387	77,184	87,077	79,420	

ITEM 5A

04/03/10	8.34					79,848	71,064	86,962	79,416
04/04/10	9.55					49,334	40,522	87,091	79,416
04/05/10	9.16					84,370	64,526	87,091	79,416
04/06/10	9.38		260.00	250.00	3.70%	94,709	83,909	87,091	79,421
04/07/10	9.04		270.00			84,010	70,805	86,918	79,422
04/08/10	9.07					89,366	78,811	86,890	79,423
04/09/10	9.21					90,202	78,322	86,861	79,494
04/10/10	8.22					89,755	76,680	84,744	79,588
04/11/10	9.72					89,222	78,178	81,907	79,588
04/12/10	10.03					83,837	75,024	81,907	79,585
04/13/10	10.43		230.00	270.00		88,776	76,694	82,008	79,590
04/14/10	9.31		270.00			88,416	77,227	81,850	79,617
04/15/10	8.99					89,366	78,523	77,069	79,814
04/16/10	8.84					92,779	80,510	76,925	79,979
04/17/10	8.60					88,661	77,371	77,083	80,370
04/18/10	8.47					92,678	82,109	76,925	80,528
04/19/10	8.95					89,482	78,782	80,309	80,807
04/20/10	8.90		260.00	276.00		89,554	78,970	82,022	81,143
04/21/10	8.53		230.00			70,157	60,566	81,864	81,360
04/22/10	8.58					51,422	43,142	50,947	80,490
04/23/10	8.94					95,026	78,610	72,029	80,322
04/24/10	8.32					95,760	86,789	72,014	80,155
04/25/10	8.12					94,493	79,848	76,968	80,154
04/26/10	8.77					88,920	77,702	82,037	80,321
04/27/10	9.09		190.00			59,803	49,478	82,109	80,491
04/28/10	9.02		230.00	272.00		86,688	74,390	82,022	80,657
04/29/10	8.98					88,992	77,342	81,994	80,826
04/30/10	9.14					82,022	70,790	81,950	80,989
05/01/10	8.87					78,682	70,747	81,922	80,820
05/02/10	8.74					86,486	71,510	82,051	80,652
05/03/10	9.19					75,974	66,730	98,482	81,036
05/04/10	8.87		220.00	248.00	2.90%	99,634	83,016	62,626	80,220
05/05/10	9.03		250.00			148,680	126,994	72,806	79,744
05/06/10	8.59					83,088	74,477	58,608	78,795
05/07/10	8.33					109,498	79,070	66,038	78,099
05/08/10	8.00					88,502	78,667	72,029	77,604
05/09/10	8.19					71,582	62,338	71,914	77,105
05/10/10	8.45					91,958	80,813	72,216	76,688
05/11/10	8.48		240.00	315.00		86,918	76,234	73,742	76,416
05/12/10	8.50		230.00			90,950	78,034	77,112	76,256
05/13/10	8.38					85,925	76,853	83,664	76,311
05/14/10	8.45					90,878	81,806	88,099	76,519
05/15/10	8.11	8.65				74,016	63,115	87,869	76,879
05/16/10	7.88	8.61				88,056	77,472	87,955	77,247
05/17/10	8.63	8.62				75,326	65,074	43,589	76,130
05/18/10	9.10	8.64	240.00	352.00		45,130	38,059	41,616	74,953
05/19/10	8.95	8.64	220.00			47,621	38,693	50,213	73,950
05/20/10	8.75	8.63				80,798	73,498	72,533	73,634
05/21/10	9.61	8.67				90,778	79,906	77,054	73,474
05/22/10	8.49	8.66				65,203	59,357	77,026	74,343
05/23/10	8.63	8.65				75,614	66,859	76,925	74,506
05/24/10	8.97	8.68				82,166	68,774	76,939	74,670
05/25/10	8.40	8.69	250.00	320.00		53,856	42,422	76,781	74,664
05/26/10	8.43	8.67	240.00			90,173	82,454	60,912	73,960
05/27/10	8.12	8.64				76,709	67,003	61,747	73,281
05/28/10	8.34	8.62				64,325	52,632	61,747	72,605
05/29/10	7.93	8.58				59,659	49,824	61,877	71,935
05/30/10	7.38	8.53				89,957	81,461	61,934	71,268
05/31/10	8.34	8.51				77,861	67,334	61,675	70,593
06/01/10	8.37	8.50	240.00	308.00	3.40%	159,883	75,614	61,790	69,917
06/02/10	8.10	8.46	260.00			228,643	61,661	61,877	68,697
06/03/10	8.25	8.44				75,110	66,211	61,862	68,672
06/04/10	8.26	8.41				74,549	61,574	65,808	68,438
06/05/10	8.01	8.39				75,542	67,781	66,974	68,717
06/06/10	7.96	8.38				68,285	60,192	67,018	68,750
06/07/10	8.04	8.38				68,832	56,218	66,960	68,581
06/08/10	8.13	8.38	230.00	274.00		49,579	39,470	66,830	68,412
06/09/10	8.15	8.37	220.00			76,018	68,342	66,557	68,223
06/10/10	8.27	8.36				82,296	76,565	62,914	67,862
06/11/10	8.55	8.37				83,362	69,221	72,043	67,693
06/12/10	7.86	8.35				82,843	73,498	72,043	67,306
06/13/10	7.77	8.33				77,688	74,477	72,043	66,770
06/14/10	8.07	8.32				57,240	54,936	71,899	66,238
06/15/10	8.20	8.33	270.00	329.00		64,714	63,720	71,885	65,702
06/16/10	8.41	8.33	230.00			53,842	42,005	65,117	66,420
06/17/10	8.18	8.30				84,600	71,496	48,370	66,645
06/18/10	8.07	8.27				74,736	63,878	41,328	66,349
06/19/10	7.83	8.24				82,944	77,069	41,400	65,311
06/20/10	7.77	8.18				73,483	63,893	38,995	64,043
06/21/10	8.05	8.16				66,600	54,000	77,400	64,055
06/22/10	8.40	8.15	220.00	336.00		70,862	60,221	78,048	64,092
06/23/10	9.27	8.16	200.00			74,779	65,275	72,000	63,928
06/24/10	9.23	8.19				76,680	67,334	72,000	63,768
06/25/10	9.16	8.22				84,989	72,562	72,029	64,139
06/26/10	8.79	8.24				85,046	71,078	72,086	64,484
06/27/10	8.71	8.25				84,686	72,432	71,928	64,823
06/28/10	8.87	8.28				84,686	71,467	72,043	65,162
06/29/10	8.53	8.32	220.00	356.00		97,459	83,146	66,744	65,322
06/30/10	9.30	8.35	280.00			89,957	75,542	72,014	65,667
07/01/10	9.01	8.37				69,120	54,259	79,013	66,241
07/02/10	8.50	8.39				65,506	51,739	71,626	66,566
07/03/10	7.98	8.38				87,408	73,915	71,957	66,902
07/04/10	7.70	8.36				73,757	60,394	71,942	67,107
07/05/10	7.85	8.35				87,638	74,102	71,899	67,271
07/06/10	8.78	8.38	250.00	259.00	3.00%	96,307	81,259	71,971	67,436
07/07/10	8.83	8.41	260.00			77,962	71,683	71,928	67,602

07/08/10	8.68	8.43				82,901	74,506	71,971	67,773
07/09/10	8.63	8.44				87,494	82,570	62,698	67,644
07/10/10	8.41	8.45				90,418	61,157	72,043	67,949
07/11/10	8.41	8.44				71,064	61,272	71,971	67,946
07/12/10	7.88	8.44				45,130	31,853	73,469	67,994
07/13/10	7.76	8.44	220.00	338.00		23,515	42,466	71,899	67,989
07/14/10	7.89	8.44	230.00			34,934	74,621	58,579	67,545
07/15/10	8.02	8.43				35,064	71,006	65,981	67,348
07/16/10	8.59	8.44				35,942	82,094	71,885	67,574
07/17/10	8.76	8.46				34,661	76,176	71,971	68,361
07/18/10	8.47	8.47				38,002	78,566	71,899	69,380
07/19/10	8.78	8.50				34,157	72,835	71,942	70,398
07/20/10	8.81	8.54	220.00	296.00		34,258	82,368	72,029	71,499
07/21/10	8.79	8.56	200.00			74,218	82,051	75,600	71,439
07/22/10	8.52	8.56				72,432	76,003	80,251	71,512
07/23/10	8.71	8.55				72,446	74,462	77,026	71,680
07/24/10	8.29	8.51				70,661	75,110	77,069	71,849
07/25/10	8.48	8.49				67,939	69,307	76,982	72,014
07/26/10	8.50	8.48				82,080	77,760	76,320	72,155
07/27/10	9.41	8.50	210.00	230.00		87,379	78,293	76,939	72,322
07/28/10	8.74	8.50	260.00			88,934	82,008	76,982	72,487
07/29/10	9.06	8.52				92,909	78,206	76,522	72,813
07/30/10	8.09	8.48				88,315	82,584	77,054	72,981
07/31/10	8.95	8.48				88,675	78,034	76,997	72,913
08/01/10	8.88	8.49				91,325	77,645	70,200	72,866
08/02/10	9.18	8.53				87,984	81,216	81,043	73,169
08/03/10	9.25	8.58	200.00	270.00	2.90%	90,158	81,158	87,019	73,671
08/04/10	9.44	8.63	220.00			89,712	79,646	86,947	74,173
08/05/10	9.00	8.64				91,454	85,291	84,139	74,579
08/06/10	8.69	8.64				86,976	78,998	78,394	74,794
08/07/10	7.98	8.61				90,446	79,056	82,037	75,130
08/08/10	8.14	8.60				90,792	75,456	82,022	75,774
08/09/10	8.80	8.61				89,366	78,437	79,690	76,029
08/10/10	8.76	8.62	250.00	285.00		90,878	77,472	71,626	76,017
08/11/10	8.44	8.64				89,309	79,560	60,494	75,585
08/12/10	8.12	8.65	180.00			73,901	66,082	74,448	75,670
08/13/10	8.12	8.66				91,526	74,837	82,152	76,455
08/14/10	8.51	8.68				88,733	71,093	82,224	76,997
08/15/10	8.31	8.67				89,352	75,442	82,109	77,338
08/16/10	8.54	8.66				89,510	72,878	79,085	77,575
08/17/10	8.69	8.67	220.00	278.00		92,606	71,453	77,198	77,751
08/18/10	8.98	8.67	220.00			86,616	72,346	77,141	77,925
08/19/10	8.53	8.66				89,611	83,131	77,184	78,096
08/20/10	8.56	8.66				92,808	72,058	77,098	78,146
08/21/10	8.27	8.65				87,552	73,584	77,141	78,043
08/22/10	8.27	8.63				97,963	78,811	77,126	78,046
08/23/10	8.33	8.63				86,501	72,763	77,069	78,046
08/24/10	9.17	8.66	220.00	345.00		92,419	72,778	77,054	78,048
08/25/10	8.38	8.65	210.00			90,043	72,403	77,112	78,075
08/26/10	8.51	8.62				87,394	72,403	77,126	78,081
08/27/10	8.57	8.62				89,482	74,362	73,886	77,978
08/28/10	8.42	8.60				91,354	76,435	77,098	77,997
08/29/10	8.23	8.60				89,539	74,664	77,026	77,996
08/30/10	8.77	8.59				85,616	75,000	75,000	77,930
08/31/10	8.88	8.59	210.00	367.00		93,010	75,629	70,474	77,939
09/01/10	8.64	8.58	200.00			86,342	76,421	72,043	77,639
09/02/10	8.57	8.55				90,749	76,666	69,408	77,052
09/03/10	8.79	8.53				87,451	76,810	62,136	76,225
09/04/10	8.21	8.51				92,592	80,338	72,000	75,820
09/05/10	8.22	8.49				88,848	76,190	71,928	75,604
09/06/10	8.48	8.51				89,928	76,939	71,986	75,269
09/07/10	8.51	8.52	250.00	360.00	2.90%	95,328	82,829	62,986	74,635
09/08/10	8.66	8.52	240.00			93,816	77,616	78,408	74,592
09/09/10	8.74	8.51				86,573	74,160	81,504	74,921
09/10/10	8.74	8.52				98,366	85,118	84,888	75,735
09/11/10	7.63	8.51				92,333	79,142	86,083	76,122
09/12/10	7.47	8.49				98,093	81,158	86,126	76,255
09/13/10	7.91	8.47				98,352	82,973	86,126	76,385
09/14/10	8.06	8.46	240.00	381.00		102,542	87,365	86,184	76,521
09/15/10	7.83	8.43	250.00			98,597	85,090	86,141	76,756
09/16/10	7.94	8.41				100,613	85,349	86,040	77,051
09/17/10	8.35	8.39				100,123	86,904	86,011	77,346
09/18/10	7.77	8.36				96,250	85,219	86,098	77,644
09/19/10	8.05	8.35				101,333	85,867	86,069	77,943
09/20/10	8.41	8.35				98,683	89,179	89,107	78,341
09/21/10	8.98	8.37	180.00	296.00		102,038	83,203	87,998	78,704
09/22/10	8.65	8.38	250.00			99,230	88,114	88,027	79,069
09/23/10	8.59	8.37				125,813	112,219	87,955	79,432
09/24/10	8.70	8.38				99,403	83,160	87,998	79,795
09/25/10	8.72	8.38				96,984	87,595	87,898	80,154
09/26/10	8.51	8.38				99,130	86,803	87,898	80,621
09/27/10	8.54	8.38				64,166	53,726	62,582	80,138
09/28/10	8.86	8.41	220.00	358.00		128,923	110,981	110,866	81,266
09/29/10	8.76	8.41	200.00			110,534	102,312	96,667	81,988
09/30/10	8.57	8.40				98,179	85,450	102,355	83,051
10/01/10	8.58	8.39				124,906	113,227	102,600	84,069
10/02/10	8.33	8.39				135,029	119,232	102,758	85,181
10/03/10	8.21	8.37				102,470	87,307	102,614	86,530
10/04/10	7.75	8.35				101,059	84,571	90,158	87,135
10/05/10	7.69	8.33	220.00	314.00	2.78%	102,701	90,965	97,430	87,985
10/06/10	8.87	8.35	180.00			104,458	94,594	100,973	88,952
10/07/10	8.26	8.34				109,411	98,194	86,314	89,729
10/08/10	8.27	8.32				101,707	88,258	88,661	90,071
10/09/10	7.56	8.29				105,466	94,306	85,450	90,203
10/10/10	7.56	8.25				107,323	91,325	83,189	90,146
10/11/10	8.09	8.26			2.70%	104,976	91,253	83,174	90,049

10/12/10	7.94	8.28	250.00	347.00	2.90%	104,328	90,720	82,339	89,923
10/13/10	8.37	8.29	220.00			97,790	88,171	89,179	90,024
10/14/10	8.12	8.29				114,106	106,171	102,038	90,553
10/15/10	8.09	8.30				106,762	90,130	102,024	91,082
10/16/10	7.36	8.28				117,014	108,187	102,010	91,615
10/17/10	7.80	8.27				115,142	98,438	101,995	92,148
10/18/10	7.64	8.26				126,461	110,102	98,741	92,569
10/19/10	7.26	8.24	200.00	382.00	2.80%	116,654	97,762	94,090	92,836
10/20/10	7.60	8.21	210.00			103,939	96,336	97,042	93,101
10/21/10	7.15	8.15				148,752	135,965	96,941	93,399
10/22/10	7.55	8.11				101,333	88,301	97,114	93,702
10/23/10	7.07	8.06				116,136	109,670	97,142	94,008
10/24/10	7.19	8.01				110,837	102,686	97,056	94,310
10/25/10	7.20	7.96				120,341	109,411	96,984	94,613
10/26/10	7.38	7.92	240.00	394.00		111,312	99,144	96,984	94,916
10/27/10	7.28	7.88	210.00			120,240	107,539	109,181	96,469
10/28/10	7.33	7.83				122,054	103,838	116,640	96,661
10/29/10	7.41	7.78				121,349	103,594	116,510	97,323
10/30/10	7.25	7.74				122,069	105,091	102,715	97,335
10/31/10	7.19	7.69				118,958	100,181	96,970	97,147
11/01/10	7.99	7.68				123,941	107,971	99,216	97,029
11/02/10	7.98	7.67	240.00	431.00	2.60%	117,490	100,642	102,326	97,020
11/03/10	7.93	7.68	240.00			87,653	82,238	106,546	97,566
11/04/10	8.00	7.69				141,509	155,794	106,704	97,875
11/05/10	7.92	7.66				142,733	163,886	106,603	98,063
11/06/10	7.58	7.64				121,810	148,565	106,618	98,739
11/07/10	7.77	7.62				107,208	131,602	106,517	99,335
11/08/10	8.22	7.64				111,341	139,032	106,416	100,033
11/09/10	8.14	7.66	220.00	390.00		100,267	130,824	106,488	100,810
11/10/10	8.06	7.66	260.00			100,066	123,250	106,502	101,588
11/11/10	8.12	7.66				115,762	133,272	106,603	102,396
11/12/10	8.02	7.65				122,558	117,936	106,690	102,980
11/13/10	7.48	7.63				126,994	124,632	106,013	103,113
11/14/10	8.07	7.63				123,451	120,917	106,632	103,266
11/15/10	7.73					123,365	119,318	106,142	103,404
11/16/10	7.86		270.00	443.00		120,744	116,438	106,603	103,558
11/17/10	8.30		220.00			110,117	110,174	106,632	103,821
11/18/10	7.96					122,098	122,256	106,690	104,241
11/19/10	8.74					125,698	121,104	106,560	104,558
11/20/10	9.22					125,179	123,710	106,502	104,877
11/21/10	9.38					125,438	122,256	110,203	105,313
11/22/10	8.82		220.00	363.00		121,262	113,702	106,214	105,615
11/23/10	9.36		210.00			120,168	114,941	106,502	105,930
11/24/10	8.83					100,440	90,403	106,502	106,248
11/25/10	9.47					115,949	104,270	106,675	106,571
11/26/10	8.58					119,678	112,810	106,603	106,485
11/27/10	8.18					116,395	112,997	106,646	106,152
11/28/10	9.15					110,635	105,221	106,445	105,816
11/29/10	8.03					121,349	103,594	116,510	106,276
11/30/10	8.37		190.00	282.00		122,069	105,091	102,715	106,467
12/01/10	8.36					112,838	113,630	106,733	106,718
12/02/10	8.31					115,963	117,878	106,243	106,848
12/03/10	8.40					112,450	118,051	106,459	106,846
12/04/10	8.19					114,941	119,347	106,214	106,829
12/05/10	8.46					110,376	113,515	106,474	106,825
12/06/10	8.70					115,358	116,482	106,502	106,821
12/07/10	8.81		260.00	404.00	2.80%	114,336	119,765	106,488	106,820
12/08/10	9.01		220.00			115,992	114,840	106,603	106,826
12/09/10	8.78					117,230	130,824	109,224	106,918
12/10/10	8.46					117,533	123,250	106,978	106,933
12/11/10	8.24					118,426	133,272	107,136	106,951
12/12/10	8.75					118,930	117,936	107,136	106,966
12/13/10	8.25					108,518	124,632	65,549	105,617
12/14/10	8.55		220.00	483.00		99,835	120,917	87,782	104,989
12/15/10	9.08		260.00			137,534	119,318	122,702	105,541
12/16/10	8.72					141,192	116,438	122,702	106,078
12/17/10	9.46					139,306	110,174	122,688	106,613
12/18/10	11.45					137,261	122,256	114,509	106,873
12/19/10	15.14					120,456	121,104	112,320	107,065
12/20/10	15.12		120.00	306.00		124,862	123,710	119,117	107,486
12/21/10	15.92		170.00			136,670	122,256	122,717	107,903
12/22/10	16.29					144,648	113,702	125,309	108,540
12/23/10	15.39					138,370	114,941	122,558	109,075
12/24/10	12.39					129,974	90,403	122,530	109,609
12/25/10	11.97					135,648	104,270	122,371	110,132
12/26/10	12.09		190.00			137,102	112,810	120,442	110,593
12/27/10	11.79		230.00	236.00		133,474	136,685	122,443	111,120
12/28/10	11.16					131,198	151,128	122,371	111,651
12/29/10	12.06					135,576	151,488	122,429	111,848
12/30/10	11.35					136,598	147,802	122,645	112,512
12/31/10	11.47					136,008	144,590	122,386	113,034
01/01/11	10.17					132,552	137,203	122,544	113,578
01/02/11	11.59					136,771	134,251	122,472	114,111
01/03/11	11.74					136,685	127,512	122,285	114,647
01/04/11	10.65		160.00	255.00	2.50%	132,955	123,581	122,314	115,175
01/05/11	10.96		210.00			133,171	117,950	122,342	115,703
01/06/11	11.00					132,710	116,971	122,386	116,233
01/07/11	10.18					130,694	116,899	122,328	116,757
01/08/11	10.46					112,032	97,690	122,314	117,193
01/09/11	10.62					106,373	91,210	122,299	117,704
01/10/11	10.09					114,134	98,006	112,334	117,877
01/11/11	10.29		130.00	253.00		111,989	93,067	107,208	117,880
01/12/11	10.29		220.00			114,322	94,982	107,251	119,270
01/13/11	9.45					118,584	100,685	107,366	119,923
01/14/11	10.40					131,918	114,451	100,310	119,176
01/15/11	9.14					129,974	112,594	97,416	118,333

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01/16/11	9.51				115,906	98,611	97,488	117,493
01/17/11	9.08				104,242	87,926	96,005	116,877
01/18/11	9.41	190.00	294.00		102,442	84,946	97,618	116,387
01/19/11	9.22	240.00			113,515	97,099	97,445	115,664
01/20/11	9.41				112,882	95,760	102,730	114,998
01/21/11	8.82				112,262	94,968	107,381	114,400
01/22/11	9.19				113,126	98,338	103,061	113,750
01/23/11	8.85				84,917	79,200	104,861	113,161
01/24/11	8.75				117,936	110,246	107,338	112,660
01/25/11	9.11	190.00	305.00		112,090	103,248	107,280	112,222
01/26/11	8.94	210.00		2.70%	104,774	93,730	107,525	111,724
01/27/11	8.95				105,480	90,115	107,539	111,230
01/28/11	8.74				109,742	99,734	107,381	110,728
01/29/11	9.21				105,163	97,603	107,453	110,222
01/30/11	8.77				105,163	97,603	107,453	109,724
01/31/11	9.15				105,768	95,616	107,410	109,220
02/01/11	9.11	200.00	287.00	2.40%	81,835	137,203	105,466	108,653
02/02/11	9.01	220.00			100,958	134,251	107,410	108,157
02/03/11	9.14				79,848	127,512	107,482	107,663
02/04/11	8.70				101,549	123,581	107,309	107,161
02/05/11	8.69				100,973	117,950	107,309	106,659
02/06/11	8.83				100,901	116,971	107,323	106,159
02/07/11	8.53				95,054	116,899	99,043	105,383
02/08/11	8.87	180.00	292.00	2.80%	87,264	97,690	87,293	104,216
02/09/11	8.81	210.00			79,978	65,059	72,965	102,904
02/10/11	8.85				96,696	77,587	67,046	101,565
02/11/11	8.45				93,658	74,434	67,090	100,226
02/12/11	8.16				92,117	72,979	67,003	98,881
02/13/11	8.73				92,549	73,440	72,072	97,940
02/14/11	8.48				92,592	74,102	80,323	97,370
02/15/11	9.21	200.00	360.00	2.80%	92,059	73,800	87,322	97,031
02/16/11	10.13	240.00			87,768	69,422	96,149	97,036
02/17/11	9.17				86,227	66,989	89,150	96,754
02/18/11	11.21				67,910	84,946	87,394	96,419
02/19/11	11.89				68,818	97,099	87,394	95,907
02/20/11	9.87				79,704	95,760	87,221	95,235
02/21/11	10.63				99,360	94,968	87,278	94,709
02/22/11	10.71	190.00	284.00	2.60%	113,126	106,330	92,894	94,310
02/23/11	9.33	250.00			84,917	107,568	107,294	94,309
02/24/11	10.87				117,936	111,082	103,219	94,174
02/25/11	10.61				112,090	83,592	107,395	94,169
02/26/11	11.45				104,774	65,750	107,395	94,164
02/27/11	10.59				105,480	70,445	107,280	94,161
02/28/11	11.32				109,742	99,518	100,685	93,936
03/01/11	10.25	150.00	255.00	2.62%	114,768	107,669	97,416	93,601
03/02/11	10.60	206.00			114,739	96,293	97,229	93,262
03/03/11	10.42				114,955	96,595	97,286	92,989
03/04/11	10.07				107,683	93,614	97,114	92,646
03/05/11	9.82				85,997	74,232	97,229	92,304
03/06/11	10.04				100,541	100,138	91,094	91,764
03/07/11	10.31				90,619	77,414	92,131	91,258
03/08/11	9.31		287.00	2.20%	67,306	48,643	97,502	90,930
03/09/11	10.24	220.00			82,325	62,093	96,250	90,837
03/10/11	8.71				84,686	69,163	97,272	91,170
03/11/11	9.40				82,469	63,792	86,486	91,620
03/12/11	9.63				85,939	68,414	82,022	92,120
03/13/11	9.07				89,525	79,877	82,210	92,624
03/14/11	9.78				92,851	95,342	82,267	93,132
03/15/11	9.16	180.00	286.00	2.90%	92,059	73,800	87,322	93,641
03/16/11	9.21	220.00			87,768	69,422	96,149	94,168
03/17/11	9.57				86,227	66,989	89,150	94,229
03/18/11	8.91				67,910	84,946	87,394	93,937
03/19/11	9.64				68,818	97,099	87,394	93,879
03/20/11	17.59				79,704	95,760	87,221	93,873
03/21/11	18.93				99,360	94,968	87,278	93,869
03/22/11	16.12			2.40%	113,126	106,330	92,894	94,058
03/23/11	13.48	140.00	226.00		84,917	107,568	107,294	94,726
03/24/11	12.03				103,291	113,717	102,758	95,054
03/25/11	14.89				106,848	118,886	102,758	94,903
03/26/11	11.92				102,672	129,355	102,571	94,882
03/27/11	12.65				104,083	126,562	102,686	94,725
03/28/11	10.52			2.98%	106,848	118,886	102,758	94,570
03/29/11	11.23	140.00	273.00		108,432	126,202	102,658	94,416
03/30/11	11.59	170.00			111,125	124,646	102,557	94,478
03/31/11	10.52				108,187	130,219	102,744	94,656
04/01/11	9.89				106,978	126,547	102,499	94,832
04/02/11	10.56				107,482	124,992	102,427	95,003
04/03/11	10.36				107,726	126,778	102,586	95,185
04/04/11	9.60				107,366	120,326	102,485	95,361
04/05/11	9.35				105,696	116,280	152,914	97,421
04/06/11	9.38	180.00	245.00		103,939	129,413	99,288	97,660
04/07/11	10.17				104,458	119,074	101,866	97,805
04/08/11	9.10				103,118	118,181	101,794	97,990
04/09/11	9.12							98,015
04/10/11	10.07				106,747	120,269	96,408	98,357
04/11/11	9.84							98,940
04/12/11	9.81	200.00	250.00	2.40%	109,958	128,347	100,037	99,577
04/13/11	10.01	200.00			124,301	142,963	88,819	99,811
04/14/11	9.51				120,485	129,182	101,534	100,319
04/15/11	9.08				122,501	144,230	101,376	100,505
04/16/11	8.77				111,312	133,056	101,419	100,943
04/17/11	8.37				108,187	127,512	101,779	101,457
04/18/11	8.60				103,205	118,498	101,261	101,953
04/19/11	9.07	220.00		2.80%	105,034	98,323	101,621	102,467
04/20/11	9.04	210.00	324.00		106,790	92,750	101,362	102,970
04/21/11	8.15				106,733	94,853	101,477	103,276

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04/22/11	8.56					104,890	96,624	83,030	102,410
04/23/11	8.35					83,362	70,387	101,491	102,364
04/24/11	8.15					77,486	59,501	101,362	102,315
04/25/11	8.61					94,493	86,976	101,318	102,270
04/26/11	8.22		190.00		2.30%	101,750	100,267	101,275	102,219
04/27/11	8.49		200.00	304.00		105,437	95,818	101,246	102,165
04/28/11	8.66					106,358	93,758	99,374	102,048
04/29/11	8.30					110,419	92,102	101,304	102,003
04/30/11	8.01					106,776	89,971	101,218	101,949
05/01/11	7.60					106,877	90,547	101,160	101,901
05/02/11	8.75					107,208	93,370	101,102	101,854
05/03/11	7.93		240.00	278.00	2.50%	106,690	96,149	96,365	101,632
05/04/11	8.12		210.00			109,397	93,830	94,147	101,334
05/05/11	7.92					109,080	98,237	94,435	99,245
05/06/11	7.78					113,558	106,459	94,234	99,065
05/07/11	8.08					115,819	118,339	93,744	98,775
05/08/11	7.57					112,392	113,371	94,262	98,506
05/09/11	8.23					120,413	121,162	102,240	98,635
05/10/11	8.40		210.00	293.00		134,611	140,486	109,008	99,069
05/11/11	8.51		210.00			132,538	144,432	110,304	99,444
05/12/11	8.55					133,070	143,208	113,443	99,890
05/13/11	8.05					135,331	147,168	115,646	100,785
05/14/11	7.98					126,360	140,573	115,790	101,260
05/15/11	8.18	8.30				117,101	127,440	115,618	101,735
05/16/11	8.40	8.29				106,603	109,699	111,125	102,058
05/17/11	8.83	8.30	190.00	324.00		93,528	93,744	105,811	102,192
05/18/11	8.58	8.30	230.00			88,963	74,362	89,381	101,796
05/19/11	8.26	8.28				92,923	79,128	66,514	100,626
05/20/11	9.24	8.28				93,298	84,470	66,211	99,455
05/21/11	8.60	8.30				93,888	85,262	66,643	98,293
05/22/11	7.96	8.28				96,120	89,338	65,520	97,710
05/23/11	8.57	8.29				100,397	91,915	83,520	97,111
05/24/11	8.02	8.28	240.00	342.00		107,266	97,848	93,024	96,833
05/25/11	7.77	8.25	340.00			106,790	87,595	95,501	96,639
05/26/11	8.24	8.25				95,904	74,275	95,602	96,450
05/27/11	8.64	8.26				90,864	68,861	95,918	96,272
05/28/11	8.04	8.24				81,778	57,874	95,328	96,137
05/29/11	7.74	8.22				81,691	58,824	95,501	95,944
05/30/11	7.93	8.22				93,269	71,165	95,270	95,746
05/31/11	8.44	8.24	220.00	300.00		93,917	72,648	88,517	95,324
06/01/11	8.22	8.23	250.00			82,210	59,270	72,187	94,360
06/02/11	8.41	8.24				78,552	55,685	60,912	93,179
06/03/11	8.23	8.25				82,786	60,811	63,058	92,142
06/04/11	8.13	8.25				85,090	64,987	63,115	91,098
06/05/11	8.17	8.27				78,480	59,069	63,216	90,064
06/06/11	8.23	8.27				83,880	64,642	68,688	89,229
06/07/11	7.96	8.28				99,950	80,726	73,368	88,533
06/08/11	8.63	8.30	250.00	318.00		101,160	84,686	93,182	88,231
06/09/11	8.40	8.30				100,325	87,797	96,293	87,807
06/10/11	8.16	8.29				98,525	87,926	95,616	87,317
06/11/11	7.81	8.26				100,253	91,613	96,970	86,768
06/12/11	7.95	8.26				99,648	93,312	96,898	86,143
06/13/11	8.71	8.28				98,352	89,986	89,021	85,251
06/14/11	8.63	8.30	260.00	371.00	2.90%	99,432	88,632	91,872	84,459
06/15/11	8.34	8.29	190.00			98,813	86,933	90,792	83,782
06/16/11	8.48	8.28				101,131	91,670	90,562	83,273
06/17/11	8.17	8.27				101,275	94,262	91,901	83,357
06/18/11	8.03	8.26				102,269	92,174	92,102	84,210
06/19/11	7.66	8.21				105,149	95,400	92,131	85,074
06/20/11	8.54	8.21				103,766	95,544	91,973	85,919
06/21/11	8.57	8.23	210.00	309.00	3.00%	101,966	93,816	92,131	86,806
06/22/11	8.46	8.22	280.00			101,506	90,590	91,987	87,088
06/23/11	8.49	8.24				99,331	91,656	94,622	87,141
06/24/11	8.32	8.26				99,691	88,747	91,944	87,023
06/25/11	7.88	8.25				100,469	89,410	91,699	86,892
06/26/11	7.36	8.20				101,189	93,888	91,800	86,755
06/27/11	9.01	8.23				100,570	91,152	91,728	86,635
06/28/11	8.30	8.25	210.00		2.70%	101,678	89,626	87,710	86,376
06/29/11	8.69	8.28	170.00	279.00		100,958	89,741	88,906	86,163
06/30/11	9.21	8.30				104,501	92,290	94,694	86,369
07/01/11	9.41	8.34				103,738	87,725	93,499	87,080
07/02/11	8.92	8.36				103,306	88,862	94,666	88,205
07/03/11	8.70	8.38				102,629	91,397	94,666	89,258
07/04/11	8.54	8.39				100,138	86,602	93,600	90,275
07/05/11	9.12	8.42	220.00	318.00	2.30%	100,267	87,451	88,517	91,118
07/06/11	9.25	8.46				107,669	93,974	87,077	91,731
07/07/11	9.36	8.50				107,323	94,378	86,774	92,178
07/08/11	9.31	8.53				104,083	96,336	86,731	91,963
07/09/11	9.29	8.56				106,272	95,918	86,645	91,641
07/10/11	8.94	8.58				102,888	92,491	85,378	91,300
07/11/11	9.10	8.62				107,035	98,856	87,062	90,970
07/12/11	9.31	8.67			2.70%	106,402	96,466	93,629	90,861
07/13/11	9.06	8.68	180.00			111,974	103,277	97,819	91,154
07/14/11	9.28	8.70				116,266	107,885	101,923	91,489
07/15/11	9.02	8.73				113,530	111,499	100,440	91,811
07/16/11	9.01	8.74				98,539	87,739	101,592	92,178
07/17/11	9.12	8.77				118,454	113,659	101,808	92,508
07/18/11	9.41	8.82				113,990	110,866	105,494	92,955
07/19/11	9.23	8.87	200.00	286.00	2.60%	114,120	102,586	106,445	93,432
07/20/11	9.39	8.90	220.00			112,219	102,974	103,205	93,806
07/21/11	9.44	8.93				110,506	98,323	101,606	94,122
07/22/11	8.93	8.95				103,766	85,493	101,621	94,443
07/23/11	8.79	8.96				93,398	75,715	101,506	94,673
07/24/11	8.71	8.97				94,781	78,595	101,232	94,982
07/25/11	9.33	9.02				100,469	89,410	80,208	94,599
07/26/11	9.15	9.08	170.00	331.00	2.80%	100,339	82,656	89,510	94,523

07/27/11	9.18	9.08	200.00			96,984	81,806	90,331	94,476
07/28/11	9.49	9.12				103,637	89,194	91,670	94,608
07/29/11	9.37	9.15				101,808	86,242	90,389	94,658
07/30/11	8.47	9.12				97,459	85,306	91,339	94,546
07/31/11	8.79	9.10				87,840	80,122	59,587	93,416
08/01/11	9.11	9.11				104,342	101,102	88,142	93,198
08/02/11	9.29	9.13	190.00	283.00	2.50%	104,515	91,670	91,512	93,093
08/03/11	9.05	9.14	230.00			104,818	93,269	85,162	92,812
08/04/11	9.19	9.15				105,163	92,117	85,680	92,717
08/05/11	8.54	9.12				105,062	91,858	91,325	92,859
08/06/11	9.00	9.11				105,869	93,542	85,594	92,820
08/07/11	9.15	9.10				104,731	92,520	90,518	92,946
08/08/11	9.40	9.11				103,694	89,006	92,333	93,135
08/09/11	9.06	9.11	220.00	361.00		102,384	90,043	92,333	93,367
08/10/11	9.21	9.12				106,704	94,378	84,442	93,280
08/11/11	9.13	9.11				106,718	93,586	84,442	92,974
08/12/11	9.06	9.11				105,077	93,470	85,853	92,575
08/13/11	8.77	9.09				103,579	89,683	87,422	92,091
08/14/11	8.62	9.08				101,923	87,696	87,336	91,655
08/15/11	8.90	9.08				99,475	80,741	87,235	91,176
08/16/11	8.94	9.07	200.00	736.00	2.80%	100,526	78,653	81,922	90,513
08/17/11	8.96	9.06	210.00			97,920	74,419	71,842	89,391
08/18/11	8.89	9.04				99,763	77,746	71,957	88,242
08/19/11	9.31	9.04				99,619	75,715	59,184	86,774
08/20/11	8.68	9.02				96,710	72,029	69,034	85,689
08/21/11	8.82	9.01				95,141	69,826	72,000	84,701
08/22/11	8.78	9.01				95,890	69,826	72,072	83,720
08/23/11	9.14	9.03	180.00	336.00	3.20%	96,034	69,826	72,072	82,748
08/24/11	9.05	9.02	220.00			98,467	69,826	72,000	82,475
08/25/11	9.00	9.01				99,533	69,826	79,070	82,127
08/26/11	8.88	9.00				99,547	69,826	86,184	81,988
08/27/11	8.43	8.97				99,936	69,826	87,034	81,834
08/28/11	8.59	8.94				99115.2	69,826	86,990	81,720
08/29/11	9.31	8.97				99633.6	69,826	86,976	81,575
08/30/11	9.35	8.99			3.00%	97934.4	78,581	86,990	82,488
08/31/11	9.46	9.00				99,259	76,882	86,962	82,449
09/01/11	9.21	9.00	190.00	331.00		99,778	77,256	88,142	82,337
09/02/11	8.77	8.99				100,109	76,536	91,512	82,548
09/03/11	8.70	8.97				89,294	66,859	85,162	82,531
09/04/11	8.62	8.97				97,243	78,725	85,680	82,343
09/05/11	9.00	8.97				100,051	81,302	91,325	82,534
09/06/11	8.93	8.97	200.00	371.00	3.10%	96,840	75,413	85,594	82,370
09/07/11	9.17	8.96	240.00			99,576	76,565	90,518	82,309
09/08/11	8.88	8.95				98,842	77,083	92,333	82,309
09/09/11	8.98	8.94				100,296	77,702	92,333	82,572
09/10/11	8.94	8.94				99,706	76,378	84,442	82,572
09/11/11	8.23	8.91				99,720	77,861	84,442	82,525
09/12/11	9.07	8.92				98,870	77,429	85,853	82,473
09/13/11	9.14	8.94	230.00	270.00	3.10%	100,613	76,781	87,422	82,476
09/14/11	9.22	8.95	310.00			99,000	75,744	86,918	82,465
09/15/11	9.04	8.95				75,168	55,512	86,846	82,630
09/16/11	9.00	8.95				78,163	54,720	86,832	83,129
09/17/11	8.63	8.94				93,931	78,538	79,906	83,394
09/18/11	8.84	8.93				100,296	91,469	76,867	83,984
09/19/11	9.10	8.94				100,426	85,795	80,395	84,362
09/20/11	9.18	8.95	210.00	311.00	3.30%	40,565	26,107	63,058	84,064
09/21/11	9.06	8.96	230.00			75,096	63,763	35,957	82,860
09/22/11	8.85	8.95				105,523	100,670	65,981	82,657
09/23/11	8.81	8.95				105,955	102,773	85,550	83,109
09/24/11	8.84	8.94				106,373	95,515	92,016	83,541
09/25/11	8.43	8.93				102,240	86,976	91,987	83,734
09/26/11	8.35	8.92				90,115	69,811	86,400	83,713
09/27/11	8.56	8.92	230.00	387.00	3.00%	87,552	65,074	79,243	83,455
09/28/11	7.55	8.86	260.00			96,192	78,192	77,184	83,128
09/29/11	8.79	8.85				93,888	80,554	77,155	82,800
09/30/11	9.71	8.85				89,021	80,827	77,083	82,471
10/01/11	7.78	8.81				96,106	85,795	76,867	82,095
10/02/11	7.96	8.78				98,165	84,010	77,054	81,613
10/03/11	8.06	8.76				92,952	74,880	76,939	81,339
10/04/11	7.87	8.73	250.00	314.00	3.20%	84,182	59,443	76,968	81,049
10/05/11	8.82	8.73	230.00			56,405	37,037	62,798	80,098
10/06/11	7.79	8.69				63,950	51,782	46,267	78,787
10/07/11	7.45	8.63				83,146	87,048	56,693	77,660
10/08/11	7.15	8.57				49,838	41,069	61,834	76,643
10/09/11	7.58	8.53				53,770	39,787	53,482	75,348
10/10/11	7.53	8.48				51,970	43,229	41,990	73,933
10/11/11	7.38	8.45	280.00	309.00		56,966	50,587	26,741	72,010
10/12/11	7.67	8.40	320.00		3.00%	79,603	79,747	57,859	71,076
10/13/11	7.88	8.36				45,749	40,147	66,499	70,379
10/14/11	8.20	8.33				55,613	48,326	28,555	68,434
10/15/11	7.41	8.27				88,949	83,059	59,328	67,516
10/16/11	7.80	8.23				84,427	74,894	71,122	66,993
10/17/11	8.11	8.22				85,752	74,851	77,141	66,900
10/18/11	7.80	8.18			3.10%	80,208	62,770	68,112	66,609
10/19/11	7.93	8.14	300.00	328.00		65,419	65,419	71,064	66,298
10/20/11	7.88	8.10	270.00			88,690	84,888	70,978	66,562
10/21/11	7.84	8.06				83,232	59,789	71,107	67,733
10/22/11	7.45	8.01				86,443	63,648	71,050	67,902
10/23/11	7.50	7.97				80,222	61,114	70,704	67,407
10/24/11	7.57	7.93				63,418	47,650	53,741	66,132
10/25/11	7.86	7.91	240.00	331.00	3.10%	93,096	77,976	71,021	65,433
10/26/11	7.63	7.88	230.00			93,672	77,198	73,253	64,994
10/27/11	7.54	7.85				87,379	70,114	75,744	64,878
10/28/11	7.75	7.86				88,790	71,165	75,672	64,827
10/29/11	7.52	7.81				95,386	76,853	75,672	64,778
10/30/11	7.43	7.74				100,080	83,174	75,758	64,734

ITEM 5A

10/31/11	7.49	7.73				95,357	75,125	78,365	64,784	
11/01/11	7.63	7.72	300.00	294.00	2.80%	93,557	71,928	80,582	64,901	
11/02/11	7.63	7.70	280.00			99,202	78,451	80,597	65,023	
11/03/11	7.74	7.70				71,582	55,022	70,042	64,792	
11/04/11	7.62	7.66				96,134	77,976	69,422	65,013	
11/05/11	7.56	7.65				92,808	76,882	73,555	65,923	
11/06/11	7.62	7.66				94,450	83,390	73,454	66,481	
11/07/11	7.94	7.68				84,744	67,550	74,693	66,910	
11/08/11	7.71	7.69	240.00	361.00	3.20%	62,942	45,158	75,629	67,648	
MIN	7.05	7.62	120.00	190.00	2.20%	23,515	23,054	26,741		
MAX	18.93	9.15	340.00	736.00	3.70%	228,643	163,886	152,914	**119,923**	
AVG	**9.07**	**8.47**	**222.24**	**310.18**	**2.84%**	**94,985**	**85,831**	**86,335**		

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ITEM 5A

April 2, 2012 JPA Board Meeting

TO: Board of Directors

FROM: General Manager

Subject: Cancellation of May 7, 2012 Regular JPA Board Meeting

SUMMARY:

ACWA's Spring Conference and Exhibition is being held in Monterey, California, on May 8 through 11, 2012, resulting in a lack of quorum within the jurisdiction for the Regular JPA Board Meeting of May 7, 2012.

RECOMMENDATION(S):

Authorize the Administering Agent General Manager to issue a cancellation notice for the Regular JPA Board Meeting of May 7, 2012, and discuss whether a Special Meeting needs to be scheduled for an alternate date.

FINANCIAL IMPACT:

None.

Prepared By: Kimmey Conklin, Executive Assistant/Clerk of the Board

April 2, 2012 JPA Board Meeting

TO: JPA Board of Directors

FROM: General Manager

Subject: Heal the Bay - Bring Back the Beach: Director Attendance

SUMMARY:

Each year the environmental group Heal the Bay has held the "Bring Back the Beach Dinner" in Santa Monica as one of its annual fundraising activities. This year's event will be held on May 17, 2012, at The Jonathan Beach Club in Santa Monica.

Over the years JPA Directors have attended the event as part of developing relationships, not only with Heal the Bay, but other environmental groups who attend the event as well. Initially the JPA reserved a 10-seat table, but when costs rose from $3,000 to $5,000 it was decided to only send the Chairs of each board. Individual seats are $500.

RECOMMENDATION(S):

The JPA Board of Directors to provide direction to the Administering Agent/General Manager as to whether to participate, and if participating, designate one Director from each agency to attend at a cost of $500.00 per person.

FINANCIAL IMPACT:

Funds in the amount of $1,000.00 are available in 751840.6785.

Prepared By: Kimmey Conklin, Executive Assistant/Clerk of the Board

ATTACHMENTS:

Bring Back The Beach Flier

honoring the environmental leadership of Matt Hart · Danny Moder & Julia Roberts · Amy Smart Thursday, May 17, 2012 at 5pm on the sand at THE JONATHAN BEACH CLUB in Santa Monica

Heal the Bay invites you to celebrate the ultimate beach party at our annual Bring Back the Beach gala benefit on May 17, 2012 at The Jonathan Beach Club in Santa Monica.

We will also recognize the eco-accomplishments of this year's three honorees: past president and chief operating officer of Hilton Hotels Matt Hart, director of photography Danny Moder and actress Julia Roberts, and actress Amy Smart.

Relax with your toes in the sand while you meet and mix with leaders from Southern California's environmental, political, business and entertainment communities. Join us for a fun-filled evening under the stars to celebrate our honorees and support the mission of Heal the Bay.

We look forward to your company at our annual gala fundraising benefit!

Schedule

- 5 p.m. – 11 p.m.
- Cocktail Reception & Silent Auction
- Dinner
- Live Auction
- Entertainment

Tickets & Sponsorships

- Tables and Sponsorships: $5,000 – $50,000
- Individual Tickets: $500

ITEM 5C

Attire

- Beach Chic

April 2, 2012 JPA Board Meeting

TO: JPA Board of Directors

FROM: Facilities & Operations

Subject: Tapia Water Reclamation Facility: Lease of Recreation Land

SUMMARY:

In 2007, the District entered into an agreement that allowed The Salvation Army to use District property at the Tapia Water Reclamation Facility. The agreement allowed renewal, up to five (5) additional one-year terms, through the execution of a "lease amendment". The current one year renewal expires on May 6, 2012. The Salvation Army requests renewal of the lease under the same terms. The proposed lease agreement is attached and the site is shown in Exhibit A.

The subject area is used as part of The Salvation Army's summer program for less fortunate kids. The summer program is a supervised daytime activity for children ages 6-12 in June and July. The area is used for field games such as soccer and baseball. The children come from Salvation Army youth centers in the Ventura and Los Angeles counties. The adult to child supervision ratio is 1:8. The Salvation Army provides removable plastic fencing to designate the boundaries of the playing area during the program. Access to the area is prohibited at other times via a lockable gate.

The lease notes possible use of the area for emergency effluent disposal in case of plant upsets. The area can be developed as a waste spray field during creek avoidance. No structures will be built that will impair the scenic corridor. The Salvation Army will also provide the appropriate insurance coverage and name the District as an additional insured party in that policy. District counsel has reviewed the attached lease agreement.

RECOMMENDATION(S):

Authorize the Administering Agent/General Manager to execute the Lease agreement of the Recreation Land with The Salvation Army.

FINANCIAL IMPACT:

None.

Prepared By: Brett Dingman, Water Reclamation Manager

ATTACHMENTS:

Lease Agreement

Exhibit A - Map

Lease Agreement and Intent

AMENDMENT TO
LEASE OF RECREATION LAND

As of ________________, 2012, **Las Virgenes Municipal Water District**, hereinafter "Lessor," and **THE SALVATION ARMY**, hereinafter "Lessee," agree as follows:

1. Purpose.
The parties entered into a Lease dated May 7, 2007 ("original lease"), which they desire to amend as set forth below.

2. Amendment.
The term may be renewed for five (5) one-year terms if Lessee provides Lessor with written intention to renew prior to the end of the then current term. Lessee provided written intent to renew the Lease dated March 5, 2012. As a result, the termination date of the Lease is May 6, 2013. This is the last of the five (5) one-year terms available in connection with the original lease.

3. Other.
Except as provided herein, the original Lease is reaffirmed.

THE PARTIES HAVE APPROVED THIS AMENDMENT TO AGREEMENT AS OF THE DATE FIRST ABOVE WRITTEN.

LAS VIRGENES MUNICIPAL WATER DISTRICT

By: ______________________________
John R. Mundy
Administering Agent/General Manager

Attest:

____
Janna Orkney, Vice Chair

Approved as to Form:

____
District Counsel

THE SALVATION ARMY

By: ______________________________

____
[Print Name & Title]

Exhibit "A"

Lease of Recreation Land

ITEM 5D

5 March 2012

Mr. John R. Mundy
General Manager
4242 Las Virgenes Road
Calabasas, CA 91302

RE: Tapia Water Reclamation Facility, Lease of Recreation Land

Dear Mr. Mundy,

The Salvation Army Camp Mt. Crags and Camp Gilmore wants to thank the district for the ability to use the land on Tapia Water Facility property during the summer of 2011. Our current lease is about to expire in April and we wish to extend it for another year, per copy of the attached "Letter Agreement".

The ability to use this land during our nine week summer camp program gives us additional opportunities to give under-privileged kids a chance to enjoy the outdoors. We will continue to give a strong level of supervision while anyone is on your land. Since our first lease agreement in 2002, we have not had any negative situations occur.

I appreciate the great relationship we have with our neighbors at the Tapia Plant and look forward to continuing to nurture and build this relationship further. Please let me know if there is anything more that I can provide for you.

Regards,

Tim Pacillas
Interim Camp Director

The Salvation Army
Camp Mt. Crags and Camp Gilmore
26801 Dorothy Drive
Calabasas, CA 91302

(818) 222-6327 Office

TP:kp

ITEM 5D

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 10/05/2011

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Willis Insurance Services of California, Inc.
c/o 26 Century Blvd.
P. O. Box 305191
Nashville, TN 37230-5191

CONTACT NAME:
PHONE (A/C, NO, EXT): 877-945-7378 FAX (A/C, NO): 888-467-2378
E-MAIL ADDRESS: certificates@willis.com

INSURED
The Salvation Army - Division 11
180 East Ocean Blvd.
Long Beach, CA 90802

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A: Lexington Insurance Company	19437-000
INSURER B: Greenwich Insurance Company	22322-000
INSURER C: Greenwich Insurance Company	22322-076
INSURER D: XL Specialty Insurance Company	37885-000
INSURER E:	
INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** 16770502 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADD'L INSRD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	GENERAL LIABILITY	Y		027712409	10/1/2011	10/1/2012	EACH OCCURRENCE	$ 2,000,000
	X COMMERCIAL GENERAL LIABILITY						DAMAGE TO RENTED PREMISES (Ea occurence)	$ 1,000,000
	CLAIMS-MADE X OCCUR						MED EXP (Any one person)	$
							PERSONAL & ADV INJURY	$ 2,000,000
							GENERAL AGGREGATE	$ 4,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$ 4,000,000
	POLICY PRO-JECT X LOC							$
B	AUTOMOBILE LIABILITY	Y		CA RAE500021801	10/1/2011	10/1/2012	COMBINED SINGLE LIMIT (Ea accident)	$ 5,000,000
C	X ANY AUTO	Y		AOS RAD500021901	10/1/2011	10/1/2012	BODILY INJURY (Per person)	$
	ALL OWNED AUTOS / SCHEDULED AUTOS						BODILY INJURY (Per accident)	$
	HIRED AUTOS / NON-OWNED AUTOS						PROPERTY DAMAGE (Per accident)	$
								$
	UMBRELLA LIAB / OCCUR						EACH OCCURRENCE	$
	EXCESS LIAB / CLAIMS-MADE						AGGREGATE	$
	DED / RETENTION $							$
D	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			** RWD500021701	10/1/2011	10/1/2012	X WC STATU-TORY LIMITS / OTH-ER	
D	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) Y/N	N/A		** RWE500021601	10/1/2011	10/1/2012	E.L. EACH ACCIDENT	$ 1,000,000
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$ 1,000,000
							E.L. DISEASE - POLICY LIMIT	$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach Acord 101, Additional Remarks Schedule, if more space is required)

DIVISION #11-193

*** Workers Compensation:
Policy No. RWD500021701 provides coverage in the following states: AK,HI,ID,MT,NM,NV,TX,UT
Policy No. RWE500021601 provides coverage in the following states: AZ,CO,OR
CA - Work Comp is fully Self Insured per the attached State Certificate.

CERTIFICATE HOLDER

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 LAS VIRGENES ROAD
CALABASAS, CA 91302

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

ITEM 5D

Coll:3507986 Tpl:1343272 Cert:16770502

AGENCY CUSTOMER ID: 303702

LOC#:

ACORD®

ADDITIONAL REMARKS SCHEDULE

AGENCY		NAMED INSURED
Willis Insurance Services of California, Inc.		The Salvation Army - Division 11 180 East Ocean Blvd. Long Beach, CA 90802
POLICY NUMBER: See First Page		
CARRIER: See First Page	NAIC CODE:	EFFECTIVE DATE: See First Page

ADDITIONAL REMARKS

THIS ADDITIONAL REMARKS FORM IS A SCHEDULE TO ACORD FORM,

FORM NUMBER: 25 FORM TITLE: CERTIFICATE OF LIABILITY INSURANCE

CA - Auto is fully Self Insured per the attached State Certificate.

LAS VIRGENES MUNICIPAL WATER DISTRICT, ITS ELECTED APPOINTED BOARDS, OFFICERS, AGENTS AND EMPLOYEES ARE INCLUDED AS ADDITIONAL INSURED'S AS THEIR INTERESTS MAY APPEAR IN CONNECTION WITH SECURING AN ACCESS AGREEMENT FOR IMPROVEMENT TO AN ACCESS ROAD, BUY ONLY AS RESPECTS THE GENERAL LIABILITY COVERAGE PROVISIONS.

ITEM 5D

STATE OF CALIFORNIA–BUSINESS, TRANSPORTATION AND HOUSING AGENCY — EDMUND G. BROWN JR., Governor
DEPARTMENT OF MOTOR VEHICLES
P.O. BOX 942884
SACRAMENTO, CA 94284-0884
(916) 657-6523

August 17, 2011

S.I. # 202

The Salvation Army
180 East Ocean Boulevard
Long Beach, California 90802
Attention: Porjai Semiau

Dear Ms. Semiau,

Your annual report/financial statements have been reviewed and the requirements for renewal of you self-insurance certificate have been met. Your self-insurance status is valid from August 19, 2011, through August 18, 2012.

Vehicle Code Section 16020 requires that every driver and every owner shall at all times be able to establish financial responsibility and shall at all times carry in the vehicle evidence of the form of financial responsibility in effect for the vehicle. A copy of your Certificate of Self-Insurance or a copy of this letter constitutes written evidence of financial responsibility and should be placed in each of your affected vehicles.

If you have any questions or need further information, please call the administrative staff at (916) 657-6520.

Sincerely,

NADINE PIZZIMENTI, Support Manager
Financial Responsibility Unit

ITEM 5D

DMV
A Public Service Agency

CERTIFICATE OF SELF-INSURANCE

This is to certify that:

The Salvation Army
NAME OF SELF-INSURER

180 East Ocean Boulevard, Long Beach, California 90802
ADDRESS CITY, STATE, ZIP

has been approved as a Self-Insurer under the California Compulsory Financial Responsibility Law and assigned Self-Insurance # 202 pursuant to Section 16053 of the *California Vehicle Code* for the period August 19, 2011 through August 18, 2012.

MANAGER
Financial Responsibility Unit
Department of Motor Vehicles

SR 27 (REV. 5/99) UH

03/21/2002 02:30 916-657-5551 DMV PAGE 03

ITEM 5D

STATE OF CALIFORNIA Gray Davis, *Governor*

DEPARTMENT OF INDUSTRIAL RELATIONS
SELF-INSURANCE PLANS
2265 Watt Avenue, Suite 1
Sacramento, CA 95825
Phone No. (916) 483-3392
FAX (916) 483-1535

RISK MANAGE...
FEB 05 2002
DEPT. THQ

CERTIFICATION OF SELF-INSURANCE OF WORKERS' COMPENSATION

TO WHOM IT MAY CONCERN:

This certifies that Certificate of Consent to Self-Insure No. 566 was issued by the Director of Industrial Relations to:

THE SALVATION ARMY

under the provisions of Section 3700, Labor Code of California, on November 15, 1933. The Certificate is now and has been in full force and effective since that date.

Dated at Sacramento, California
This 1st day of February, 2002

MARK B. ASHCRAFT, Manager
Self Insurance Plans

Orig: Nancy Cookson
Law Offices of
Laughlin, Falbo, Levy & Moresi
P.O. Box 492617
Redding, CA 96049-2617

cc: John McCarthy
Director of Risk Management
The Salvation Army
180 East Ocean Blvd., 10th Fl.
Long Beach, CA 90801-5646

ITEM 5D

HEADQUARTERS
4232 Las Virgenes Road
Calabasas, CA 91302
(818) 251-2100
Fax (818) 251-2109

WESTLAKE
FILTRATION PLANT
(818) 251-2370
Fax (818) 251-2379

TAPIA WATER
RECLAMATION FACILITY
(818) 251-2300
Fax (818) 251-2309

RANCHO LAS VIRGENES
COMPOSTING FACILITY
(818) 251-2340
Fax (818) 251-2349

www.lvmwd.com

LETTER AGREEMENT AMENDING THE LAS VIRGENES MUNICIPAL WATER DISTRICT, TAPIA WATER RECLAMATION FACILITY, LEASE OF RECREATION LAND ("Lease"), DATED MAY 7, 2007 BY AND BETWEEN LAS VIRGENES MUNICIPAL WATER DISTRICT AND THE SALVATION ARMY

WHEREAS, the Lease provides that the term may be renewed for five (5) one-year terms if The Salvation Army provides District with written intention to renew prior to the end of the then current term; and

WHEREAS, The Salvation Army has provided written intent to renew the lease, dated March 26, 2008, and attached hereto;

THEREFORE, the termination date of the Lease has been amended to be May 6, 2009.

DATED: March 26, 2008

LAS VIRGENES MUNICIPAL WATER DISTRICT

John R. Mundy
General Manager

ITEM 5D

LEASE AND AGREEMENT

As of MAY 7, 2007, LAS VIRGENES MUNICIPAL WATER DISTRICT, hereinafter "Lessor", and THE SALVATION ARMY, hereinafter "Lessee", agree as follows:

SECTION 1. DESCRIPTION OF PREMISES

Lessor leases to Lessee and Lessee leases from Lessor unimproved land in Los Angeles County described on Exhibit "A" attached hereto and hereby incorporated by reference.

SECTION 2. TERM

A. The term of this lease shall be for one year, commencing on the date first above written.
B. This lease may be extended for up to five (5) additional one-year terms if Lessee provides the Lessor written notice of intent to renew at least 60 days prior to the end of the then current term and Lessee is not in default under this lease.
C. This lease may be terminated by the Lessor upon at least 90 days prior to the commencement of summer activities by written notice if the premises are needed for Lessor's uses.
D. Lessee may terminate this lease on 30 days prior written notice.

SECTION 3. RENT

As consideration for this lease, Lessee shall maintain and use the premises for recreation activities.

SECTION 4. USE

A. The premises shall be used for the purpose of supervised recreation of children. Oak tree protection is very important. Lessor shall stake off an area around any oak trees and Lessee shall not park vehicles, disc, plow, or otherwise disturb the area under the oak tree drip line.
B. Lessor may operate and maintain roads on the premises for access to wastewater treatment facilities adjacent to the premises.
C. Lessor may require Lessee to vacate the premises in the event of a process failure at the Tapia Water Reclamation Facility.
D. Lessor may use the premises to dispose of sewage or reclaimed water by means of spray irrigation. Lessor may use the site as a recycled water disposal spray field from April 15th through November 15th if necessary to satisfy regulatory requirements. Lessee shall notify agents, volunteers and employees the premises may be irrigated with non-potable recycled water. Lessee shall train agents, volunteers and employees in the safe use of recycled water. Lessor is available to perform such training at a mutually acceptable time at no cost to Lessee.
E. Lessor and Lessor's agents and assigns may enter the premises to inspect for compliance with the terms of this lease, exercise rights under this lease, post notices, and for other lawful purposes. Lessee shall supply Lessor, and its agents and assigns, with keys and other instruments necessary to affect entry on the premises.

SECTION 5. CONDITION OF PREMISES

Lessor makes no warranty of the site's suitability for children's activities or the condition of the soils or geology for the site, which consists of fill resulting from past blasting activities. Lessee accepts the premises in its present condition. On termination, Lessee shall surrender the premises in the same condition as when received, reasonable wear and tear excepted. Lessee shall remove its personal property from the premises.

SECTION 6. UTILITIES

No utilities will be supplied by Lessor. However, Lessor currently serves recycled water to Lessee through an existing meter. Plumbing from this existing service to the land described on Exhibit "A" is the responsibility of Lessee.

SECTION 7. WASTE

Lessee shall not commit or permit others to commit on the premises waste or a nuisance or any other act that could disturb the quiet enjoyment of Lessor, its neighbors or other tenancy of Lessor on reserved or adjacent property.

SECTION 8. ALTERATIONS

Lessee shall provide removable fencing as shown on Exhibit "B". Lessee employees shall supervise children activities and ensure activities are conducted within the fenced area. Lessee shall not make or permit other alterations without first obtaining Lessor's consent.

SECTION 9. INSURANCE, LIABILITY AND INDEMNITY

Lessee shall provide and maintain the following commercial general liability and automobile insurance:

A. Coverage – Coverage for commercial general liability and automobile liability insurance shall be at least as broad as the following:
    1. Insurance services Office Commercial General Liability Coverage (Occurrence form CG 0001)
    2. Insurance Services Office Automobile Liability Coverage (Form CA0001), covering Symbol 1 (any auto)
B. Limits – Lessee shall maintain limits no less than the following:
    1. General Liability – One million dollars ($1,000,000) per occurrence for bodily injury, personal injury and property damage. If Commercial General Liability Insurance or other form with a general aggregate limit or products-completed operations aggregate limit is used, either the general aggregate limit shall apply separately to the premises (with the ISO CG 2503 or ISO CG 2504 or insurer's endorsement provided to Lessor) or the general aggregate limit and products-completed operations aggregate limit shall be twice the required occurrence limit.
    2. Automobile Liability – One million dollars ($1,000,000) for bodily injury and property damage each accident limit.
C. Required provisions – The general Liability and automobile policies are to contain, or be endorsed to contain the following provisions:
    1. The Lessor, the Joint Powers Authority, its directors, officers, employees, or authorized volunteers are to be given insured status (via ISO endorsement CG 2040, CG 2033 or insurer's equivalent for general liability coverage) as respects: liability arising out of activities performed by or on behalf of Lessee; products and completed operations of Lessee; premises owned, occupied or used by Lessee; or automobiles owned, leased, hired, or borrowed by Lessee. The coverage shall contain no special limitations on the scope of protection afforded to Lessor, the Joint Powers Authority, its directors, officers, employees, or authorized volunteers.
    2. For any claims related to this lease, Lessee's insurance shall be primary insurance as respects the Lessor, the Joint Powers Authority, its directors, officers, employees, or authorized volunteers. Any insurance, self-insurance or other coverage maintained by the Lessor, its directors, officers, employees or authorized volunteers shall not contribute to it.
D. Lessee and subcontractors shall insure (or be qualified as self-insured) under the applicable laws relating to worker's compensation insurance, all of their employees and volunteers working on or about the premises in accordance with the "Workers Compensation and Insurance Act", Division IV of the Labor Code of the State of California and any Acts

amendatory thereof. Lessee shall provide employer's liability insurance in the amount of at least $1,000,000 per accident for bodily injury and disease.

E. Lessee shall defend, indemnify and hold harmless the Lessor officers, employees, and agents free and harmless from costs, liability of damages, including attorneys fees, arising out of any act or omission to act including any negligent act or omission to act by Lessee, its officers, employees, agents and volunteers in connection with the use of the premises.

SECTION 10. ASSIGNMENT AND SUBLETTING

Lessee shall not assign this lease or any rights under it and shall not sublet the entire or any part of the premises or allow any person to occupy or use the entire or any portion of premises without first obtaining Lessor's written consent which may by withheld in the Lessor's sole discretion.

SECTION 11. NOTICES

Any and all notices relating to this Lease shall be deemed given when personally delivered or personally deposited in the U.S. Mail, postage prepaid to the addresses set forth herein.

THE SALVATION ARMY
900 W James Wood Blvd.
Los Angeles, CA 90015
Attention: Don Mowery
Telephone Number: (818) 222-6327

LAS VIRGENES MUNICIPAL WATER DISTRICT
4232 Las Virgenes Road
Calabasas, CA 91302
Attention: John R. Mundy
Telephone Number: (818) 251-2100

THE SALVATION ARMY,
A CALIFORNIA CORPORATION

Don Mowery

LAS VIRGENES MUNICIPAL WATER DISTRICT

John R. Mundy, General Manager

APPROVED AS TO FORM:

District Counsel

INFORMATION ONLY

April 2, 2012 JPA Board Meeting

TO: JPA Board of Directors

FROM: Facilities & Operations

Subject: CH2M Hill Biosolids Compost Market Analysis

SUMMARY:

CH2M Hill has recently completed a biosolids compost market analysis survey entitled, "Biosolids Compost... What's it Worth?" Twenty-five composting facilities across the United States responded to the survey, including the Rancho Las Virgenes Composting Facility (identified as CA 1 in the analysis). A copy of the analysis is attached for your information.

FINANCIAL IMPACT:

Not applicable.

Prepared By: Brett Dingman, Water Reclamation Manager

ATTACHMENTS:

Compost Markets Final

BIOSOLIDS COMPOST…WHAT'S IT WORTH?

Tania Datta[1], Todd Williams[2] and Ron Alexander[3]

[1]CH2M HILL, 215 S State Street, Suite 1000, Salt Lake City, UT-84111,
Email:Tania.Datta@ch2m.com

[2]CH2M HILL, 8720 Stony Point Parkway, Suite 110, Richmond, VA-23235,
Email: Todd.Williams@ch2m.com

[3]R. Alexander Associates, Inc., 1212 Eastham Drive, Apex, NC 27502,
Email: alexassoc@earthlink.net

ABSTRACT

Biosolids composting in the United States continues to proliferate with nearly 260 active projects according to Beecher and Goldstein (2010). Many utilities continue to consider composting as a proven biosolids management alternative, especially when management of other materials such as brush and yard wastes is included. However, with the exception of anecdotal information about occasional case studies, little information exists in the public domain on the value of compost products being generated. Due to lack of this information, many would-be planners and designers of new biosolids compost facilities believe that a cost for disposal of compost produced must be included. The fact is, majority of facilities have robust marketing programs and many of them are sold out of compost products. But, limited information exists on the regional pricing of compost sold, the methods used for sale and the marketing efforts being practiced. Further, little is known about the breakdown of market segments to where compost is being sold on a national basis. In order to determine more accurate information on the marketing practices and the value of compost products throughout the U.S, a survey was conducted on biosolids composting facilities to gather definitive data on the value received from the sales of compost products, its nutrient contents, the marketing methods used (in house staff, contract sales, etc.) and the overall impact on operating costs that the revenues of these products offset.

Sixty biosolids composting facilities were randomly selected and contacted for the survey effort and 25 survey responses were received. The facilities that responded back were of various size ranges, with varying years of operating experience and from different regions in the United States. A total compost production of approximately 627,215 CY annually was reported by all the surveyed facilities and 80% of them were selling their products. The price of compost ranged from $2/CY to $22/CY, with an overall average of $10.21/CY. Average regional price for compost product was also determined and was found to be highest in the midwestern and mountain region at $12.95/CY and lowest in the northeastern region at $7.65. Primarily, facilities either adopted a uniform pricing structure or had a volume-based pricing structure for product purchased. Ranges of customers served were mostly local residents, landscapers, nurseries and soil blenders. It was also found that on an average, facilities that advertised their product received twice as much the price on their sales when compared to facilities that did not advertise

their products. The percent of the O&M cost that was covered by the product sales revenue varied significantly between facilities, however, in several cases, up to one third of the O&M cost was offset by the revenue generated through the sale of compost.

The results obtained from the survey validated that biosolids compost product has great value and is highly accepted and marketable. This information will provide useful and meaningful data to planners and engineers who are considering composting as an alternative for biosolids management or who are actually developing new or expanded facilities.

KEYWORDS

Biosolids compost, market, value, regional pricing, O&M cost, revenue

INTRODUCTION

Biosolids composting is one of the technologies implemented to manage and beneficially use wastewater residuals. This biological process converts a complex mixture of degradable organic and nutrient-rich material by populations of indigenous microorganisms, usually under a warm, humid and aerobic environment, to create a stabilized, mature, deodorized, and hygienic product which is free of pathogens, rich in humic substances and easy to store. The end product can be used as a soil conditioner and fertilizer for gardening, landscaping, and agriculture, as well as for other non-traditional purposes such as soil erosion control and storm water management (Turovaskiy et al., 2003). Apart from providing large quantities of organic matter and nutrients (such as nitrogen, phosphorus and potassium) to the soil, biosolids composts improve soil texture and elevates soil cation exchange capacity (an indication of the soil's ability to hold nutrients), exhibiting all characteristics of a good organic fertilizer (EPA, 2002). Thus, this marketable Class A product competes well with other commercial bulk and bagged products available to homeowners, landscapers, farmers, and ranchers.

Many cities, counties and wastewater utilities have turned to composting as a means of treating sewage sludge to create a high value biosolids product. A survey published in 1983 identified only 61 actively operating biosolids compost facilities in the United States, with 29 expected to begin operations within the next year (Goldstein and Steuteville, 1996). A similar survey conducted in 2010 identified a total of 265 facilities, with 258 that are actively operating (Beecher and Goldstein, 2010). Thus, in 27 years there has been a four-fold increase in the number of actively operating biosolids compost facilities in United States. This growth is likely contributed by several factors. Perhaps the most important factor is the increasing emphasis of the importance of sustainability in wastewater residuals practices and management. This has shifted the trend of decision-making in wastewater industry from compliance-driven to resource-recovery-driven. Moreover, there has been a significant increase in public awareness on reuse and recycle, and communities have begun to recognize biosolids as a resource rather than a waste. Thus, when planning for recycling and waste diversions, many cities, counties and municipal treatment plants find composting to be the optimal solution for diverting biosolids along with yard and green wastes from landfills. In some cases, composting is favored by regulations that promote beneficial use management practices. The U.S EPA encourages beneficial use and the production of Class A, “Exceptional Quality” (EQ) products. Increasing useful landfill life, the phase-out of unlined landfills, public apprehension over land application of Class B biosolids and its bans in areas of California, Connecticut, New Hampshire, and Maine, the advances in composting technology and the availability of numerous options in system design to suit local conditions are some of the other contributing factors in the growth of biosolids composting. Numbers of facilities are also increasing as wastewater utilities are entering into regional solutions or contracting with privately-owned companies in financing and operating these facilities. Lastly, but definitely not the least, compost products are widely marketed and accepted and income from the sale of the product has the potential to reduce operating costs.

However, with the exception of anecdotal information about occasional case studies (Epstein et al., 2000; Williams et al., 2005), little information exists in the public domain on the value of biosolids compost being generated. A few studies address the trends in compost marketing, but these include compost generated from a variety of feedstocks including yard trimmings, biosolids, industrial byproducts, manure and plant debris (Alexander, 1994; Alexander, 2000; CalRecycle, 2010). They do not specifically discuss the value of biosolids compost. Due to lack of this information, many would-be planners and designers of new biosolids compost facilities believe that a cost for disposal of compost produced must be included. The fact is, majority of biosolids compost facilities have robust marketing programs and many of them are sold out of compost products. Limited information also exists on the regional pricing of compost sold, the methods used for sale (bulk sales, bagged, or both) and the marketing efforts being practiced. Further, little is known about the breakdown of market segments to where compost is being sold on a national basis.

In order to determine more accurate information on the marketing practices and the value of compost products throughout the United States, a survey of biosolids compost facilities was conducted to gather definitive data on the value received from the sales of compost products, the marketing methods used (in house staff, contract sales, etc.) and the overall impact on operating costs that the revenues of these products offset. This information will provide useful and meaningful data to planners and engineers who are considering composting as an alternative for biosolids management or who are actually developing new or expanded facilities.

METHODOLOGY

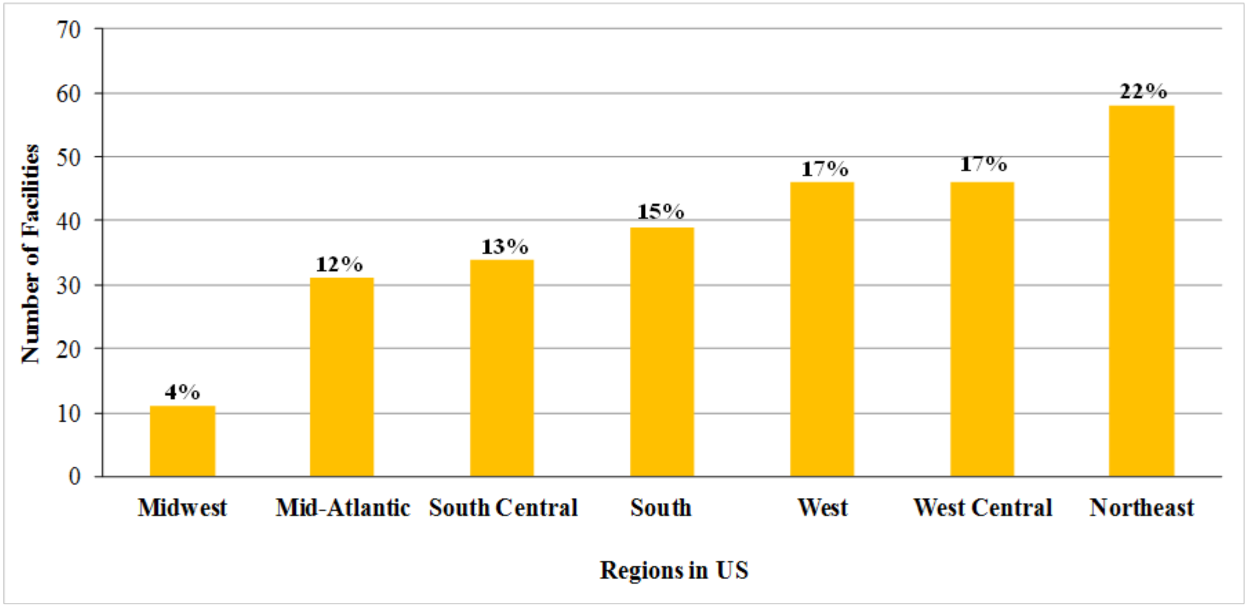
A recent list of all biosolids compost facilities in the United States was published by Beecher and Goldstein, 2010. To streamline the survey effort in order to obtain meaningful results that would benefit this market analysis, random facilities, mostly familiar to CH2M HILL, across various regions in the U.S were targeted. An effort was made to include a good mix of large, medium and small-sized facilities using different technologies for composting and with varying successes and strategies for marketing the end-products.

The survey included questions on annual amounts of biosolids processed, characteristics of those biosolids, the composting technology used, years of operation, details about type and source of bulking agents, whether bulking agents had to be purchased or are obtained free of cost, the quality of compost products and testing done on the product, pricing structure of the product , type of targeted customers and marketing strategies, facility operating and maintenance (O&M) cost for composting and revenue generated from compost sales.

A contact list was generated and facilities were initially contacted via phone to verify their willingness to participate. Subsequently they were either interviewed over phone or the survey form was emailed to them to respond.

RESULTS AND DISCUSSION

Forty-four states in the United States house a total of 265 biosolids composting facility, with 258 facilities that are actively operating (Beecher and Goldstein, 2010). The states of New York and Washington have the highest number of facilities representing 9% of the total 265 facilities each, followed by Utah representing 6% of the total number of facilities. The distribution of the number of facilities in different regions of the United States is shown in Figure 1, with percentages of the total number of facilities shown above each bar. These numbers depends on the number of wastewater utilities in each region; however, it should be noted that the information does not necessarily represent the largest amount of biosolids processed for composting.



Regions:

Northeast: CT, ME, MA, NH, NY, RI, VT

Mid-Atlantic DC, DE, MD, NJ, PA, VA, WV

South: AL, FL, GA, KY, MS, NC, SC, TN

Midwest: IL, IN, IA, MI, MN, MO, OH, WI

South Central: AZ, AR, LA, NM, OK, TX

West Central: CO, KS, MT, NE, ND, SD, UT, WY

West: AK, CA, HI, ID, NV, OR, WA

Figure 1. Number and distribution of biosolids composting facilities in different US regions

Background of Facilities Surveyed

Out of the 265 facilities reported by Beecher and Goldstein, 2010, 60 facilities were randomly selected for the survey. Responses were received from 25 facilities. Table 1 summarizes the generic names of the facilities that responded back along with annual biosolids processed for composting and the type of composting technology implemented.

Table 1. Generic names, amount of biosolids processed and composting technology used for facilities that responded to the survey

Facilities	**Biosolids Quantities (Wet Tons/Year)**	**Composting Technology Used**
California		
CA 1	28,734	In-Vessel
CA 2	28,213	Aerated In-Vessel
CA 3	208,333	Aerated Static Pile
Colorado		
CO 1	311	Aerated Static Pile
Delaware		
DE 1	11,429	Aerated Static Pile
Florida		
FL 1	19,000	Windrow
FL 2	43,714	In-Vessel IPS System
Iowa		
IA 1	52,722	Extended Aerated Static Pile
Maine		
ME 1	9,750	Agitated Bay
ME 2	1,675	Aerated Static Pile
Massachusetts		
MA 1	2,576	Aerated Static Pile
New Jersey		
NJ 1	51,282	IPS Horizontal Agitated Bed
NJ 2	9,000	In-Vessel
New York		
NY 1	26,136	IPS
North Carolina		
NC 1	5,091	In-Vessel IPS
NC 2	69,700	Ashbrook-Simon-Hartley In-Vessel Tunnel Reactor
Utah		
UT 1	2,984	Windrow
UT 2	513	Windrow
UT 3	32,206	In-Vessel IPS
UT 4	3,833	Windrow
Virginia		
VA 1	12,307	Aerated Static Pile
VA 2	20,000	Windrow
Washington		
WA 1	1,568	Aerated Static Pile
WA 2	333	Aerated Static Pile
Wyoming		
WY 1	1,604	Turned Windrow

Beecher and Goldstein, 2010, estimated that a total national amount of 562,000 dry tons of biosolids was being processed for composting annually. Based on this survey data, 20% of that quantity is covered in this study. Figure 2 shows the distribution of biosolids processing capacities of the facilities that responded back to the survey. A little more than half of the facilities surveyed (52%) are currently processing more than 10,000 wet tons of biosolids annually, while 48% are processing less than that. The distribution exhibits that the survey effort included a good mix of small, medium and large facilities.

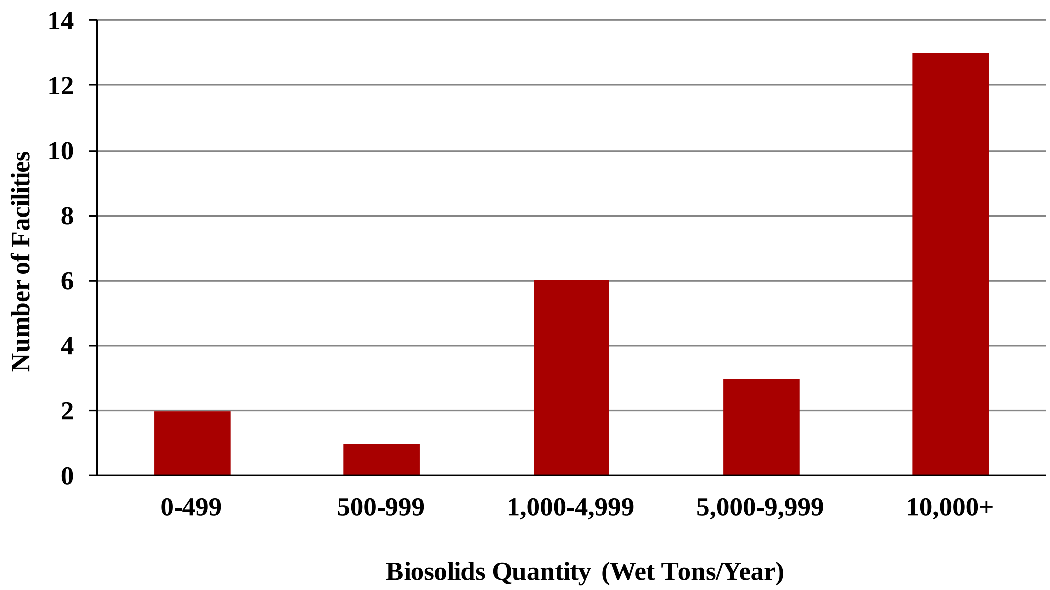


Figure 2. Distribution of facilities by annual biosolids quantity

About 40% of these facilities are using aerated static pile, 36% are using in-vessel and 24% are implementing windrow systems for composting process. In terms of years of operational experience, most facilities have 10+ years of experience with the highest percentage of surveyed facilities falling in the 10 to 20 years of operational experience range. Figure 2 shows the distribution of surveyed facilities with the number of years in operation, again exhibiting a good range of mix between new and old facilities.

From the responses received on the type of sludge (digested or undigested) that was being processed for composting, only 28% indicated that they were processing undigested sludge, while the rest indicated to be either aerobically or anaerobically digesting sludge prior to composting. Comparisons of aerobic digestion versus anaerobic digestion before composting indicated that majority of the facilities are operating anaerobic digesters. In addition, 88% of the facilities surveyed are dewatering the sludge prior to composting. Fifty-six percent of the respondents have their composting facility offsite from the wastewater treatment plant, which required them to haul biosolids. Thus, dewatering prior to composting reduces the number of hauls required.

Only 24% (6 out of 25) of the facilities surveyed are contracting the operations out to a third party while the rest are composting using in-house staff. Some of the facilities surveyed were also regional and accepts biosolids from several different wastewater treatment plants.

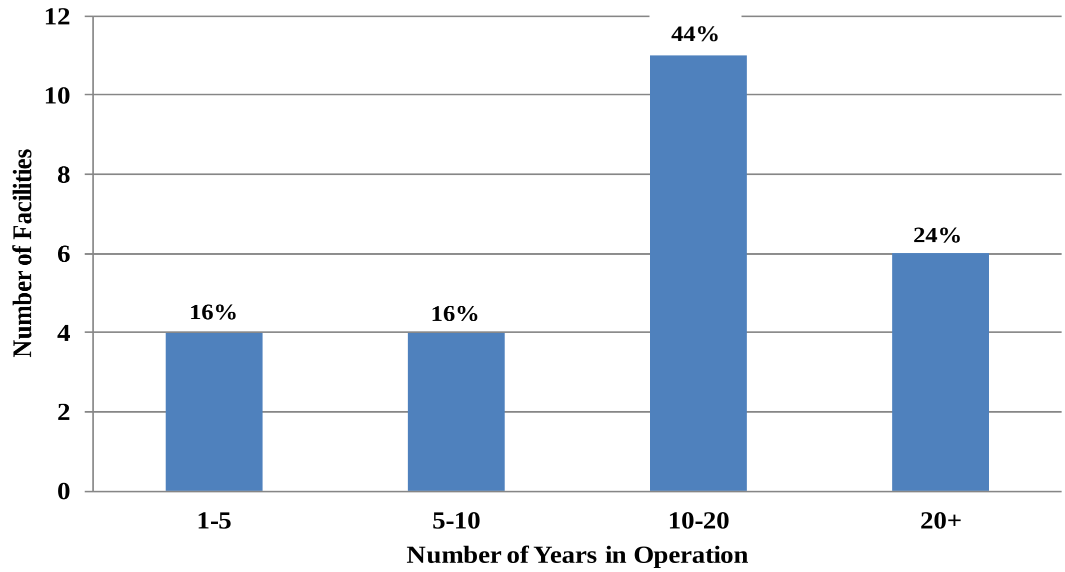


Figure 2: Distribution of facilities by number of years in operation

Bulking Agent

Bulking agent is needed to adjust the solids content of the initial mix, to provide porosity for aeration, to allow the biosolids to be stackable, and in some cases to adjust the carbon-to-nitrogen ratio. The amount of bulking agent required is roughly equal to the amount of sludge or biosolids cake requiring composting on a weight to weight basis. On a volume basis, bulking agent can easily be 3-4 times that of the dewatered sludge or biosolids, depending on the solids content. Some facilities receive bulking agents free of cost, especially in regions where large quantities of yard and green wastes are generated and there is a desire to divert this waste from landfills, while others need to buy bulking agents. The need to buy bulking agents can significantly increase operating costs of a composting facility. From the surveys received, it was found that 11 facilities are using yard and green waste that are obtained at no cost, mostly from city or county curbside collection programs or from general public and tree trimmers. Some are also receiving woody wastes from local pallet manufacturers at no cost. Seven facilities are using woodchips as bulking agents, out of which 2 receive them at no cost while the others either have to buy them or receive only some at no cost. Woodchips were generally received or bought from local lumber mills, pallet manufacturers and forest product manufacturers. Two facilities indicated that they occasionally use chipped tires as bulking agent. One facility is buying this from a local tire recycling company and the other is receiving it at no cost. In summary, 46% of the facilities were receiving bulking agent at no cost, 42% had to buy their bulking agent supply and 13% purchased some and received some bulking agent at no cost. The facilities that purchase bulking agents mostly fell in the northeastern and mid-Atlantic region of the United States. The general cost for purchasing bulking agents was found to range between $2 and $10 per cubic yard.

Biosolids Compost Production and Sales

A total compost production of approximately 627,215 CY was reported by all the surveyed facilities for the year 2010. Out of the 25 facilities, 20 (80% of total surveyed) are selling their products, some along with compost mulch and screened woodchips. Only 3 facilities are participating in a give-away program and 2 others sell some and give-away some of their compost. Mostly, the ranges of customers served are local residents or general public, landscapers, nurseries and soil blenders. Some facilities sell compost to construction and material yards, golf courses and for agricultural purposes.

Only 5 facilities provided a breakdown of their sales by various categories of customers served and the information received is exhibited in Figure 3. As can be seen, the major use categories included landscaping and soil blending with only modest use in nurseries or in general public.

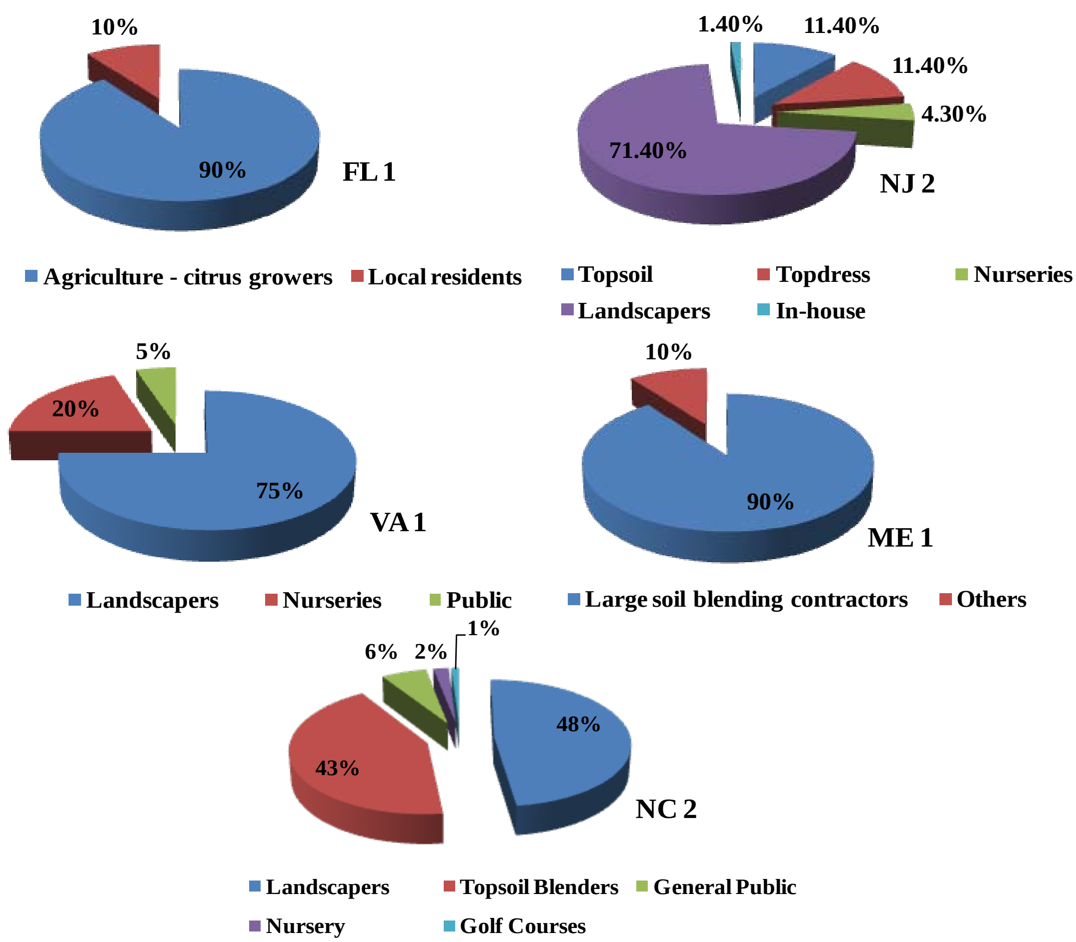


Figure 3: Breakdown by categories of customers served by five of the facilities surveyed

Based on the survey data, the wholesale price of compost at facility ranged from $2/CY to $22/CY. Figure 4 shows the compost price of each facility ranked lowest to highest.

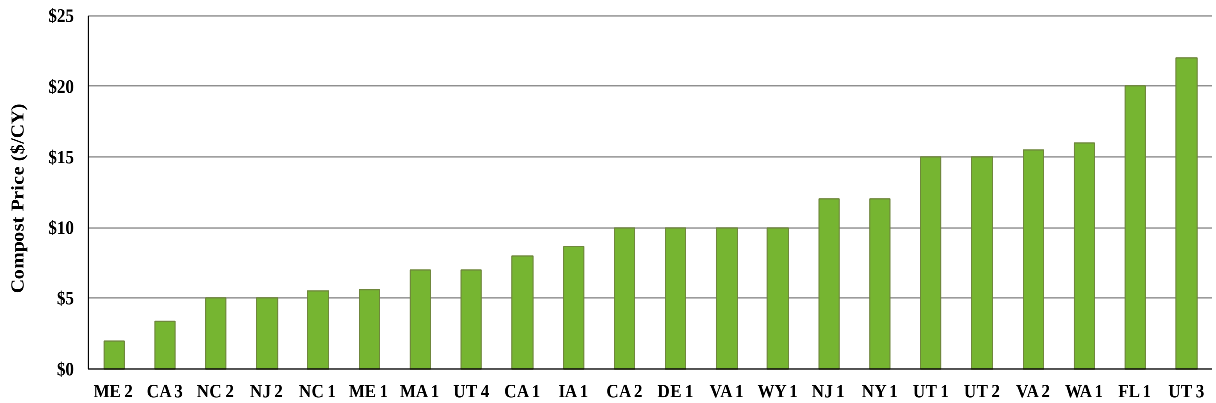


Figure 4: Wholesale compost price of surveyed facilities

Fourteen facilities (56% of total facilities that responded to the survey) have a uniform pricing structure of cost per cubic yard of compost product. One facility reported to have a different pricing for wholesale and retail amount of product, with the retail price being more than wholesale, while another indicated different pricing for bulk and bagged sales. Five facilities have their pricing structure based on volume of product purchased, while one facility based its product price on volume and the number of times purchases are made either in a year or month. All of these facilities have a reduced price for higher volume of product purchased. Some facilities also have seasonal pricing structure with a higher price during the summer season when demand of product is more and lower price during the winter season when the demand for product is less. In a commercial market setting, developing a sliding scale pricing scheme is commonplace, with the product price reducing with increasing volumes purchased.

Regional price ranges and average price of compost product was also estimated from the survey. Due to less number of respondents, the facilities were divided among four regions – Northeast, Southeast, Midwest/Mountain US and West. Northeast region included Maine, New Jersey, New York, Delaware and Massachusetts; Southeast region included Virginia, North Carolina and Florida, Midwest/Mountain US included Iowa, Utah and Wyoming and West region included California and Washington. Figure 5 shows the ranges of compost price in each of these regions while Table 2 presents the average regional price.

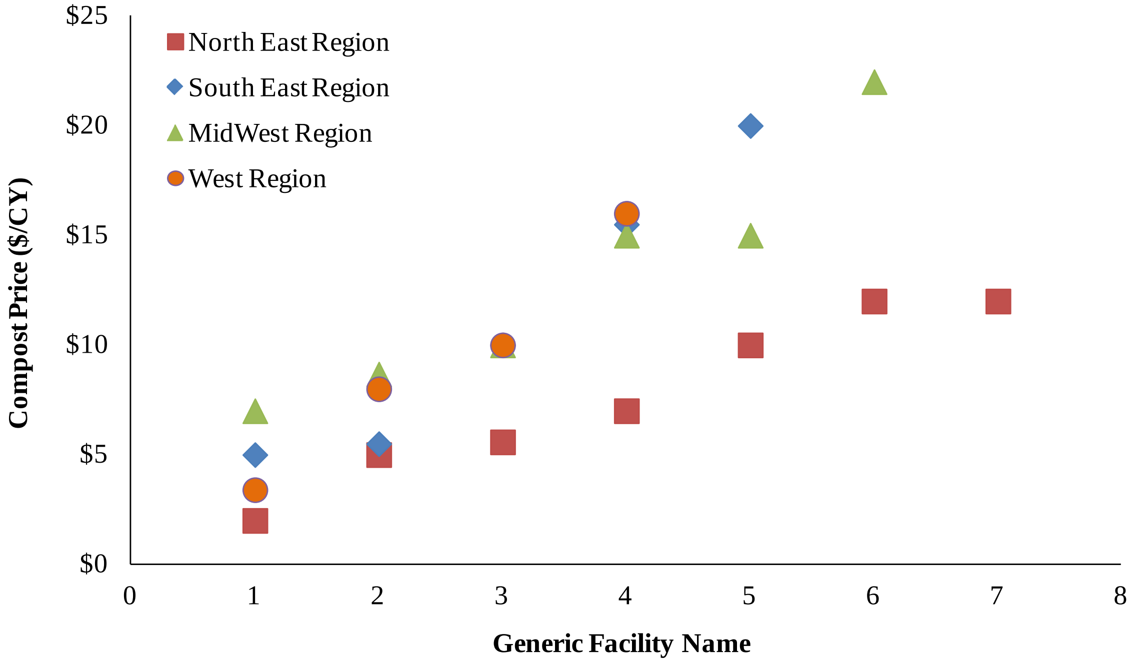


Figure 5: Regional price range of biosolids compost

Table 2: Average price of biosolids compost in various regions in the U.S

Region	**Average Price ($/CY)**
North East US	$7.65
Western US	$9.35
South East US	$11.20
Midwestern/Mountain US	$12.95
ALL US	$10.21

The quality of compost product can be guaranteed through certification. This guarantee provides an assurance for the quality of product being marketed, and in most cases can increase its market value. The US Composting Council's Seal of Testing Assurance Program (STA) was initiated for compost testing, labeling and information disclosure, designed to provide information needed to get the maximum benefit from the use of compost and improve customer confidence and satisfaction. In addition, several State Department of Agriculture require compost product to be registered whether compost is sold or given away if the product is distributed and soil amending claims or nutrient claims (Alexander, 2007).

Compost product from 5 facilities was neither registered with its State Department of Agriculture (DOA), nor certified through the US Composting Council's STA program. Three of these 5 facilities are currently participating in a give-away program. Apart from that, all other facilities surveyed either had their product registered as a fertilizer or soil amendment/conditioner, or was certified under STA, or had done both. Facilities that were not registered or certified generally sampled their product once a year, while those that were STA certified sampled their quality of product monthly, bimonthly or quarterly depending on the quantity of solids processed.

Figure 6 shows a comparison of price ranges of both certified and registered products with those that were neither certified nor registered, and Figure 7 shows the price ranges of STA-certified and non-certified products. For Figure 7, it should be noted that even though the product may not be STA-certified, it may be registered as fertilizer or soil amendment with State DOA. Per the graphs, though a slightly higher price range is indicated for registered and certified products from the facilities surveyed, the difference in the ranges is not significant. However, quality assurance is an important factor for successful marketing of the products.

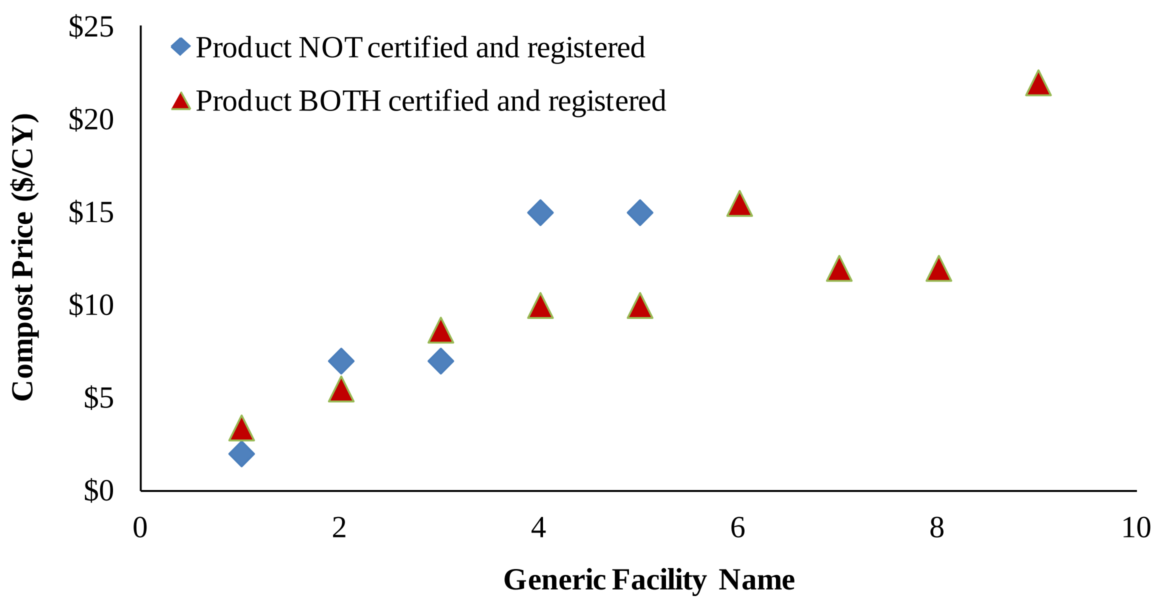


Figure 6: Comparison of price ranges for compost product that are both STA-certified and registered and that are neither certified nor registered

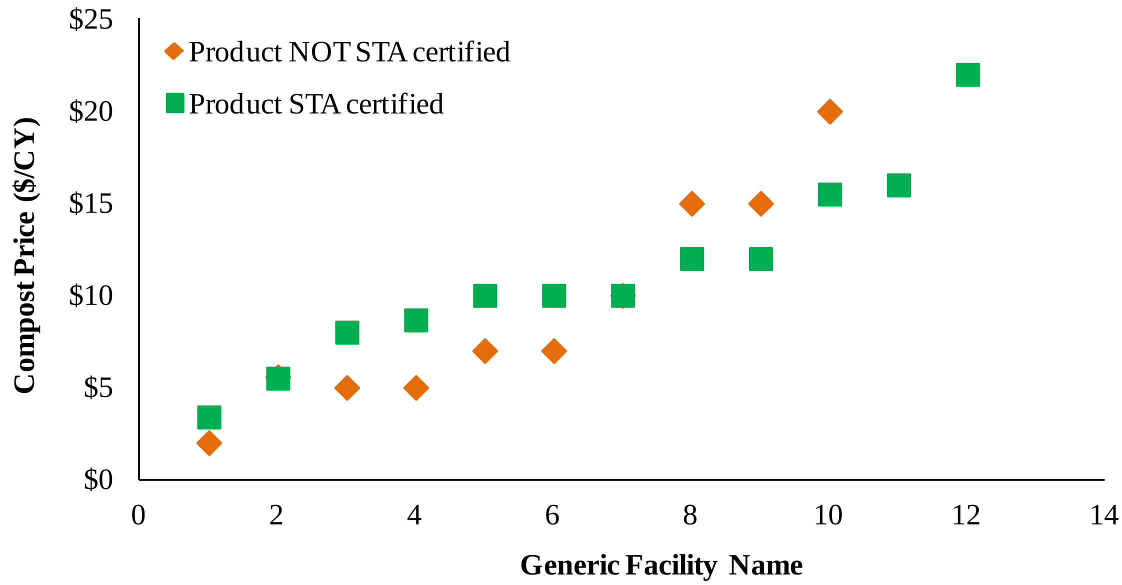


Figure 7: Comparison of price ranges for compost product that are STA-certified and that are not STA-certified

Seventy-six percent of the facilities surveyed reported their product's N-P-K value. The average N-P-K value of all the facilities surveyed was found to be 1.9-1.8-0.4 on a dry weight basis. Nineteen facilities either have their product information published in a brochure or on a website. From the survey data it was estimated that on an average, facilities that advertise their product and the quality of the product receive twice as much the price on their sales when compared to facilities that do not advertise their products. Four facilities reported that they have a separate budget for marketing their products. Three out of these 4 facilities are contracting their composting services to a third party contractor.

Only 12 facilities provided some information on annual operating and maintenance (O&M) cost for the composting facility, as well as on revenues obtained from compost sales. The percent of the O&M cost that was covered by the product sales revenue varied significantly between facilities and was estimated to have a range of 0.5% to 33% from the survey responses received. This variation was because of the size of facility, if they were selling all the compost products or giving some away and also on whether or not they were purchasing bulking agents. The facilities that were purchasing bulking agent but selling their product were able to offset only about 10% of their O&M costs. In several cases, up to one third of the O&M cost was offset by the revenue generated through the sale of compost.

Examples of Success Stories

The Livingston Composting facility in Spotsylvania County, Virginia has been in the biosolids composting business since 2001. The facility started small and learned how to develop and support markets. The County focused on creating a high value product and certified its compost with the US Composting Council's STA program and registered as a fertilizer with the Virginia Department of Agriculture. They developed compost use literature, held compost days where small giveaways were used to educate people on the use and benefits of compost, and talked to many potential customers about their product. They slowly increased the price of the compost over time as demand grew. Now, after two facility expansions, the demand for the product is greater than production. The Livingston Blend compost sells in bulk to small users for $16/CY and to large users (>100 CY) for $10/CY. The principal users are Landscapers, Soil blenders and general public, and the primary use is in landscaping. Through their compost sales, the facility is able to offset approximately 30% of their O&M cost.

The City of Davenport has been composting biosolids and yard wastes together since 1995. The City has created numerous products under the Earth Cycle brand name and their compost is US Composting Council's STA program certified. Currently Davenport sells compost in bulk for $12/CY up to 10 cubic yards, $8/CY for 11-50 cubic yards and $6/CY for purchases of 51 cubic yards or more. The City also produces several soil and mulch products to meet customer demand and bags a portion of their product for small users.

The Central Valley Water Reclamation Facility in Utah has been composting its anaerobically digested and dewatered biosolids for the past 15 years. The facility sells compost mulch, screened compost and compost woodchips under the label name "Oquirrh Mountain Compost Products", at a volume-based pricing structure depending on whether customers pick up the product from the facility or if it is delivered by the facility to customers. Currently, they sell screened compost product at $22/CY and $35/pick-up truck or equivalent, if picked up from the facility. The prices for these products were slowly raised based on local market surveys of similar products generated from wastewater utilities and landfills. Central Valley has information brochures available for customers that are also used for marketing the product to landscapers and nurseries. The product is US Composting Council's STA certified and through their compost sales, the facility is able to offset approximately 30% of their biosolids processing O&M costs.

CONCLUSIONS

Survey of 25 biosolids composting facilities from different regions in the United States clearly indicated that biosolids compost is a valuable product that is easily marketable with diverse range of uses and various categories of customers. The key conclusions from the survey effort are presented as follows:

- The overall average price of compost was estimated to be $10.21/CY
- Some facilities are selling their product at a price as high as $22/CY
- The markets available for this product were generally found to be very strong
- The value of product was impacted by certified and guaranteed product quality and the knowledge of the product through active product literature
- Biosolids compost sales revenues can offset up to 35% of a facility's O&M cost

ACKOWLEDGEMENT

The authors would like to extend their appreciation to all facilities that participated in this survey.

REFERENCES

Alexander, R, (1994). Compost Market Programs at 60 facilities. Biocycle, Vol. 35 (1), pp 34-35.

Alexander, R, (2007). Registration Options for Compost Products. Biocycle, Vol. 48 (9), pp. 30-31.

Beecher, N. and Goldstein, N. (2010). Biosolids Composting in the United States – 2010 Update. Biocycle, Vol. 51 (12), pp. 35-41.

CalRecycle, (2010). Third Assessment of California's Compost- and Mulch-Producing Infrastructure--Management Practices and Market Conditions. http://www.calrecycle.ca.gov/Publications/default.asp?pubid=1358

Epstein, E., Alix, C., Poe, C., Wescoat, N. (2000). Composting Biosolids in Virginia: Case Studies of Three Facilities. Y2K Composting in the Southeast, October 9 – 11, 2000, Charlottesville, Virginia

Williams, T.O., Barnes, C.D., and McWhirt K. (2005). Composting in Spotsylvania County, Virginia. Presented at the WEF/AWWA/KY-TN WEA 2005 Joint Residuals and Biosolids Conference. Nashville, Tennessee.

Turovaskiy, Izrail S., and Jeffrey D. Westbrook. "Recent Advancements in Wastewater Sludge Composting." Water Engineering & Management October 2002

INFORMATION ONLY

April 2, 2012 JPA Board Meeting

TO: JPA Board of Directors

FROM: Facilities & Operations

Subject: Rancho Las Virgenes Compost Reactor Building Ceiling Repair: Approval of Change Order No. 1

Las Virgenes-Triunfo Joint Powers Authority approved funding for this matter in the Joint Powers Authority Budget. The Las Virgenes Board, as the administering agent, approved this change order at the March 27, 2012, Board meeting.

SUMMARY:

On July 11, 2011, the Board awarded the contract for the Compost Reactor Building Ceiling Repair Project to Ventura Construction in the amount of $239,450. A portion of the project involved taking down existing lighting fixtures and associated conduit and reinstalling that conduit and lighting at the end of construction. After removal, District staff noted that both the conduit and light fixtures were not in reusable condition. Staff directed Ventura Construction to generate an estimate for replacement of the lighting system with new fixtures and PVC conduit. Therefore, a change order would be required to furnish additional material, labor and equipment to install the new lighting system. The cost of materials associated with the new lighting system is $41, 457. Additionally, a new metal stud is to be installed as part of the proposed suspended ceiling, per the original contract. Staff has requested that this stud be wrapped in 5/8-inch thick, moisture resistant, "greenboard" and painted with epoxy coating to match the ceiling deck. The contract documents originally called for the stud only to be wrapped in 5/8-inch thick gypsum board. Staff requested this change in scope in order to prevent corrosion of the new stud. Change Order No. 1 is comprised of items related to the changed conditions and/or quantities associated with the installation of these items.
Change Order No. 1 in the amount of $60,549.50 was submitted to the District on March 12, 2012 and reviewed by staff.

FINANCIAL IMPACT:

Change Order No.1 increases the total contract amount to $299,999.50. These improvements will be funded through CIP Work Order Account 10391.

Prepared By: James Spicer II, Associate Engineer

INFORMATION ONLY

April 2, 2012 JPA Board Meeting

TO: JPA Board of Directors

FROM: Facilities & Operations

Subject: Sewer Bridge Rehabilitation Project: Award of Contract

Las Virgenes-Triunfo Joint Powers Authority approved funding for this matter in the Joint Powers Authority Budget. The Las Virgenes Board, as the administering agent, approved the award of this contract at the March 13, 2012, meeting.

SUMMARY:

At the meeting held on August 9, 2011, the LVMWD Board approved plans & specifications, and issued a call for bids for the Sewer Bridge Rehabilitation Project. This project is part of the JPA's ongoing sewer maintenance service. Sewer bridges throughout the service area are routinely inspected and identified for required maintenance. The scope of this project includes various types of repair for 11 sewer bridges, including re-application of deteriorating coatings, minor seismic retrofitting, and installation of security fencing.

The bid opening for this project was held on January 31, 2012, and a total of 2 bids were received. The low bid recommended for acceptance by the Board was submitted by L.A. Builders, Inc. for $244,560.13. The complete results of the bid opening are shown below. The project has a completion date of one hundred fifty (150) calendar days.

Contractor	Bid Amount
L.A. Builders, Inc.	$ 244,560.13
O'Connel Engineering & Construction, Inc.	$ 257,677.17

Although only 2 bids were received, a total of 3 pre-bid walks were conducted in an effort to solicit bids, as well as contact various contractors to guage their interest in the project. The bids received were comparable to the engineering estimate. In addition, staff performed due diligence by verifying the contractor's license status, previous project references, and by meeting with the contractor to review scope of work and their understanding of the project.

FINANCIAL IMPACT:

This project will be funded through Account 751800 with a FY11-12 budget of $105,000. The expense to date is $16,042. No appropriation is needed at this time as the remaining funding will be accounted for in the FY12-13 budget.

Prepared By: James Spicer II, Associate Engineer

INFORMATION ONLY

April 2, 2012 JPA Board Meeting

TO: JPA Board of Directors

FROM: Facilities & Operations

Subject: Tapia WRF Alternative Disinfection Project: Approval of Plans and Specifications and Call for Bids

Las Virgenes-Triunfo Joint Powers Authority approved funding for this matter in the Joint Powers Authority Budget. The Las Virgenes Board, as the administering agent, approved the Call for Bids for this project at the March 27, 2012, meeting.

SUMMARY:

At the September 6, 2011, meeting, the JPA approved a proposal from MWH to prepare plans and specifications for the Tapia WRF Ammonia Feed System and Chemical Facilities Design. The Ammonia Feed System and Chemical Facilities Design is part of the District's efforts to comply with the terms of Tapia's latest NPDES permit.

The project design calls for the implementation of a modified chlorination system including the construction of aqueous ammonia storage tanks and feed pumps; as well as upgrades to the existing sodium hypochlorite and bisulfate pumps and associated piping. The permit deadline to have the alternative disinfection facilities in place is September 2, 2014. The proposed schedule will ensure that the project is complete ahead of schedule:

Call for Bids	March 27, 2012
1st Advertisement	April 3, 2012
2nd Advertisement	April 10, 2012
Mandatory Pre-bid Job Walk	May 8, 2012
Bid Opening	June 5, 2012
Project Award	July 2, 2012
Project Completion	September 15, 2013

FINANCIAL IMPACT:

The FY 2011-12 budget provides funding in the amount of $150,000 for this project under CIP Job No. 10457, Tapia Alternative Disinfection Study. An appropriation in the amount of $50,000 was approved at the September 6, 2011, JPA meeting. No additional budget is required at this time.

Prepared By: James Spicer II