**SAN JOSÉ/SANTA CLARA TREATMENT PLANT ADVISORY COMMITTEE**

CHUCK REED, CHAIR
JOSE ESTEVES, MEMBER
PAT KOLSTAD, MEMBER
JAMIE MATTHEWS, MEMBER
MADISON NGUYEN, MEMBER
CHUCK PAGE, MEMBER
JOHN GATTO, MEMBER
ALEX GURZA, MEMBER
KANSEN CHU, MEMBER

# AGENDA/TPAC
# SPECIAL MEETING

**4:00 p.m.** **November 20, 2014** **Wing Rooms 118/119/120**

## 1. ROLL CALL

## 2. AGREEMENTS/ACTION ITEMS

A. Biosolids Transition Strategy Update

Staff Recommendation: Accept this staff report that provides an update on the Biosolids Transition Strategy for the San José – Santa Clara Regional Wastewater Facility.

B. Biosolids Transition Strategy

Staff Recommendation: Approve the Biosolids Transition Strategy for the San José – Santa Clara Regional Wastewater Facility.

## 3. OPEN FORUM

## 4. ADJOURNMENT

NOTE: If you have any changes or questions, please contact Adriana Márquez, Environmental Services, (408) 975-2547.

To request an accommodation or alternative format for City-sponsored meetings, events or printed materials, please contact Adriana Márquez (408) 975-2547 or (408) 294-9337 (TTY) as soon as possible, but at least three business days before the meeting/event.

**Availability of Public Records**. All public records relating to an open session item on this agenda, which are not exempt from disclosure pursuant to the California Public Records Act, that are distributed to a majority of the legislative body will be available for public inspection at San Jose City Hall, 200 East Santa Clara Street, 10th Floor, Environmental Services at the same time that the public records are distributed or made available to the legislative body.

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

# Memorandum

**TO:** TRANSPORTATION AND ENVIRONMENT COMMITTEE

**FROM:** Kerrie Romanow

**SUBJECT:** **BIOSOLIDS TRANSITION STRATEGY UPDATE**

**DATE:** October 22, 2014

Approved [signature] Date 10-22-14

## RECOMMENDATION:

Accept this staff report that provides an update on the Biosolids Transition Strategy for the San José-Santa Clara Regional Wastewater Facility.

## BACKGROUND

The cities of San José and Santa Clara jointly own the San José-Santa Clara Regional Wastewater Facility[1] (RWF) which serves six other South Bay cities in part, through four special districts. The RWF has been in operation since 1956 at its current location on Zanker Road just north of Highway 237 in North San Jose. The RWF is the largest advanced wastewater treatment facility in the Western United States and treats an average of 110 million gallons per day of wastewater. About 100 million gallons of the treated wastewater is discharged into the South Bay and approximately 10 million gallons are recycled for use in irrigation, toilets and cooling towers in parts of San José, Santa Clara, and Milpitas.

Treating the wastewater also results in approximately 85 dry tons of biosolids per day which must be disposed of or beneficially reused. The current treatment process stabilizes the solids in anaerobic digesters, and then transfers the digested sludge to open-air lagoons for approximately three years before moving the biosolids to drying beds for another year. The anaerobic digesters are a commonly used solids stabilization process in wastewater treatment, where sludge is heated and biologically stabilized in covered tanks. This solids stabilization process significantly reduces the amount of volatile material and pathogens in the sludge, and lowers the odor potential in downstream processes. The dried biosolids are then transported to the adjacent Newby Island landfill for use as an alternative daily cover material. The current process creates a "Class A" product which is the highest level of treatment as defined by federal regulators.

---

[1] *The legal, official name of the facility remains San Jose/Santa Clara Water Pollution Control Plant, but beginning in early 2013, the facility was approved to use a new common name, the San José-Santa Clara Regional Wastewater Facility.*

Most of the RWF's infrastructure is now more than 50 years old and has exceeded its useful life, with repairs needed to every process area. In 2008, the RWF embarked on a master planning process to rehabilitate and upgrade its facilities and to explore potential process changes. The Plant Master Plan (PMP) used an extensive community engagement process to develop overarching environmental, economic, social, and operational goals for the RWF. To support these goals, the PMP envisioned a comprehensive Biosolids Management Program (BMP) that would transition from the current process to an enclosed, mechanical treatment system with the resulting dewatered biosolids hauled off-site. The BMP also called for flexibility with multiple and diversified disposition options for the biosolids.

The BMP envisioned a mix of Class A and Class B biosolids products. The US Environmental Protection Agency (USEPA) defines the processes and handling requirements of wastewater sludge in terms of "Class A" and "Class B" biosolids products. Class A biosolids, with the highest level of treatment, contain very low levels of volatile material and pathogens and thus lend themselves to safe land application. Class B biosolids, with a lower level of treatment, have a higher level of pathogens than Class A, which places some limitations on the end uses of the sludge. Key BMP goals included minimizing disposal volume and costs, reducing footprint/greenhouse gas emissions and odors, using innovative approaches, maximizing reuse of biosolids in the community, and increasing flexibility and diversity in disposition options. The major project elements recommended for the BMP include:

- Rehabilitation of the existing sludge thickening and digester facilities;
- Mechanical dewatering for all of the biosolids; with 70% of the biosolids material going to off-site uses and disposal
- Thermal drying for 20% of the biosolids and Greenhouse drying for 10% of the biosolids;
- Decommissioning of the existing open sludge lagoons and drying beds; and
- Multiple disposition options and contracts for biosolids reuse/disposal.

The mechanical dewatering process will remove a significant portion of the water in the digested sludge to reduce the overall volume of sludge to be hauled offsite. The thermal drying process is an additional process to remove most of the water by heating the digested sludge in an enclosed vessel. Similar to thermal drying process, the Greenhouse drying process uses the sun to heat and dry the sludge. More detail on the BMP can be found at http://sjenvironment.org/ArchiveCenter/ViewFile/Item/1554 Final Draft of Project Memorandum No. 2 Biosolids Treatment Alternatives dated August 2011.

The PMP was adopted and the Environmental Impact Report certified by the San José City Council in November 2013 and by Santa Clara City Council in December 2013. Subsequent to the PMP adoption, a Biosolids Transition Strategy project was initiated to review the feasibility of diversifying disposition options and to evaluate ways to reduce environmental impacts, use modern technologies for the biosolids processing, and evaluate alternate delivery options for the construction of the facilities (e.g., design-build).

On April 10, 2014, staff presented preliminary information on the Biosolids Transition Strategy to the Treatment Plant Advisory Committee (TPAC) at a Biosolids Study Session. The Study Session also provided an opportunity for TPAC and various stakeholders to provide their perspective and input on the transition strategy. Discussion topics included a summary of the

PMP recommendations, an overview of Biosolids management approaches, a discussion of various disposition options, and potential project and disposition options for the RWF. Staff also outlined steps to solicit interest from the open market and the methodology for conducting business case evaluations in order to bring back recommendations to the City Council in fall 2014. Feedback from TPAC on the biosolids transition strategy included consideration of odor impacts, expandability of the facility in the future, possibility of producing Class A biosolids instead of Class B biosolids, and impact on operation and maintenance costs.

## ANALYSIS

Although the PMP was officially adopted in 2013, the technical component of the PMP was completed in 2010. During the three-year environmental review process, there were a number of changes in conditions related to the BMP that required staff to reevaluate the assumptions and recommendations in the BMP. Since the TPAC study session in April 2014, staff has made significant progress on the Biosolids Transition Strategy. Key elements of the work include testing the market interest for treatment and disposition options, evaluation of alternate sites for the project elements, and business case evaluations of the various project options that would best achieve the goals established in the BMP. These changes and follow-up are summarized below:

### *Accelerated Delivery Schedule*

In May 2011, in response to community concerns about odors emanating from the lagoons and drying beds, the City Council directed staff to accelerate the biosolids transition process and cease discharging biosolids to the existing lagoons by 2018, followed by emptying the lagoons and drying beds by 2024. The PMP envisioned a three phase approach that would have decommissioned the lagoons and drying beds by 2030.

### *Biosolids Facility Site*

During the PMP EIR process, it was determined that the planned location of the proposed biosolids facilities contained potential wetlands and aquatic habitat. Siting facilities in such a location would likely trigger extensive environmental mitigation and a lengthy permitting process. The resulting schedule delays would push project completion out well beyond the 2018 goal. Therefore, alternative sites needed to be evaluated.

Four alternative sites have been evaluated to identify constraints including available space, existence of sensitive environmental conditions, presence of existing and planned facilities, and capacity to accommodate potential new and future biosolids facilities. The recommendation of a final site is pending based on additional environmental field work to be done in October 2014. The alternative sites are shown in Attachment A. A recommendation will be brought forward to Council in December for approval of an alternative site as part of the Biosolids Transition Strategy.

### *Biosolids Market*

In April 2014, TPAC directed staff to evaluate the possibility of producing Class A biosolids instead of Class B biosolids. Evaluation of options for the Digester Rehabilitation project led to

the selection of a Temperature Phased Anaerobic Digestion (TPAD) process technology to provide the flexibility to produce Class A biosolids as well as further enhance the stabilization of biosolids and increase energy production.

In June 2014, a "Request for Information (RFI) for the Biosolids Transition Program" was issued to determine market interest in the processing and/or disposition of the dewatered biosolids product that will be produced from the new Biosolids Dewatering Facility. Eleven responses to the RFI were received. The RFI process results have indicated that a wide variety of local biosolids disposition markets are available including composting, land application and landfill to meet the BMP diversification objectives. All respondents expressed interest in accepting either Class A or Class B biosolids, and 70% of them were also interested in contracting with the City regarding the final disposition of the dewatering biosolids product or producing diversified end products (Class A biosolids) onsite or offsite to provide flexibility in disposition options. A contract term of five years was considered to be acceptable by most proposers. The RFI response results also show that the hauling and disposition price range provided in the RFI responses is relatively close to a 2013 Bay Area survey that was previously reviewed by staff. The current biosolids disposition costs are $22.50 per ton to Newby Island Landfill. The RFI responses indicated disposition costs would range from $20 to $85 per ton. A summary of the responses is included in Attachment B.

*Project Validation Process*

The CIP Program team conducted a detailed project validation process of all the PMP projects in early 2014. This validation effort led to a change in assumption from a large, covered storage lagoon (sized for 180 days of storage) to a short-term enclosed storage facility located at the Biosolids Dewatering Facility, which is more in line with best practices in the wastewater industry and results in a smaller footprint and lower costs.

*Business Case Evaluations*

During the April TPAC Study Session, staff discussed triple bottom line plus methodology with social, economic, environmental, and operational criteria for evaluating various project options. This methodology included analyzing quantitative and qualitative criteria. Quantitative criteria includes capital costs, net present value and schedule and qualitative criteria includes the ability to meet underlying goals, ease of maintenance and operations, ease of permitting and project delivery, and flexibility to move disposition options.

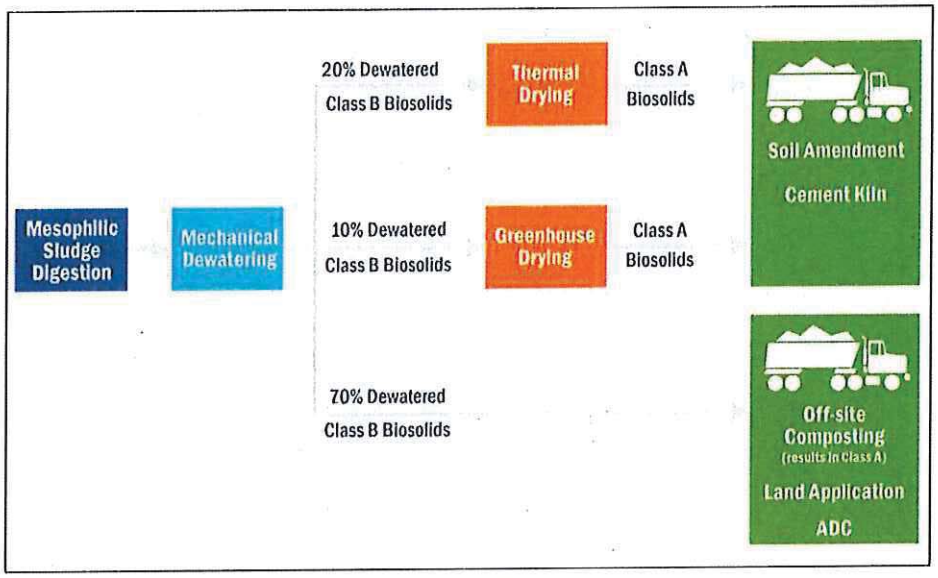
The first step of the evaluation process included a screening of biosolids processing alternatives which was conducted using the Solids-Water-Energy Tool (SWET) Model. The analysis helped screen out less favorable alternatives and provided a basis in subsequent business case evaluations (BCEs). The analysis concluded that producing 100 percent Class A biosolids, either by expanding on-site drying capacity or by sending 100 percent of the dewatered biosolids to an off-site composting facility, would not be cost-effective relative to other alternatives.

The analysis further concluded that TPAD digestion, coupled with batch tanks, appeared to be one of the more cost effective methods for producing Class A biosolids. However, a number of

potential alternatives appeared to be essentially equivalent from a cost perspective and the study recommended that further analysis, which should include non-economic factors, was warranted. A consultant is currently performing BCEs to enable staff to develop recommendations related to components and timing of new biosolids facilities. The BCE analysis uses a Triple Bottom Line Plus methodology, similar to that used in the PMP, which includes four main evaluation categories: economic, environmental, social, and operational.

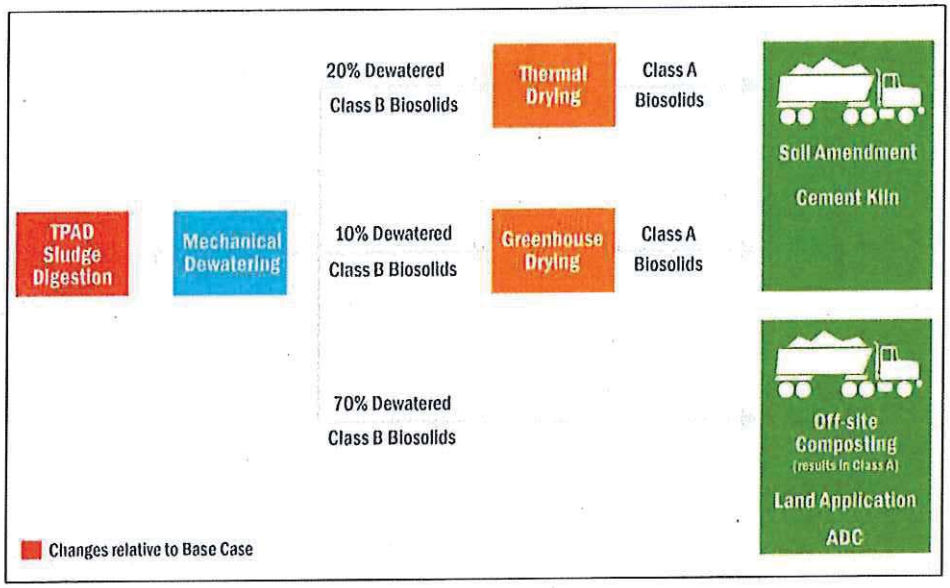
The base case PMP recommendation is shown in Figure 1.

**Figure 1: Base Case PMP Recommendation with Mesophilic Digestion**




Three alternatives being evaluated and compared against the base case are depicted below. Each alternative provides multiple disposition options; Alternatives 1 and 2 result in a mix of Class A and Class B biosolids while Alternative 3 results in Class B biosolids in the near term with the flexibility to produce all Class A biosolids in the future.

## Figure 2: Alternative 1 – Modified Base Case with Thermophilic Digestion




## Figure 3: Alternative 2 – Base Case with a Blending Option

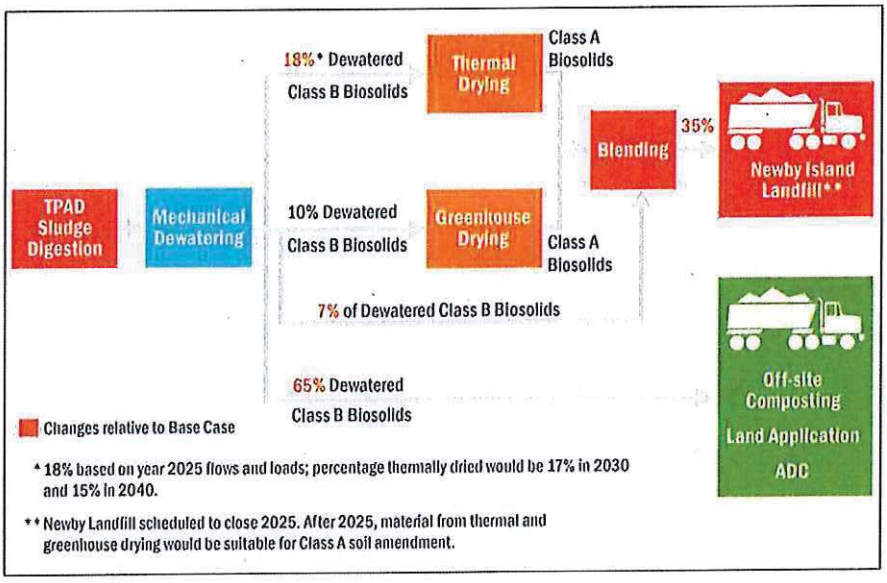
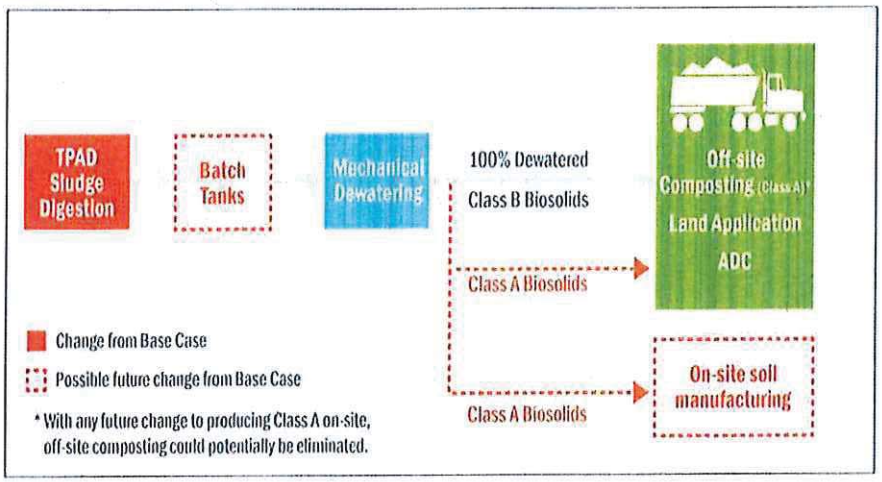


**Figure 4: Alternative 3 – Thermophilic Digestion with Future Batch Tanks**




Based on the responses from the biosolids market, all BCEs assume that a new biosolids dewatering facility will be required. Major components of this project will include dewatering equipment, polymer feeding systems, short-term storage, conveyance, odor treatment, and truck load-out facilities. Once the dewatering facilities are on-line, the decommissioning of the existing lagoons and drying beds will be able to commence.

An evaluation of project delivery methods (e.g., design-bid-build, design-build) is also being prepared. The evaluation will be completed in October 2014 and will inform staff recommendations that will be brought forward to Council in December.

*Cost Implications*

The CIP project validation process that was completed in February 2014 identified approximately $397 million in capital costs for the implementation of the biosolids transition. Projects include Digester and Thickener Facilities Upgrade Project, Additional Digester Facility Upgrades, Digested Sludge Dewatering Facility, FOG Receiving, Lagoons and Drying Beds Retirement, Greenhouse Drying Demonstration Project, and Thermal Drying Facility. When the new biosolids facilities come online and while the existing lagoons and drying beds are still being decommissioned, existing O&M costs are anticipated to be increased by about $14 million. Once the decommissioning has been completed, the new facilities will still require an additional $8 million in O&M costs in comparison to existing O&M costs. Additional cost information will be brought forward to Council as part of the BCE analysis and staff recommendations. Furthermore, detailed cost estimates will be developed for the individual project components.

*Next Steps*

Upcoming activities related to the Biosolids Transition Strategy include:

- Complete the alternative site analysis, business case and project delivery evaluation;

- Prepare the Biosolids Transition Strategy including recommendations for the near term and longer term Biosolids Management Program;
- Continue with the preliminary design of the sludge thickening and digestion facilities;
- Initiate early project planning activities for the dewatering facility; and
- Bring forward recommendations on the Biosolids Transition Strategy to TPAC in November and City Council in December.

## PUBLIC OUTREACH/INTEREST

This memorandum will be posted on the City's website for the November 3, 2014 Transportation and Environmental Committee Agenda, and will be presented to the Treatment Plant Advisory Committee (TPAC) at their November 13, 2014 meeting.

## COORDINATION

This report has been coordinated with the Department of Public Works and the City Attorney's Office.

## CEQA

Not a project, File No. PP10-069 (a) Staff Reports.

/s/
Kerrie Romanow
Director, Environmental Services

For questions, please contact Ashwini Kantak, Assistant Director (ESD), at 408-975-2553.

Attachments:
A – Alternative Sites Considered for New Biosolids Processing Facilities
B – A Summary of Biosolids Market RFI Responses

## Attachment A - Alternative Sites Considered for New Biosolids Processing Facilities

## Attachment B - A Summary of Biosolids Market RFI Responses

| Respondent | Proposed Technology | Technology Status | Type of Reuse | Acceptable Biosolids | Type of Contract | Disposition Cost [1] |
|---|---|---|---|---|---|---|
| **CH2M Hill** | Thermal Drying | Proven | Pelletized Fuel<br>Soil Enhancement/Fertilizer | Class A or B | N/A | N/A |
| **NEFCO** | Thermal Drying | Proven | Pelletized Fuel<br>Fertilizer | Class A or B | Service & Disposition | $60-$70 |
| **USG** | Belt Dryer | Proven | Alternative Fuel<br>Land Application | Class A or B | Service only | $30-$50 |
| **Liberty** | Composting | Proven | Compost | Class A or B | Service & Disposition | $20-$30 |
| **Synagro** | Land Application<br>Composting | Proven | Land Application<br>Compost<br>ADC | Class A or B | Service & Disposition | $30-$40 |
| **Terra Renewal** | Land Application<br>Composting | Proven | Land Application<br>ADC | Class A or B | Service & Disposition | $20-$30 |
| **Degremont** | N/A | | N/A | Class A or B | N/A | N/A |
| **Lystec** | Hydrolysis<br>Land Application | Emerging | Liquid Fertilizer for Land Application | Class A or B | Service & Disposition | $50-$60 |
| **VitAg** | Fertilizer | Emerging | Class A Fertilizer | Class A or B | Service & Disposition | $20-$60 |
| **Biogas Equity 2** | Gasification | Non-Commercial Proven | Syngas | Class A or B | Service & Disposition | N/A |
| **Gate 5 Energy** | Dryer<br>Combustion<br>Energy Recovery | Non-Commercial Proven | Renewable Electricity | Class A or B | Service & Disposition | $40-$85 |

Notes:

1. Disposition cost is per wet ton based on 25% solids. Transportation is not included in the disposition cost.

COUNCIL AGENDA: 12/2/14
ITEM:

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

# Memorandum

**TO:** HONORABLE MAYOR AND CITY COUNCIL

**FROM:** Kerrie Romanow

**SUBJECT: BIOSOLIDS TRANSITION STRATEGY**

**DATE:** November 5, 2014

Approved [signature] Date 11/13/14

## RECOMMENDATION

Approve the Biosolids Transition Strategy for the San José-Santa Clara Regional Wastewater Facility.

## OUTCOME

Approval of the recommendation will enable staff to proceed with capital improvements to support the Plant Master Plan (PMP) goals to transition out of the open air lagoons and drying beds and to reduce odors. Establishment of a biosolids management team (BMT) will enable staff to implement the PMP goal of multiple and diversified options and to continue to track and appropriately respond to any future regulatory and market changes through the use of pilot programs and other tools.

## EXECUTIVE SUMMARY

Most of the infrastructure at the San José-Santa Clara Regional Wastewater Facility is now more than 50 years old and has exceeded its useful life, with repairs needed to every process area. The RWF embarked on a master planning process to rehabilitate and upgrade its facilities and to explore potential process changes. The PMP envisioned a comprehensive Biosolids Management Program (BMP) that would transition from the current process to new processes with multiple and diversified disposition. Some changes have occurred since the technical component of the PMP was completed in 2010. In response to the changed conditions, a number of analyses and market surveys were conducted to evaluate and refine alternative approaches to implementing the biosolids facilities recommended in the PMP. Based on the evaluation results, a biosolids transition strategy for near term transition and long term management has been developed.

The near term biosolids transition strategy includes the following:

- Proceed with temperature phased anaerobic digestion (TPAD) upgrades.
- Proceed with only the new Digested Sludge Dewatering Facility.
- Defer thermal and greenhouse drying facilities until regulatory or market conditions require a drier product.
- Further evaluating other alternative sites that are closer to the existing digesters and locating the Digested Sludge Dewatering Facility at Site A if there is no other suitable site.
- Establish a BMT to begin developing, negotiating and procuring disposition contracts.

The long term biosolids management strategy will focus on tracking biosolids regulatory and market changes and potentially starting small pilots/demonstrations.

## BACKGROUND

The cities of San José and Santa Clara jointly own the San José-Santa Clara Regional Wastewater Facility[1] (RWF) which serves six other South Bay cities in part, through four special districts. The RWF has been in operation since 1956, at its current location on Zanker Road, just north of Highway 237, in North San José. The RWF is the largest advanced wastewater treatment facility in the Western United States and treats an average of 110 million gallons per day of wastewater. About 100 million gallons of the treated wastewater is discharged into the South Bay and approximately 10 million gallons are recycled for use in irrigation, toilets and cooling towers in parts of San José, Santa Clara, and Milpitas.

Treating the wastewater also results in approximately 85 dry tons of biosolids per day, which must be disposed of or beneficially reused. The current treatment process stabilizes the solids in anaerobic digesters and transfers the digested sludge to open-air lagoons, for approximately three years, before moving the biosolids to drying beds for another year. This solids stabilization process significantly reduces the amount of volatile material and pathogens in the sludge, and lowers the odor potential in downstream processes. The dried biosolids are then transported to the adjacent Newby Island landfill for use as an alternative daily cover material. The current process creates a "Class A" product which is the highest level of treatment as defined by federal regulators.

Most of the RWF's infrastructure is now more than 50 years old and has exceeded its useful life, with repairs needed to every process area. In 2008, the RWF embarked on a master planning process to rehabilitate and upgrade its facilities and to explore potential process changes. The PMP used an extensive community engagement process to develop overarching environmental,

---

[1] *The legal, official name of the facility remains San Jose/Santa Clara Water Pollution Control Plant, but beginning in early 2013, the facility was approved to use a new common name, the San José-Santa Clara Regional Wastewater Facility.*

economic, social, and operational goals for the RWF. To support these goals, the PMP envisioned a comprehensive BMP that would transition from the current process to an enclosed, mechanical treatment system with the resulting dewatered biosolids hauled off-site. The PMP was adopted by the San José City Council in November 2013 and by Santa Clara City Council in December 2013.

Subsequent to the PMP adoption, a Biosolids Transition Strategy project was initiated and Brown and Caldwell was retained as the City's consultant to evaluate alternative approaches to implementing the biosolids facilities recommended in the PMP, develop recommendations on the biosolids transition, and prepare biosolids transition strategy report.

On April 10, 2014, staff presented preliminary information on the Biosolids Transition Strategy to the Treatment Plant Advisory Committee (TPAC) at a Biosolids Study Session. The Study Session also provided an opportunity for TPAC and various stakeholders to provide their perspective and input on the transition strategy. Discussion topics included a summary of the PMP recommendations, an overview of biosolids management approaches, a discussion of various disposition options, and potential project and disposition options for the RWF. Staff also outlined steps to solicit interest from the open market and the methodology for conducting business case evaluations in order to bring back recommendations to the City Council in fall 2014. Feedback from TPAC on the Biosolids Transition Strategy included consideration of odor impacts, expandability of the facility in the future, possibility of producing Class A biosolids instead of Class B biosolids, and impact on operation and maintenance costs.

This report provides recommendations on near-term and long-term components of a Biosolids Transition Strategy. Background information on the strategy, including changes since the PMP, and information from a recent market survey, was provided in a November 2014 staff report to the Transportation and Environment (T&E) Committee, which is attached for reference (Attachment 1) and also can be viewed at http://sanjoseca.gov/DocumentCenter/View/36636. The staff report also included information on key evaluations conducted by the City's consultant in order to inform the recommendations on the Biosolids Transition Strategy.

## ANALYSIS

Development of the Biosolids Transition Strategy involved an in-depth evaluation covering the following five major elements:

- *Background Investigations:* including information gathering and technical reviews as well as site visits to help assess certain technologies and the practices of other utilities employing biosolids management systems as those recommended by the PMP.
- *Market Survey:* to assess issues such as the demand for Class A and dried biosolids, prices paid by other agencies for off-site processing and disposition, available market interest in providing off-site processing and beneficial reuse service, and interest in participating in the development of on-site facilities.

- *Business Case Evaluations:* including development and screening of alternatives as well as Triple Bottom Line Plus and economic evaluation of the "short listed" alternatives.
- *Alternative Site Evaluations:* to determine the preferred location or locations for biosolids facilities recommended in the PMP.
- *Project Delivery Evaluation:* to evaluate alternate delivery options to accelerate the schedule.

Based on the market survey and evaluation results, a biosolids transition strategy for the RWF has been developed. The biosolids transition strategy includes a near term biosolids transition strategy and a long term biosolids management strategy as described below.

Near Term Biosolids Transition Strategy:

- Proceed with temperature phased anaerobic digestion (TPAD) upgrades. TPAD provides a cost-effective path to Class A biosolids if needed in the future, improved solids stabilization and biogas (energy) production.
- Proceed with only the new Digested Sludge Dewatering Facility because there is no imminent driver for Class A or thermally dried biosolids.
- Defer thermal and greenhouse drying facilities until regulatory or market conditions require a drier biosolids product. This would result in substantial cost saving.
- Further evaluate other alternative sites that are closer to the existing digesters to reduce pipeline length. If no other suitable site is identified at that time, locate the Digested Sludge Dewatering Facility at Site A.
- Establish a BMT to begin developing, negotiating and procuring a diverse portfolio of disposition contracts.

Long Term Biosolids Management Strategy:

- Implement an adaptive management approach to allow BMT to track changing industry, regulatory, market and land use conditions, and conduct market research to better determine local demand and price for end products.
- Implement any future on-site processing facilities considering conditions at the time including starting small with pilots, demonstrations, and phasing and potentially participating in regional facilities and emerging technologies.

The details of the evaluations and biosolids transition strategy are documented in the Biosolids Transition Strategy Report (Report) included in Attachment 2. An overview of the key evaluations performed is provided below.

*Business Case Evaluations*

Business case evaluations (BCEs) were conducted to explore various project options that would best achieve the goals established in the PMP. Based on the responses from the market survey, all BCEs assume that a dewatering facility will be required. Major components of this project will include dewatering equipment, polymer feeding systems, short-term storage, conveyance,

odor treatment, and truck load-out facilities. Once the dewatering facility is on-line, the decommissioning of the existing lagoons and drying beds will be able to commence.

The BCE's process involves two steps. The first step included a screening of biosolids processing alternatives which was conducted using the Solids-Water-Energy Tool (SWET) Model. The analysis helped screen out less favorable alternatives and provided the foundation for subsequent BCEs. The second step included evaluating three biosolids processing and disposition alternatives and comparing them against the PMP base case. The major elements of the PMP base case are outlined below:

- Mesophilic digestion with digesters operating at 95-degree Fahrenheit and sludge being heated and biologically stabilized in covered tanks.
- Mechanical dewatering of all biosolids to remove a significant portion of the water in the digested sludge to reduce the overall volume of sludge to be hauled offsite.
- Thermal drying of 20% biosolids and greenhouse drying of 10% biosolids to remove most of the water by heating the sludge in an enclosed vessel/greenhouse to produce Class A biosolids.
- Off-site processing or disposal of 70% Class B biosolids produced from mechanical dewatering.

The PMP base case produces a mix of Class A and Class B biosolids. Class A biosolids, with the highest level of treatment, essentially processes sludge to levels that substantially reduce the amount of volatile material and pathogens to very low levels in order to allow for safe land application. Class B biosolids treatment requirements employ treatment processes that significantly reduce the amount of pathogens, but this product has limitations on the end uses of the sludge. A process schematic for the PMP base case is provided in Attachment 3.

Alternative 1 (shown in Attachment 4) includes the same elements as the PMP base case except the digestion element. Instead of mesophilic digestion, TPAD was included as an alternative to enhance solids stabilization and biogas production. In addition, TPAD provides a pathway to Class A biosolids via future addition of batch tanks. TPAD is a two-stage digestion process: thermophilic digestion with digesters operating at 135-degree Fahrenheit followed by mesophilic digestion with digesters operating at 95-degrees Fahrenheit. Alternative 1 will result in a mix of Class A and Class B biosolids.

Alternative 2 (shown in Attachment 5) is very similar to Alternative 1 including TPAD digestion, mechanical dewatering, thermal drying and greenhouse drying to produce a mix of Class A and Class B biosolids. The difference is that Alternative 2 accelerates the timing for installation of thermal and greenhouse drying facilities in order to take advantage of the relatively inexpensive disposition cost associated with the Newby Island Landfill. In addition, a blending operation is included in Alternative 2 so that dried biosolids can be combined with dewatered biosolids and then transported to Newby Island Landfill. The thermal dryer in Alternative 2 is slightly smaller compared to the dryer in the PMP base case (18% versus 20%);

this sizing is a function of the amount of limited waste heat generated from the planned cogeneration facility in the year 2025.

Alternative 3 (shown in Attachment 6) was developed based on the results of the market survey which indicated no imminent need to produce Class A biosolids in northern California at this time. Thermal drying and greenhouse drying facilities could be deferred for future when there is a need due to regulatory and market changes. Alternative 3 includes TPAD, mechanical dewatering of all biosolids and disposal of all Class B biosolids produced from the mechanical dewatering. Alternative 3 results in Class B biosolids in the near term with flexibility to produce all Class A biosolids, with the addition of batch tanks, in the future.

A cost analysis was preformed to provide a comparison of the capital cost, operations and maintenance (O&M) cost and present value life cycle cost between the base case and each alternative. All costs are in 2014 dollars without escalation. The present value life cycle costs were calculated for a period from 2014 through 2040.

In addition to the cost analysis, triple bottom line plus (TBL+) methodology was used to evaluate the alternatives based on not only costs but also non-cost elements including social, economic, environmental, and operational criteria. This methodology included analyzing quantitative and qualitative criteria. Quantitative criteria include capital costs, net present value and schedule. Qualitative criteria provide the ability to meet underlying goals, ease of maintenance and operations, ease of permitting and project delivery, and flexibility to move disposition options.

*Alternative 1 Evaluation Results*

The evaluation results for Alternative 1 are summarized in Table 1 below. Also included in Table 1 are the evaluation results of the PMP base case for comparison.

**Table 1 – A Comparison of Evaluation Results: PMP Base Case vs. Alternative 1**

| Parameter | PMP Base Case | Alternative 1 Modified Base Case with TPAD | Difference |
|---|---|---|---|
| Present Value Life Cycle Cost | $520 M | $520 M | $0 M |
| Capital Cost | $298 M | $306 M | $8 M |
| O&M Cost | $14.5 M | $14.1 M | ($0.4 M) |
| TBL+ Performance Score | 5.3 | 5.4 | |

Alternative 1 has TBL+ performance score that is comparable to the base case. The present value life cycle costs are also equivalent. These results suggested that TPAD is comparable to mesophilic digestion.

*Alternative 2 Evaluation Results*

Table 2 below provides a summary of evaluation results of Alternative 2 in comparison with the PMP base case.

**Table 2 – A Comparison of Evaluation Results: PMP Base Case vs. Alternative 2**

| Parameter | PMP Base Case | Alternative 2<br>Base Case w/A Blending Option | Difference |
|---|---|---|---|
| Present Value Life Cycle Cost | $520 M | $490 M | ($30 M) |
| Capital Cost | $298 M | $270 M | ($28 M) |
| O&M Cost | $14.5 M | $14.1 M | ($0.4 M) |
| TBL+ Performance Score | 5.3 | 6.3 | |

Alternative 2 has higher TBL+ performance score than the base case and results in slight present value life cycle cost savings. However, any potential savings would be highly schedule-dependent and there was substantial risk that this alternative could not be implemented soon enough to capture all savings.

*Alternative 3 Evaluation Results*

The comparison of evaluation results between Alternative 3 and the PMP base case is presented in Table 3 below.

**Table 3 – A Comparison of Evaluation Results: PMP Base Case vs. Alternative 3**

| Parameter | PMP Base Case | Alternative 3<br>TPAD w/Future Batch Tanks | Difference |
|---|---|---|---|
| Present Value Life Cycle Cost | $520 M | $380 M | ($140 M) |
| Capital Cost | $298 M | $166 M | ($132 M) |
| O&M Cost | $14.5 M | $12.3 M | ($2.2 M) |
| TBL+ Performance Score | 5.3 | 8.5 | |

Alternative 3 shows significantly higher TBL+ performance score compared with the PMP base case, as well as substantial present value life cycle cost savings ($140 M).

Based on the evaluation results, Alternative 3 is recommended due to the following considerations:

- No apparent imminent drivers for Class A biosolids
- Substantial cost savings
- Flexibility to produce Class A biosolids in the future via the installation of batch tanks or drying facilities

- Potential to develop a future on-site soil manufacturing facility and entail beneficial reuse within the local community
- Diversification through multiple disposition contracts for off-site composting (Class A product), land application, landfill disposal or alternative daily cover at landfill.

The base case, Alternatives 1 and 2 are not recommended because they all involve significant commitment of capital investment in thermal drying and only provide some Class A biosolids.

All alternatives require disposal of the biosolids produced. Multiple disposition contracts need to be developed, negotiated, procured and potentially renewed to meet the PMP multiple and diversification goals. Staff recommends establishing a BMT to prepare and manage the disposition contracts. In addition, BMT will monitor and track future conditions to enable the RWF to appropriately respond to regulatory and market changes and emerging technologies. The size and make up of this team will be developed in the coming months and the recommendations will be incorporated into the FY 2015-2016 budget process.

*Alternative Site Evaluations*

As stated in the November 2014 T&E Committee report, environmental findings during the PMP EIR process necessitated evaluation of alternate sites for the biosolids facilities.

Four alternative sites (shown in Attachment 6) have been evaluated to identify a suitable site for the biosolids facilities. Five criteria were used for the site evaluation including available space to accommodate potential new and future biosolids facilities, conflicts with existing facilities and utilities, safe access and truck traffic, environmental and permitting limitations and proximity to related facilities. A summary of site evaluation results and recommendations is provided below:

Site A is recommended because it has the following advantages:

- Sufficient space for new and future biosolids facilities.
- Easiest for permitting biosolids facilities
- Easier truck access
- No biosolids truck traffic through the central area of the existing facilities.

Site B is not recommended due to the following issues:

- Need to demolish and relocate existing facilities prior to the new dewatering facility construction that creates schedule uncertainty.
- Potential higher construction cost due to restricted construction area
- Potential conflict with the existing underground utilities and tunnels which must remain operational.
- Long term traffic conflicts and congestion
- Limited available space for future biosolids facilities.

Site C is the second preferred site because it offers the following benefits:

- Good location for thermal drying facility since it is the closet to the planned cogeneration facility to allow for cost-effectively using the waste heat generated from the cogeneration facility to dry the biosolids at the thermal drying facility.
- Long term traffic conflict and congestion.
- Easier truck access

However, Site C would require longer time to sort through jurisdictional issues that may trigger a lengthy environmental permitting process.

Site D is not recommended because it requires longer jurisdictional/environmental permitting processes and it is difficult to access.

A preliminary site layout for the preferred site (Site A) is provided in Attachment 7. Although Site A is the preferred site over the other three sites considered, it is slightly far from the digesters and a longer pipeline would be required to transfer sludge to the new Digested Sludge Dewatering Facility. Staff recommends further evaluating additional alternative sites other than Sites B, C and D, during the planning phase of the Digested Sludge Dewatering Facility project, and locating the new Digested Sludge Dewatering Facility at Site A if there is no other suitable site that is closer to the digesters can be identified at that time.

*Project Delivery Evaluation*

In May 2011, the City Council directed staff to accelerate the biosolids transition process and cease discharging biosolids to the existing lagoons by 2018, followed by emptying the lagoons and drying beds by 2024 ( http://www3.sanjoseca.gov/clerk/Agenda/20110524/20110524a.pdf). This direction was predicated on the adoption of the PMP in spring 2013. However, the PMP was actually adopted in December 2013, which caused a delay in the development of the biosolids transition strategy. Another key consideration was the fact that during the Environmental Impact Report process, potential wetlands and aquatic habitat were identified at the site originally identified for the new biosolids facilities. The permitting process for this site was estimated to take three years; this would have adversely impacted the schedule and thus necessitated and evaluation of alternative sites.

Assuming a project start of the Digested Sludge Dewatering Facility in December 2014, the preliminary project delivery schedule shows an estimated completion of late 2019, if delivered as a traditional design-bid-build project. Design-build delivery method was evaluated as an alternative to accelerate the schedule. Design build delivery method is a method of project delivery in which the design and construction phases of a project are combined into one contract. It offers a potential to complete a project more quickly than a traditional design-bid-build delivery method. The preliminary schedule, using a design-build delivery method shows a completion date of late 2019.

In an attempt to still try and meet the deadline of ceasing discharge to the lagoons by 2018, as previously directed by Council, , staff evaluated another option as described below:

*Mobile Dewatering Alternative* - Mobile dewatering equipment could be rented and installed at the RWF as a temporary method to process biosolids until the completion of the new Digested Sludge Dewatering Facility. Installation would likely include site preparation, installation of three trailer mounted dewatering units, power and piping connection. It appears that the 2018 schedule could be achieved by processing biosolids using mobile dewatering equipment starting in the year 2018 until the completion of the Digested Sludge Dewatering Facility in late 2019.

The estimated additional annual cost for mobile dewatering is approximately $14,000,000, including equipment rental, O&M costs, and disposition costs. It is important to note, however, that significant staffing resources may have to be diverted from the Digested Sludge Dewatering Facility to the mobile dewatering project, which could further delay the permanent facility. Additionally, the mobile dewatering units will not be equipped with odor control measures, which could result in new odors on the site. Since the intent of the accelerated biosolids transition schedule was to mitigate odors, mobile dewatering would not be an effective solution. Thus, although the 2018 schedule can be met through mobile dewatering alternative, staff does not recommend this alternative due to the following issues:

- It is not cost effective (approximately additional $14,000,000 in cost per year for two years until the Digested Sludge Dewatering Facility is completed and commissioned).
- It requires additional staff time to prepare and negotiate the service contract and manage the installation of the mobile dewatering equipment.
- Mobile dewatering equipment is typically not enclosed and may exacerbate odor issue.

Instead of the mobile dewatering option, staff recommends further exploring options to meet the 2024 schedule of emptying the existing lagoons and drying beds. This would better address the intent of the May 2011 Council direction to reduce odors by 2024. In addition to the biosolids, there are other process areas that may also have odor impacts. An overall odor strategy is currently being developed and will be brought forward to Council in late November/early December, followed by a detailed odor-control implementation plan (OIP) in summer 2015. The OIC will better inform Council of all the projects with potential odor impacts and proposed mitigation measures; the timeline for emptying of the lagoons and drying beds can be further evaluated and incorporated into the OIP.

## EVALUATION AND FOLLOW-UP

If the proposed Biosolids Transition Strategy is approved, staff will begin the planning and consultant selection for the Digested Sludge Dewatering Facility project. The recommendation for award of consultant agreement for the Digested Sludge Dewatering Facility project will be brought forward to Council for approval.

Staff will also start the planning for establishment of a BMT.

## POLICY ALTERNATIVES

***Alternative1: Direct City Staff to proceed with mobile dewatering alternative.***
**Pros:** To meet the goals of ceasing discharging biosolids to existing lagoons by year 2018.
**Cons:** Additional effort is required to develop, negotiate and procure service contract and installation contract for mobile dewatering equipment, and manage the installation. Odor issue may not be mitigated and odor impacts need to be evaluated. This alternative requires a total of approximately additional $28,000,000 in O&M cost for two years.
**Reason for not recommending:** It is not cost effective and may exacerbate odor issue.

## PUBLIC OUTREACH

This memorandum will be posted on the City's website for the December 9, 2014 Council meeting and will also be presented to the Treatment Plant Advisory Committee (TPAC) at a special meeting on November 20, 2014.

## COORDINATION

This memo has been coordinated with the Department of Public Works, City Attorney's Office and the City Manager's Budget Office.

## FISCAL/POLICY ALIGNMENT

The biosolids transition strategy is consistent with the Council Direction and the BMP goals. In addition, the transition strategy is consistent with the following General Budget Principle: "We must focus on protecting our vital core city services for both the short and long-term."

## COST SUMMARY/IMPLICATIONS

The CIP project validation process that was completed in February 2014 identified approximately $397,000,000 in capital costs for the implementation of the biosolids transition. Projects include Digester and Thickener Facilities Upgrade Project, Additional Digester Facility Upgrades Project, Digested Sludge Dewatering Facility, FOG Receiving Project, Lagoons and Drying Beds Retirement Project, Greenhouse Drying Demonstration Project, and Thermal Drying Facility Project. If the proposed Biosolids Transition Strategy is approved, the Greenhouse Drying Demonstration Project and Thermal Drying Facility Project will be removed from the 10-Year CIP and the capital costs for the biosolids transition will be reduced from $397,000,000 to approximately $254,000,000. Detailed cost estimates will be developed for the individual project components.

When the new Digested Sludge Dewatering Facility comes online and while the existing lagoons and drying beds are still being decommissioned, existing O&M costs are anticipated to be increased by about $14,000,000. Once the decommissioning has been completed, the new facilities will still require an additional $8,000,000 in O&M costs in comparison to existing O&M costs.

## CEQA

Not a Project, File No. PP10-069(a), Staff Reports.

/s/
Kerrie Romanow
Director, Environmental Services

For questions, please contact Ashwini Kantak, Assistant Director (ESD), at 408-975-2553.

Attachments:
1 - November 2014 T&E Biosolids Transition Strategy Update Memo
2 - Biosolids Transition Strategy Report
3 - Figure 1: Base Case - PMP Recommendation with Mesophilic Digestion
4 - Figure 2: Alternative 1 – Modified Base Case with TPAD
5 - Figure 3: Alternative 2 – Base Case with a Blending Option
6 - Figure 4: Alternative 3 – TPAD with Future Back Tanks
7 - Figure 5: Alternative Sites Considered
8 - Figure 6: Site A Preliminary Layout

CITY OF SAN JOSE
CAPITAL OF SILICON VALLEY

# Memorandum

**TO:** TRANSPORTATION AND ENVIRONMENT COMMITTEE

**FROM:** Kerrie Romanow

**SUBJECT:** **BIOSOLIDS TRANSITION STRATEGY UPDATE**

**DATE:** October 22, 2014

Approved Kerrie Romanow Date 10-22-14

## RECOMMENDATION:

Accept this staff report that provides an update on the Biosolids Transition Strategy for the San José-Santa Clara Regional Wastewater Facility.

## BACKGROUND

The cities of San José and Santa Clara jointly own the San José-Santa Clara Regional Wastewater Facility[1] (RWF) which serves six other South Bay cities in part, through four special districts. The RWF has been in operation since 1956 at its current location on Zanker Road just north of Highway 237 in North San Jose. The RWF is the largest advanced wastewater treatment facility in the Western United States and treats an average of 110 million gallons per day of wastewater. About 100 million gallons of the treated wastewater is discharged into the South Bay and approximately 10 million gallons are recycled for use in irrigation, toilets and cooling towers in parts of San José, Santa Clara, and Milpitas.

Treating the wastewater also results in approximately 85 dry tons of biosolids per day which must be disposed of or beneficially reused. The current treatment process stabilizes the solids in anaerobic digesters, and then transfers the digested sludge to open-air lagoons for approximately three years before moving the biosolids to drying beds for another year. The anaerobic digesters are a commonly used solids stabilization process in wastewater treatment, where sludge is heated and biologically stabilized in covered tanks. This solids stabilization process significantly reduces the amount of volatile material and pathogens in the sludge, and lowers the odor potential in downstream processes. The dried biosolids are then transported to the adjacent Newby Island landfill for use as an alternative daily cover material. The current process creates a "Class A" product which is the highest level of treatment as defined by federal regulators.

---

[1] *The legal, official name of the facility remains San Jose/Santa Clara Water Pollution Control Plant, but beginning in early 2013, the facility was approved to use a new common name, the San José-Santa Clara Regional Wastewater Facility.*

Most of the RWF's infrastructure is now more than 50 years old and has exceeded its useful life, with repairs needed to every process area. In 2008, the RWF embarked on a master planning process to rehabilitate and upgrade its facilities and to explore potential process changes. The Plant Master Plan (PMP) used an extensive community engagement process to develop overarching environmental, economic, social, and operational goals for the RWF. To support these goals, the PMP envisioned a comprehensive Biosolids Management Program (BMP) that would transition from the current process to an enclosed, mechanical treatment system with the resulting dewatered biosolids hauled off-site. The BMP also called for flexibility with multiple and diversified disposition options for the biosolids.

The BMP envisioned a mix of Class A and Class B biosolids products. The US Environmental Protection Agency (USEPA) defines the processes and handling requirements of wastewater sludge in terms of "Class A" and "Class B" biosolids products. Class A biosolids, with the highest level of treatment, contain very low levels of volatile material and pathogens and thus lend themselves to safe land application. Class B biosolids, with a lower level of treatment, have a higher level of pathogens than Class A, which places some limitations on the end uses of the sludge. Key BMP goals included minimizing disposal volume and costs, reducing footprint/greenhouse gas emissions and odors, using innovative approaches, maximizing reuse of biosolids in the community, and increasing flexibility and diversity in disposition options. The major project elements recommended for the BMP include:

- Rehabilitation of the existing sludge thickening and digester facilities;
- Mechanical dewatering for all of the biosolids; with 70% of the biosolids material going to off-site uses and disposal
- Thermal drying for 20% of the biosolids and Greenhouse drying for 10% of the biosolids;
- Decommissioning of the existing open sludge lagoons and drying beds; and
- Multiple disposition options and contracts for biosolids reuse/disposal.

The mechanical dewatering process will remove a significant portion of the water in the digested sludge to reduce the overall volume of sludge to be hauled offsite. The thermal drying process is an additional process to remove most of the water by heating the digested sludge in an enclosed vessel. Similar to thermal drying process, the Greenhouse drying process uses the sun to heat and dry the sludge. More detail on the BMP can be found at http://sjenvironment.org/ArchiveCenter/ViewFile/Item/1554 Final Draft of Project Memorandum No. 2 Biosolids Treatment Alternatives dated August 2011.

The PMP was adopted and the Environmental Impact Report certified by the San José City Council in November 2013 and by Santa Clara City Council in December 2013. Subsequent to the PMP adoption, a Biosolids Transition Strategy project was initiated to review the feasibility of diversifying disposition options and to evaluate ways to reduce environmental impacts, use modern technologies for the biosolids processing, and evaluate alternate delivery options for the construction of the facilities (e.g., design-build).

On April 10, 2014, staff presented preliminary information on the Biosolids Transition Strategy to the Treatment Plant Advisory Committee (TPAC) at a Biosolids Study Session. The Study Session also provided an opportunity for TPAC and various stakeholders to provide their perspective and input on the transition strategy. Discussion topics included a summary of the

PMP recommendations, an overview of Biosolids management approaches, a discussion of various disposition options, and potential project and disposition options for the RWF. Staff also outlined steps to solicit interest from the open market and the methodology for conducting business case evaluations in order to bring back recommendations to the City Council in fall 2014. Feedback from TPAC on the biosolids transition strategy included consideration of odor impacts, expandability of the facility in the future, possibility of producing Class A biosolids instead of Class B biosolids, and impact on operation and maintenance costs.

## ANALYSIS

Although the PMP was officially adopted in 2013, the technical component of the PMP was completed in 2010. During the three-year environmental review process, there were a number of changes in conditions related to the BMP that required staff to reevaluate the assumptions and recommendations in the BMP. Since the TPAC study session in April 2014, staff has made significant progress on the Biosolids Transition Strategy. Key elements of the work include testing the market interest for treatment and disposition options, evaluation of alternate sites for the project elements, and business case evaluations of the various project options that would best achieve the goals established in the BMP. These changes and follow-up are summarized below:

*Accelerated Delivery Schedule*

In May 2011, in response to community concerns about odors emanating from the lagoons and drying beds, the City Council directed staff to accelerate the biosolids transition process and cease discharging biosolids to the existing lagoons by 2018, followed by emptying the lagoons and drying beds by 2024. The PMP envisioned a three phase approach that would have decommissioned the lagoons and drying beds by 2030.

*Biosolids Facility Site*

During the PMP EIR process, it was determined that the planned location of the proposed biosolids facilities contained potential wetlands and aquatic habitat. Siting facilities in such a location would likely trigger extensive environmental mitigation and a lengthy permitting process. The resulting schedule delays would push project completion out well beyond the 2018 goal. Therefore, alternative sites needed to be evaluated.

Four alternative sites have been evaluated to identify constraints including available space, existence of sensitive environmental conditions, presence of existing and planned facilities, and capacity to accommodate potential new and future biosolids facilities. The recommendation of a final site is pending based on additional environmental field work to be done in October 2014. The alternative sites are shown in Attachment A. A recommendation will be brought forward to Council in December for approval of an alternative site as part of the Biosolids Transition Strategy.

*Biosolids Market*

In April 2014, TPAC directed staff to evaluate the possibility of producing Class A biosolids instead of Class B biosolids. Evaluation of options for the Digester Rehabilitation project led to

the selection of a Temperature Phased Anaerobic Digestion (TPAD) process technology to provide the flexibility to produce Class A biosolids as well as further enhance the stabilization of biosolids and increase energy production.

In June 2014, a "Request for Information (RFI) for the Biosolids Transition Program" was issued to determine market interest in the processing and/or disposition of the dewatered biosolids product that will be produced from the new Biosolids Dewatering Facility. Eleven responses to the RFI were received. The RFI process results have indicated that a wide variety of local biosolids disposition markets are available including composting, land application and landfill to meet the BMP diversification objectives. All respondents expressed interest in accepting either Class A or Class B biosolids, and 70% of them were also interested in contracting with the City regarding the final disposition of the dewatering biosolids product or producing diversified end products (Class A biosolids) onsite or offsite to provide flexibility in disposition options. A contract term of five years was considered to be acceptable by most proposers. The RFI response results also show that the hauling and disposition price range provided in the RFI responses is relatively close to a 2013 Bay Area survey that was previously reviewed by staff. The current biosolids disposition costs are $22.50 per ton to Newby Island Landfill. The RFI responses indicated disposition costs would range from $20 to $85 per ton. A summary of the responses is included in Attachment B.

*Project Validation Process*

The CIP Program team conducted a detailed project validation process of all the PMP projects in early 2014. This validation effort led to a change in assumption from a large, covered storage lagoon (sized for 180 days of storage) to a short-term enclosed storage facility located at the Biosolids Dewatering Facility, which is more in line with best practices in the wastewater industry and results in a smaller footprint and lower costs.

*Business Case Evaluations*

During the April TPAC Study Session, staff discussed triple bottom line plus methodology with social, economic, environmental, and operational criteria for evaluating various project options. This methodology included analyzing quantitative and qualitative criteria. Quantitative criteria includes capital costs, net present value and schedule and qualitative criteria includes the ability to meet underlying goals, ease of maintenance and operations, ease of permitting and project delivery, and flexibility to move disposition options.

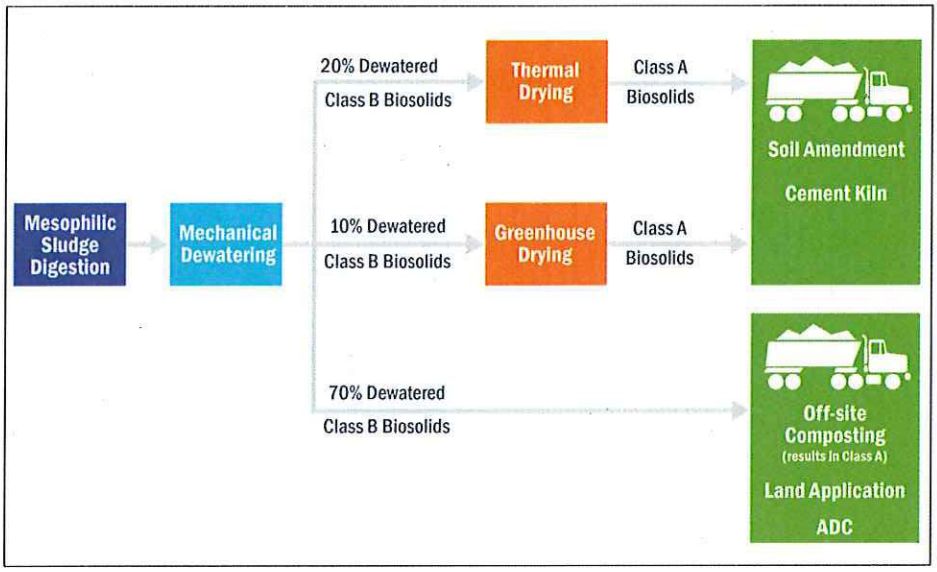
The first step of the evaluation process included a screening of biosolids processing alternatives which was conducted using the Solids-Water-Energy Tool (SWET) Model. The analysis helped screen out less favorable alternatives and provided a basis in subsequent business case evaluations (BCEs). The analysis concluded that producing 100 percent Class A biosolids, either by expanding on-site drying capacity or by sending 100 percent of the dewatered biosolids to an off-site composting facility, would not be cost-effective relative to other alternatives.

The analysis further concluded that TPAD digestion, coupled with batch tanks, appeared to be one of the more cost effective methods for producing Class A biosolids. However, a number of

potential alternatives appeared to be essentially equivalent from a cost perspective and the study recommended that further analysis, which should include non-economic factors, was warranted. A consultant is currently performing BCEs to enable staff to develop recommendations related to components and timing of new biosolids facilities. The BCE analysis uses a Triple Bottom Line Plus methodology, similar to that used in the PMP, which includes four main evaluation categories: economic, environmental, social, and operational.

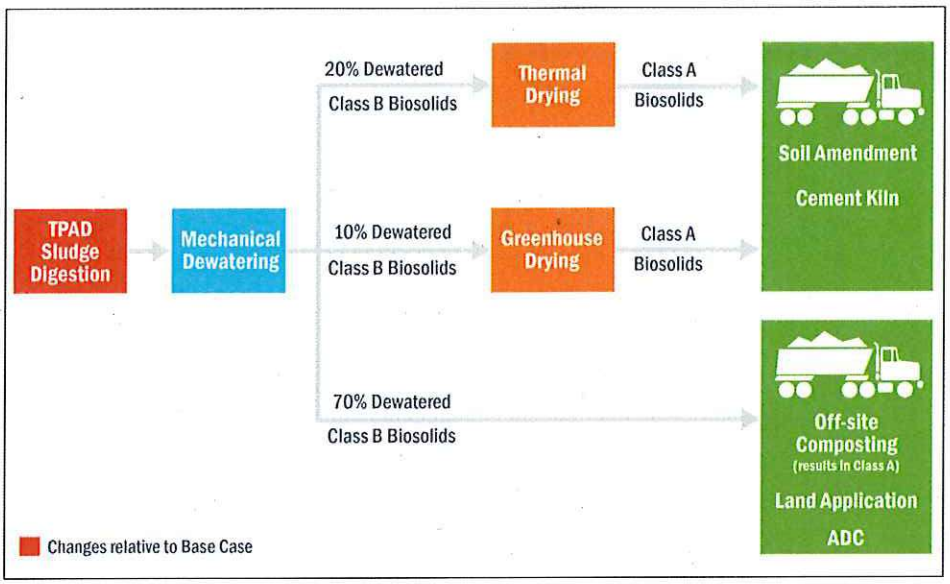
The base case PMP recommendation is shown in Figure 1.

**Figure 1: Base Case PMP Recommendation with Mesophilic Digestion**




Three alternatives being evaluated and compared against the base case are depicted below. Each alternative provides multiple disposition options; Alternatives 1 and 2 result in a mix of Class A and Class B biosolids while Alternative 3 results in Class B biosolids in the near term with the flexibility to produce all Class A biosolids in the future.

## Figure 2: Alternative 1 – Modified Base Case with Thermophilic Digestion




## Figure 3: Alternative 2 – Base Case with a Blending Option

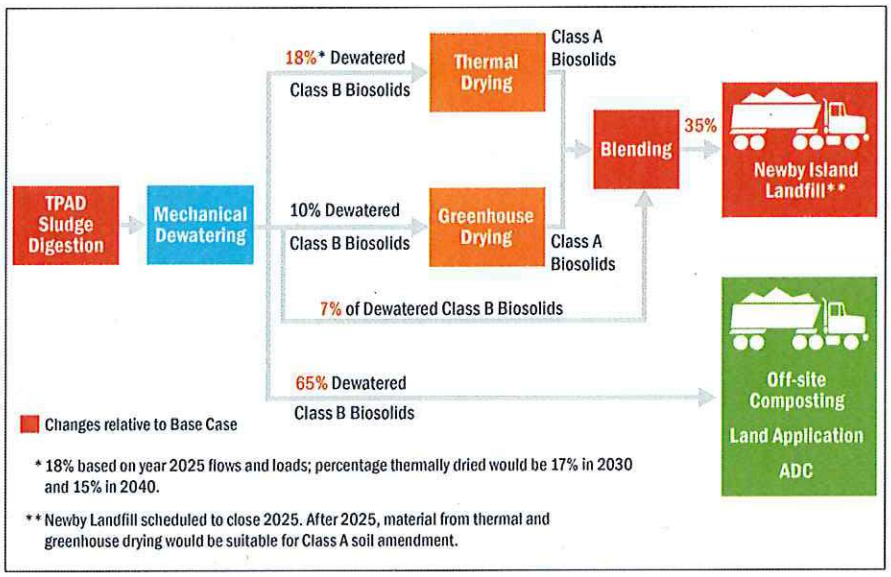
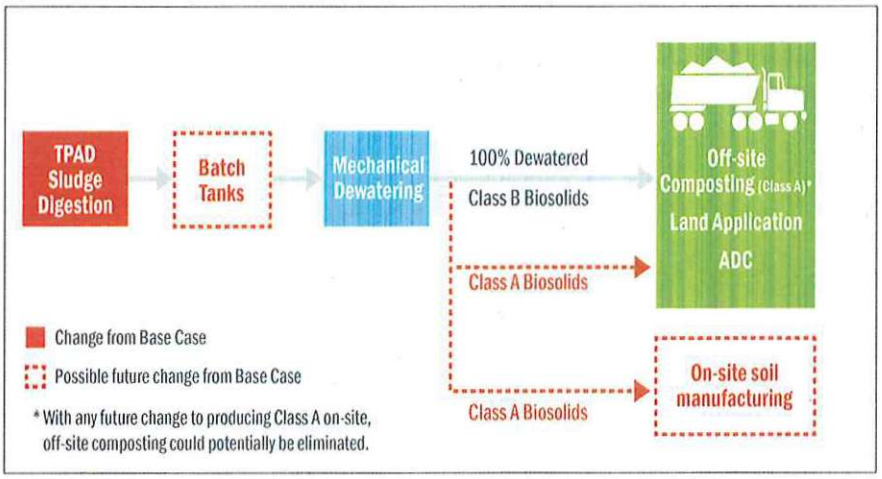


**Figure 4: Alternative 3 – Thermophilic Digestion with Future Batch Tanks**




Based on the responses from the biosolids market, all BCEs assume that a new biosolids dewatering facility will be required. Major components of this project will include dewatering equipment, polymer feeding systems, short-term storage, conveyance, odor treatment, and truck load-out facilities. Once the dewatering facilities are on-line, the decommissioning of the existing lagoons and drying beds will be able to commence.

An evaluation of project delivery methods (e.g., design-bid-build, design-build) is also being prepared. The evaluation will be completed in October 2014 and will inform staff recommendations that will be brought forward to Council in December.

*Cost Implications*

The CIP project validation process that was completed in February 2014 identified approximately $397 million in capital costs for the implementation of the biosolids transition. Projects include Digester and Thickener Facilities Upgrade Project, Additional Digester Facility Upgrades, Digested Sludge Dewatering Facility, FOG Receiving, Lagoons and Drying Beds Retirement, Greenhouse Drying Demonstration Project, and Thermal Drying Facility. When the new biosolids facilities come online and while the existing lagoons and drying beds are still being decommissioned, existing O&M costs are anticipated to be increased by about $14 million. Once the decommissioning has been completed, the new facilities will still require an additional $8 million in O&M costs in comparison to existing O&M costs. Additional cost information will be brought forward to Council as part of the BCE analysis and staff recommendations. Furthermore, detailed cost estimates will be developed for the individual project components.

*Next Steps*

Upcoming activities related to the Biosolids Transition Strategy include:

- Complete the alternative site analysis, business case and project delivery evaluation;

- Prepare the Biosolids Transition Strategy including recommendations for the near term and longer term Biosolids Management Program;
- Continue with the preliminary design of the sludge thickening and digestion facilities;
- Initiate early project planning activities for the dewatering facility; and
- Bring forward recommendations on the Biosolids Transition Strategy to TPAC in November and City Council in December.

## PUBLIC OUTREACH/INTEREST

This memorandum will be posted on the City's website for the November 3, 2014 Transportation and Environmental Committee Agenda, and will be presented to the Treatment Plant Advisory Committee (TPAC) at their November 13, 2014 meeting.

## COORDINATION

This report has been coordinated with the Department of Public Works and the City Attorney's Office.

## CEQA

Not a project, File No. PP10-069 (a) Staff Reports.

/s/
Kerrie Romanow
Director, Environmental Services

For questions, please contact Ashwini Kantak, Assistant Director (ESD), at 408-975-2553.

Attachments:
A – Alternative Sites Considered for New Biosolids Processing Facilities
B – A Summary of Biosolids Market RFI Responses

# Attachment A - Alternative Sites Considered for New Biosolids Processing Facilities

## Attachment B - A Summary of Biosolids Market RFI Responses

| Respondent | Proposed Technology | Technology Status | Type of Reuse | Acceptable Biosolids | Type of Contract | Disposition Cost [1] |
|---|---|---|---|---|---|---|
| **CH2M Hill** | Thermal Drying | Proven | Pelletized Fuel<br>Soil Enhancement/Fertilizer | Class A or B | N/A | N/A |
| **NEFCO** | Thermal Drying | Proven | Pelletized Fuel<br>Fertilizer | Class A or B | Service & Disposition | $60-$70 |
| **USG** | Belt Dryer | Proven | Alternative Fuel<br>Land Application | Class A or B | Service only | $30-$50 |
| **Liberty** | Composting | Proven | Compost | Class A or B | Service & Disposition | $20-$30 |
| **Synagro** | Land Application<br>Composting | Proven | Land Application<br>Compost<br>ADC | Class A or B | Service & Disposition | $30-$40 |
| **Terra Renewal** | Land Application<br>Composting | Proven | Land Application<br>ADC | Class A or B | Service & Disposition | $20-$30 |
| **Degremont** | N/A | | N/A | Class A or B | N/A | N/A |
| **Lystec** | Hydrolysis<br>Land Application | Emerging | Liquid Fertilizer for Land Application | Class A or B | Service & Disposition | $50-$60 |
| **VitAg** | Fertilizer | Emerging | Class A Fertilizer | Class A or B | Service & Disposition | $20-$60 |
| **Biogas Equity 2** | Gasification | Non-Commercial<br>Proven | Syngas | Class A or B | Service & Disposition | N/A |
| **Gate 5 Energy** | Dryer<br>Combustion<br>Energy Recovery | Non-Commercial<br>Proven | Renewable Electricity | Class A or B | Service & Disposition | $40-$85 |

Notes:

1. Disposition cost is per wet ton based on 25% solids. Transportation is not included in the disposition cost.

# Biosolids Transition Strategy Report

## San Jose/Santa Clara Regional Wastewater Facility

San José-Santa Clara Regional Wastewater Facility

November 2014 | CIP Program

Prepared by **Brown and Caldwell**

Brown AND Caldwell

100% Environmental | Employee Owned | Offices Nationwide | BrownandCaldwell.com

# Biosolids Transition Strategy Report

San Jose/Santa Clara Regional Wastewater Facility

## Introduction

### Background

The cities of San José and Santa Clara jointly own the San José-Santa Clara Regional Wastewater Facility (RWF) which serves six other South Bay cities in part, through four special districts. The RWF is the largest advanced wastewater treatment facility in the western United States and treats an average of 110 million gallons of wastewater each day. Having been in operation since 1956, most of the RWF's infrastructure is now more than 50 years old and has exceeded its useful life, with repairs needed to every process area.

In 2008, San José embarked on a master planning process to provide overall direction for rehabilitating and upgrading its facilities including potential process changes. The Plant Master Plan (PMP) used an extensive community engagement process to develop overarching environmental, economic, social, and operational goals. One area of focus for the master planning process was biosolids management since treating wastewater at the RWF produces about 85 dry tons of solids each day.

### Current Biosolids Management at the RWF

The RWF's current biosolids management practices produce a Class A biosolids product and include:

- **Mesophilic Digestion –** where solids remaining from the wastewater treatment process are biologically treated or "digested" in enclosed tanks designed to create a moderate temperature, low oxygen environment.
- **Lagoon Stabilization –** where digested solids are stored for about 3 years in open-air lagoons allowing further biological treatment and concentration of the solids.
- **Drying –** where stabilized biosolids are allowed to air dry in a series of drying beds.
- **Disposition at Newby Island Landfill –** where the dried and stabilized biosolids are used as daily cover in landfill operations.

## Chronology of Changes

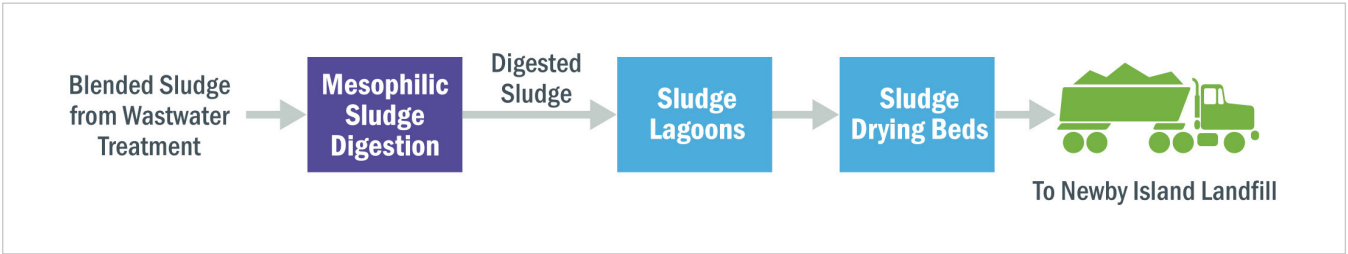
Although the PMP was officially adopted in 2013, the technical component of the PMP was completed in 2010. During the three-year environmental review process that occurred between 2010 and 2013, there were a number of changes in conditions potentially affecting the assumptions, recommendations, and implementation strategy recommended in the PMP. These changes included:

**In May 2011,** in response to community concerns about odors emanating from the lagoons and drying beds, the San José City Council directed acceleration of the transition to the new biosolids management system and specifically called for the RWF to cease discharging biosolids to the existing lagoons by 2018, followed by emptying the lagoons and drying beds by 2024. The PMP had envisioned a three phase approach that would have decommissioned the lagoons and drying beds by 2030.

**During the EIR process for the PMP,** it was determined that the planned location for recommended future biosolids facilities contained potential wetlands and habitat. Siting facilities in the recommended location would likely trigger extensive environmental mitigation and a lengthy permitting process. The resulting schedule delays would push completion of those new facilities required to cease discharge to the existing lagoons well beyond the 2018 target date, therefore, alternative sites needed to be evaluated.

**In April 2014,** TPAC provided feedback to staff to evaluate the possibility of producing Class A instead of Class B biosolids.

**In early 2014,** the RWF's Capital Improvement Program team conducted a detailed project validation review process of all projects recommended in the PMP. This validation effort led to a change in assumption from a large, open biosolids storage area near the lagoons (sized for 180 days of storage) to a managed, enclosed four-day storage facility located at the Biosolids Dewatering Facility, which is more in line with best practices in the wastewater industry.




**Existing Biosolids Practices at the RWF**


## PMP Biosolids Recommendations

This current system is land intensive and has historically been one source of odors in the area. Because of these issues and because of the planned closure of Newby Island Landfill in 2025, the PMP recommended a new Biosolids Management Program involving a variety of enclosed, odor controlled treatment processes with the resulting treated biosolids used in a variety of off-site processing and beneficial reuse applications.

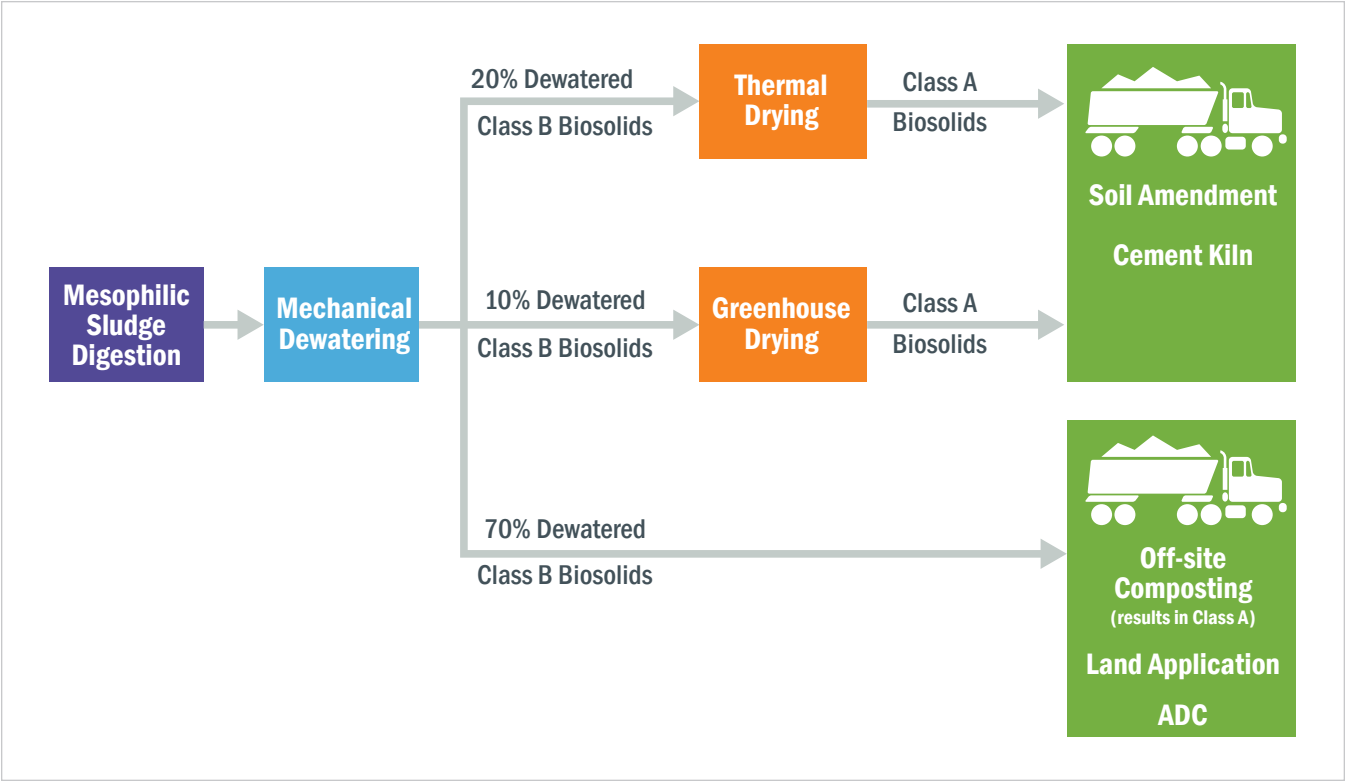
The PMP envisioned a program that produced a mix of Class A and Class B biosolids products. Specific PMP recommendations related to the future Biosolids Management Program included:

- Rehabilitation of the existing thickening facilities and mesophilic digesters and an evaluation of whether or not a different type of digestion process should be implemented.
- Mechanical dewatering for all biosolids in an enclosed, odor-controlled facility to concentrate digested biosolids which reduces the volume and weight of material requiring transport to off-site processing and beneficial re-use locations.
- Drying a portion of the dewatered biosolids using both thermal drying in an enclosed facility (20% of the biosolids) utilizing waste heat from a planned cogeneration facility and solar drying in enclosed green houses (10% of the biosolids).
- Decommissioning the existing open sludge lagoons and drying beds.
- Additional processing and beneficial re-use at off-site composting facilities, land application sites and landfills.

### Class A vs. Class B Biosolids

Class A and Class B designations for biosolids relate to the level of pathogen reduction in the end product. Class B biosolids are considered stabilized sufficiently to reduce odors and attraction of 'vectors' (flies, birds, and rodents) that could transmit pathogens and diseases resulting from contact with the material.

Management practices such as limiting crop type and preventing immediate public access to Class B application sites are considered protective of public health. Class A biosolids are essentially pathogen free. Risks associated with contacting or handling Class A biosolids are considered minimal so there are fewer restrictions on product use.




**Recommended Biosolids Management System: Plant Master Plan (PMP with Mesophilic Digestion)**

## Biosolids Transition Study

This Biosolids Transition Strategy Report addresses certain specific issues regarding implementation of the transition from the current biosolids management system to the PMP's recommended system considering changes that have occurred since the technical aspects of the PMP were developed. It includes both near-term and long-term recommendations for the Biosolids Transition Strategy, taking into consideration the goals identified in PMP. The Biosolids Transition Study focused on answering several key questions related to the transition including:

- Should San José change from its current practice of mesophilic digestion to a temperature phased anaerobic digestion (TPAD) process in order to optimize solids stabilization and increase biogas production?
- Should San José accelerate the on-line date for planned thermal drying and greenhouse drying facilities and add a blending facility to take maximum advantage of low disposition costs at Newby Island Landfill until it closes?
- Should San José focus on installing treatment processes to achieve Class B biosolids at this time while preserving the ability in the future to achieve Class A biosolids?
- Should San José preserve the potential for other on-site biosolids processing should it be warranted by future industry, market, and regulatory conditions?
- What areas should be reserved for biosolids processing facilities?
- Can the 2018 target date for ceasing discharge to the lagoons be met? And if not, what can be done about that?

# Evaluation Process

Development of the Biosolids Transition Strategy involved an in-depth evaluation covering five overall topics:

- **Background Investigations** including information gathering and technical reviews as well as site visits to help assess certain technologies and the practices of other utilities employing biosolids management systems like those recommended by the PMP.
- **Market Investigations** to assess issues such as the demand for Class A and dried biosolids, prices paid by other agencies for off-site processing and disposition, available market interest in providing off-site processing and beneficial reuse service, and interest in participating in the development of on-site facilities.
- **Evaluation of Alternatives** including development and screening of alternatives as well as Triple Bottom Line Plus and economic evaluation of the "short listed" alternatives.
- **Site Evaluations** to determine the preferred location or locations for biosolids facilities recommended in the PMP.
- **Project Delivery Evaluation** primarily focused on the potential for mobile dewatering or design-build delivery to accelerate the on-line date for the dewatering facility.

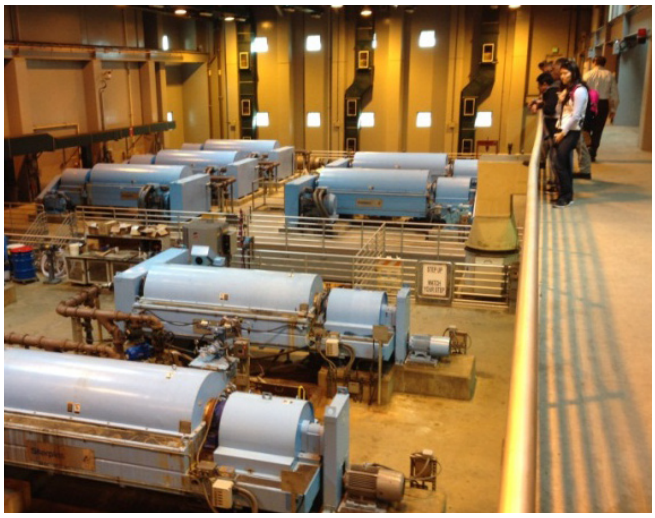
| Technical Study Summary of Findings | |
|---|---|
| **TM # 1 Biosolids Hauling and Disposition** | • Unit prices for offsite disposition are generally higher than the current Newby Island LF option.<br>• Land application and landfill disposal are approximately $35/ton; offsite composting is approximately $51/ton. |
| **TM # 2 Solids-Water-Energy Tool (SWET)** | • Alternatives that include thermal drying have a high annual energy cost, some of which can be avoided through heat recovery from cogeneration.<br>• TPAD and mesophilic digestion were comparable in cost.<br>• TPAD preserves the option for Class A digestion with the addition of batch tanks.<br>• Options involving 100% thermal drying and 100% composting were not recommended for further evaluation due to cost and lack of product diversification. |
| **TM # 3 Site Visits** | • Centrifuge dewatering – maintenance and operation require specialized training and initial tech support.<br>• Thermal drying has a very high operational cost.<br>• Disposition contract procurement should consider qualifications in addition to price. |
| **TM # 4 Sidestream Treatment** | • Sidestream treatment is feasible and will require about 43,000 sf.<br>• Pilot testing and additional modeling are recommended if it appears this will need to be implemented in the future. |
| **TM # 5 Request for Expressions of Interest** | • Numerous responses indicate a viable and competitive market for contract hauling and disposition of biosolids.<br>• Pricing submitted was somewhat higher than previous surveys therefore sensitivity analysis for disposition costs is recommended during the BCE analysis. |
| **TM # 6 Heat Recovery** | • High grade waste heat can be conveyed from the cogeneration facility to a thermal dryer using steam.<br>• If feasible, thermal drying should be located as close as possible to cogeneration to facilitate heat transfer.<br>• Approximately 18 percent of biosolids production could be dried with waste heat. |
| **TM # 7 Site Evaluation** | • Site A is recommended for near-term and longer-term biosolids processing facilities because it has sufficient space and environmental resources can generally be avoided, resulting in more streamlined CEQA and environmental permitting processes.<br>• Site C may be preferable for thermal drying due to proximity to the planned cogeneration facility, but has significant permitting uncertainty and jurisdiction issues that would need to be resolved. Permitting at this site would require significant time.<br>• Site B (within the WRF footprint) has limited space (could only accommodate dewatering) and was not recommended due to other constraints such as the need to demolish and relocate existing facilities, construction conflicts with other planned projects, and long-term traffic congestion. However, other potential sites for dewatering that are close to the digesters should be considered during design due to operational efficiency.<br>• Site D also entails significant permitting and jurisdictional uncertainty; reserving this site for any future sidestream treatment (which is unlikely to be required in the near term) is recommended. |
| **TM # 8 Business Case Evaluation (BCE)** | • TPAD and mesophilic digestion are comparable in life-cycle cost, but TPAD provides additional solids stabilization, enhances gas production, and preserves the option to upgrade to a Class A process if needed in the future.<br>• Alternatives with additional processing like thermal drying and solar drying are more costly.<br>• Accelerating the on-line dates of drying technologies and adding blending to take maximum advantage of low costs at Newby Island Landfill has a lower life-cycle cost than the Base Case (PMP) but benefits are highly sensitive to any delay.<br>• Focusing initial projects on TPAD and dewatering while deferring drying technologies can significantly reduce costs while achieving goals to decommission sludge lagoons and drying beds. Market feedback indicates end product diversification goals can be met through multiple biosolids disposition contracts. |

# Background Investigations

**Evaluation activities included facility tours as well as technical investigations of sidestream treatment and waste heat utilization in thermal drying.**

## Site Tours

Site tours of comparable facilities in the Bay Area, Southern California, and the Pacific Northwest offered the opportunity for staff and consultants to see process equipment first-hand and to discuss key features and issues with facility operators. Facility elements of particular interest included thermophilic digestion, temperature-phased anaerobic digestion (TPAD), centrifuge dewatering and thermal drying. Details are provided in TM#3.



Site Tour: Centrifuges at the San Deigo Metro Biosolids Center

## Sidestream Treatment

Mechanical dewatering results in a high strength side stream that requires treatment. Preliminary indications are that the RWF liquid stream treatment processes will have adequate capacity to handle this. However, future regulatory limits could make separate sidestream treatment a necessity. The consultant team assessed the space requirements for any future sidestream treatment facility based on the DEMON process – which is the most commonly used process at this time. If implemented, capital cost would be in the $35 million range and the system footprint would be approximately 43,000 square feet. If it begins to appear that sidestream treatment will be required, modifying existing aeration basins should be evaluated and pilot testing is recommended.

## Waste Heat Recovery

Waste heat recovery from the planned cogeneration system has long been considered as an energy source to reduce thermal drying cost at the RWF. The evaluation (TM#6) determined that high grade heat from engine exhaust would be best transferred as steam to a thermal drying system. Either a belt dryer system (convective heat) or paddle dryer (indirect heat) could be used in conjunction with waste heat recovery. The amount of recoverable heat was determined to be insufficient for drying 20% of biosolids production (only 16-18% of annual biosolids production could be dried), but would contribute significantly to reducing operating costs for alternatives that include thermal drying. Supplemental heat from natural gas could be used to make up the difference.

**Summary of Site Tours**

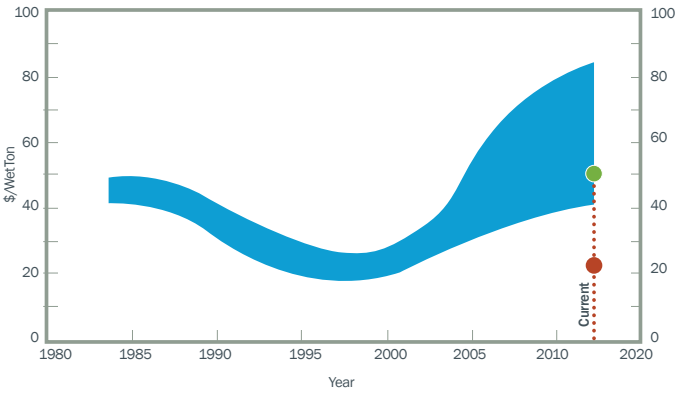
| Location | Feature | Lessons |
|---|---|---|
| **San Diego** | Transition from drying beds to centrifuge dewatering | Train in-house staff rather than rely on manufacturers for service<br>Avoid or minimize cake pumping |
| **City of Los Angeles** | Thermophilic digestion, centrifuge dewatering, nutrient removal pilot | Keeping biosolids hot was their key to maintaining Class A status |
| **Orange County Sanitation** | Mesophilic digestion with contract land application or composting | Issue RFPs for contract services rather than accept low bids to avoid problems in reuse program |
| **Green Acres Farm** | 5,000 acre farm in Kern County owned by the City of Los Angeles for biosolids land application | City-owned land provides a reliable land application option but subject to political and legal challenges |
| **South Kern Composting** | Contract operated aerated pile compost facility operated by Synagro | Composting is more expensive than land application due to extensive processing required, but produces a Class A product |
| **Sacramento Regional WWTP** | Thermal drying for 7300 dry tons of biosolids per year (contract operated) | Operating costs are very high and the facility will likely not be used when the current DBO contract expires |
| **Pierce County, WA** | Thermal drying for 2400 dry tons/year owner-operated), nutrient removal system | Agency is backing away from a retail product marketing effort because of administrative costs; dryer O&M costs also high |
| **City of Tacoma** | DAFT thickening, ATAD, soil manufacturing | Manufactured soil is successfully marketed by City staff at a net cost comparable to land application<br>Avoid centrifuge dewatering for this application due to physical properties |
| **King County** | Mesophilic digestion, 100% contract land application | Odor control performance in all process areas was remarkably good |

# Market Investigations

Market investigations included a review of literature and published surveys related to costs paid by Bay Area agencies for off-site processing and reuse of dewatered and dried biosolids products. A survey of biosolids disposition alternatives and cost was conducted as part of the original PMP effort; findings from the PMP review were comparable to a more recent market survey conducted by the San Francisco Public Utilities Commission. Options for biosolids disposition include land application (Class A or B) on agricultural land, landfill disposal and alternative daily cover, and contract composting. Past surveys showed that costs for biosolids disposition will likely increase significantly for the RWF. Newby Island Landfill currently charges $23/ wet ton, requires a minimum of 50% dry solids and may close by 2025. Unit costs for other biosolids disposition options ranged from $35 to $51/ wet ton.

The figure to the right illustrates trends and current costs for biosolids disposition. The red dot shows the current cost at Newby Island Landfill while the green dot shows the mid-range for other options. Unit costs and biosolids quantities were an important consideration for projecting future program operations costs.

Following this initial literature review, San José conducted its own market research by issuing a **Request for Expressions of Interest.** The Request asked potential service providers to answer a number of questions related to the types of off-site processing




**California Price Range for Class A/B Cake Trucking and Use/Disposal**

**Summary of Biosolids Market RFI Responses**

| Respondent | Proposed Technology | Technology Status | Type of Reuse | Acceptable Biosolids | Type of Contract | Disposition Cost [1] |
|---|---|---|---|---|---|---|
| **CH2M HILL** | Thermal Drying | Proven | Pelletized Fuel<br>Soil Enhancement/Fertilizer | Class A or B | N/A | N/A |
| **NEFCO** | Thermal Drying | Proven | Pelletized Fuel<br>Fertilizer | Class A or B | Service & Disposition | $60-$70 |
| **USG** | Belt Dryer | Proven | Alternative Fuel<br>Land Application | Class A or B | Service only | $30-$50 |
| **Liberty** | Composting | Proven | Compost | Class A or B | Service & Disposition | $20-$30 |
| **Synagro** | Land Application<br>Composting | Proven | Land Application<br>Compost<br>ADC | Class A or B | Service & Disposition | $30-$40 |
| **Terra Renewal** | Land Application<br>Composting | Proven | Land Application<br>ADC | Class A or B | Service & Disposition | $20-$30 |
| **Degremont** | N/A | | N/A | Class A or B | N/A | N/A |
| **Lystec** | Hydrolysis<br>Land Application | Emerging | Liquid Fertilizer for Land Application | Class A or B | Service & Disposition | $50-$60 |
| **VitAg** | Fertilizer | Emerging | Class A Fertilizer | Class A or B | Service & Disposition | $20-$60 |
| **Biogas Equity 2** | Gasification | Non-Commercial<br>Proven | Syngas | Class A or B | Service & Disposition | N/A |
| **Gate 5 Energy** | Dryer Combustion<br>Energy Recovery | Non-Commercial<br>Proven | Renewable Electricity | Class A or B | Service & Disposition | $40-$85 |

***Notes:*** *1. Disposition cost is per wet ton based on 25% solids. Transportation is not included in the disposition cost.*

and re-use services they could provide, the typical costs for providing such services, the number of permitted sites available, and the types of contract terms that they would require. The Request also asked potential service providers to describe on- and off-site biosolids processing facilities that they would be willing or interested in providing or helping to develop. The majority of responses were for proven technologies with useful information about service providers and potential contract features. Results included:

- Multiple providers who were interested in providing off-site processing and disposition. A 5-year minimum contract term appeared agreeable to these providers.
- Reported costs for off-site processing and disposition were somewhat higher than previously assumed in the PMP and than shown in the SPFUC survey, although this would ultimately depend on market conditions and competition. As a result, it was recommended that the evaluation of alternatives consider sensitivity cases with higher disposition costs .
- Multiple providers indicated interest in dryer and dewatering under a design-build-operate type arrangement.
- Some emerging but promising technologies were identified in the responses, indicating that options for processing may increase in the future .

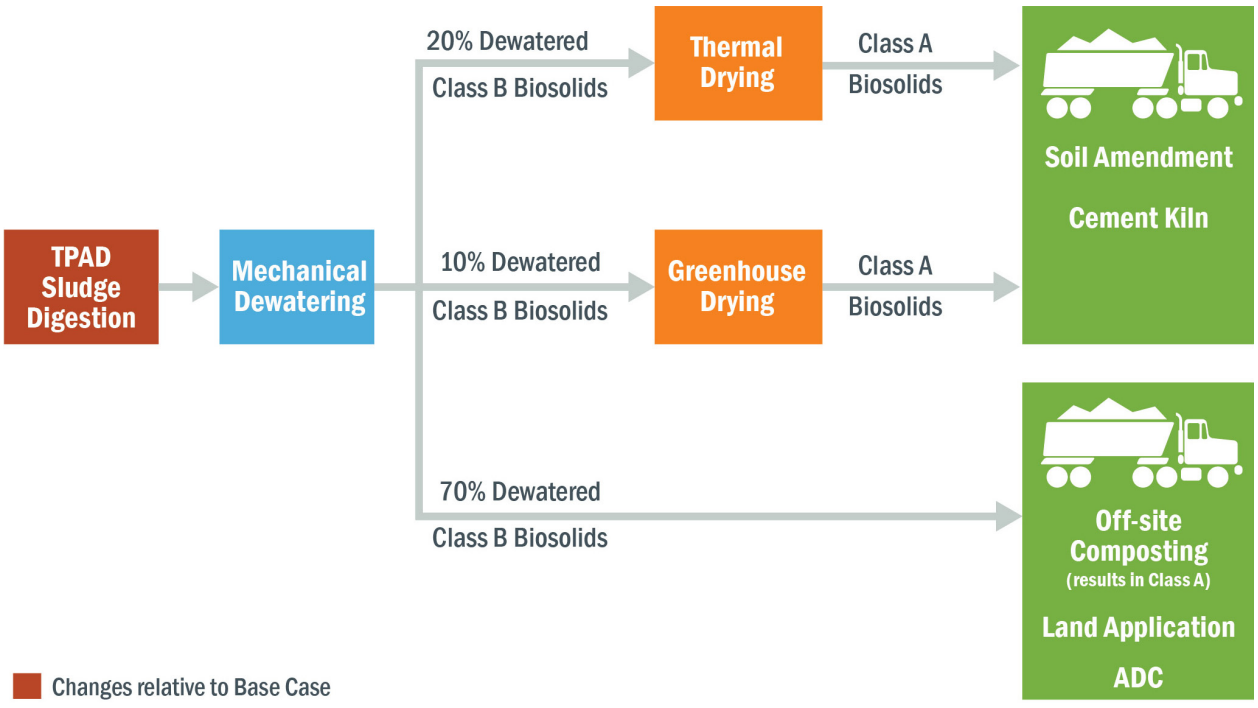
# Evaluation of Alternatives

The evaluation of alternatives entailed a two-step process. First, the Solids-Water-Energy Tool (SWET) model was used to help screen out less favorable alternatives. For example, based on the SWET analysis, alternatives involving 100% thermal drying and 100% composting were eliminated.

Team workshops were then conducted to select and refine three alternatives for comparison against the recommendations in the PMP. The alternatives were developed considering the PMP's objective of providing a cost-effective program with diverse outlets for biosolids and included:

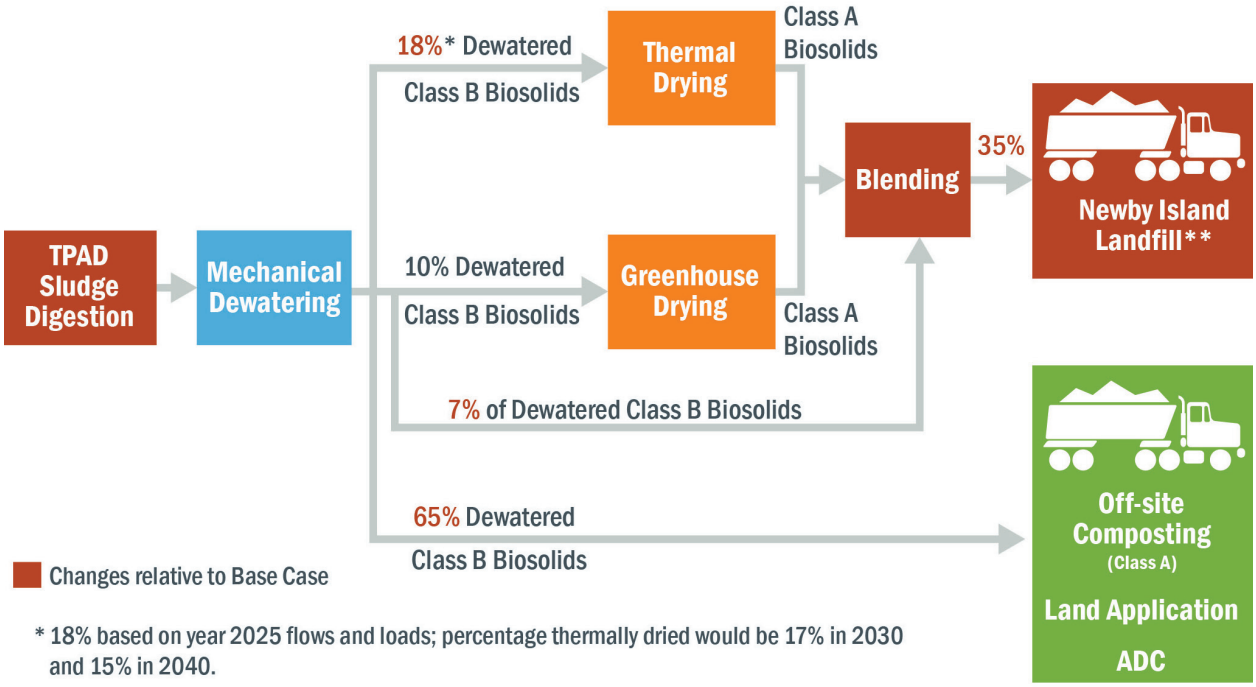
### Alternative 1: Modified Base Case with TPAD

**20% thermal drying, 10% solar drying and TPAD digestion to improve solids stabilization and increase gas production.**



## Alternative 2: Base Case with a Blending Option

Accelerated on-line date for drying technologies, smaller thermal dryer, and added blending facility to allow dried biosolids to be blended with dewatered biosolids in order to maximize benefits of low disposition costs at Newby Island Landfill until it closes in 2025.

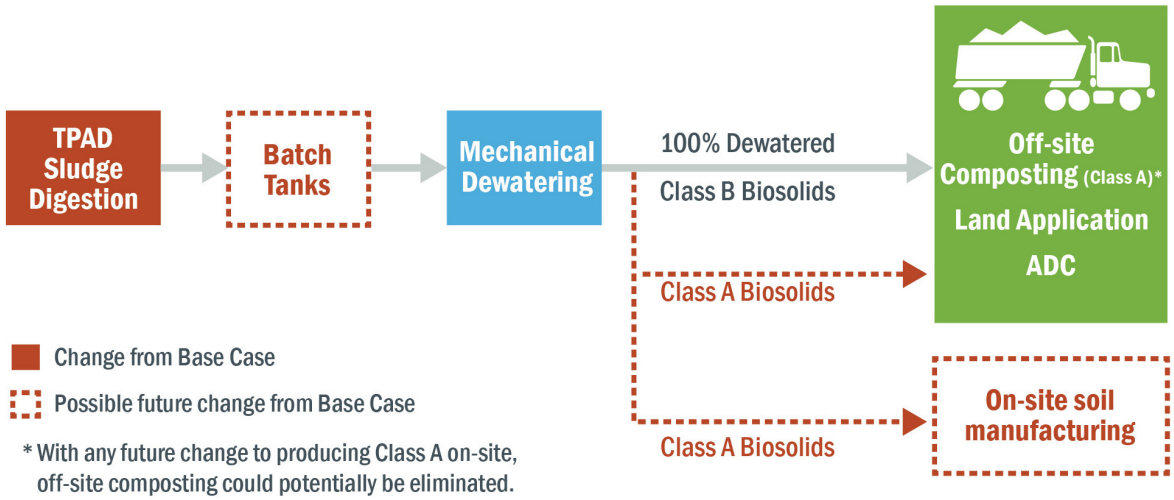



* 18% based on year 2025 flows and loads; percentage thermally dried would be 17% in 2030 and 15% in 2040.

** Newby Landfill scheduled to close 2025. After 2025, material from thermal and greenhouse drying would be suitable for Class A soil amendment.

## Alternative 3: TPAD with Future Batch Tanks

Limit facilities to TPAD and mechanical dewatering while providing future flexibility to achieve Class A biosolids through the addition of batch tanks.




* With any future change to producing Class A on-site, off-site composting could potentially be eliminated.

The alternatives were then reviewed and refined in a series of comprehensive and interactive workshops which involved program management, engineering and O&M staff. Alternatives were evaluated in terms of economic considerations and a Triple Bottom Line Plus (TBL+) evaluation that also considered non-economic factors. Results for each alternative include a TBL+ "Performance Score" and a "Value Score."

The final BCE results for each alternative are summarized in the tables below. Details of the economic and TBL+ evaluations as well as sensitivity tests are provided in TM 8, which describes the BCE for alternatives developed in this study.

| Triple Bottom Line Plus Criteria | |
|---|---|
| **Category** | **Criteria** |
| **O&M and Safety** | Process Reliability |
| | Flexibility and Simplicity |
| | Safety |
| | Regulatory Risk/Adaptability |
| **Social** | Visual, Noise and Odor Impacts |
| | Public Acceptability and Policy |
| **Economic** | Percent Value Life Cycle Costs |
| | Rate Impact |
| | Cost/Schedule Uncertainty |
| **Environmental** | Environmental Footprint and Sustainability |
| | Beneficial Use: In-plant, Energy, or End Products |

**Alternative 1 (Modified Base Case with TPAD)** had TBL+ Performance and Value Scores that were comparable to the Base Case. Present Value Life Cycle Costs (PV LCC) were also equivalent. These results suggested that TPAD is comparable to mesophilic digestion. TPAD is recommended because it also provides a pathway to Class A biosolids via future addition of batch tanks, and because it results in enhanced solids stabilization and biogas production.

| Parameter | Base Case: PMP with Mesophilic Digestion | Alternative 1: Modified Base Case with TPAD |
|---|---|---|
| **PV Life Cycle Cost** | $520 M | $520 M |
| **Capital Cost** | $298 M | $306 M |
| **O&M Cost** | $14.5 M | $14.1 M |
| **TBL+ Performance Score** | 5.3 | 5.4 |
| **Value Score** | 0.12 | 0.12 |

**Alternative 2 (Base Case with a Blending Option)** had a higher TBL+ Performance and Value Scores than the Base Case and would result in PV LCC savings. However, any potential savings would be highly schedule-dependent and there was substantial risk that this alternative could not be implemented soon enough to capture all savings.

| Parameter | Base Case: PMP with Mesophilic Digestion | Alternative 2: Base Case with a Blending Option |
|---|---|---|
| **PV Life Cycle Costs** | $520 M | $490 M |
| **Capital Cost** | $298 M | $270 M |
| **O&M Cost** | $14.5 M | $14.1 M |
| **TBL+ Performance Score** | 5.3 | 6.3 |
| **Value Score** | 0.12 | 0.14 |

**Alternative 3 (TPAD with Future Batch Tanks)** showed significantly higher TBL+ Performance and Value Scores compared with the Base Case, as well as substantial PV LCC savings ($140 M). Product diversity goals with this alternative would be met through multiple biosolids disposition contracts including off-site composting (Class A product), land application, and landfill disposal or ADC. Choosing Alternative 3 keeps options open for future process additions including Class A batch tanks, soil blending, partial thermal drying, and partial solar drying.

| Parameter | Base Case: PMP with Mesophilic Digestion | Alternative 3: TPAD with Flexibility for Future Batch Tanks |
|---|---|---|
| **PV Life Cycle Costs** | $520 M | $380 M |
| **Capital Cost** | $298 M | $166 M |
| **O&M Cost** | $14.5 M | $12.3 M |
| **TBL Score** | 5.3 | 8.5 |
| **Value Score** | 0.12 | 0.20 |

If batch tanks were installed in the future, PV LCC for Alternative 3 would increase by $10 M. If a soil manufacturing facility was also installed, PV LCC would be the same as if only batch tanks were installed. This is because the additional capital costs of soil manufacturing would be off-set by savings in disposition costs and by the revenue generated from the sale of manufactured soil. If manufactured soil was "given away" rather than sold, PV LCC for Alternative 3 would increase by $30 million.

| Parameter | Alternative 3 if Batch Tanks Added in Future | Alternative 3 if Soil Manufacturing also Added in Future | Alternative 3 if Soil Manufacturing also Added in Future but no Revenue from Sale of Soil |
|---|---|---|---|
| **PV Life Cycle Cost** | $390 M | $390 M | $410 M |
| **Capital Cost** | $181 M | $209 M | $209 M |
| **O&M Cost** | $11.9 M | $10.5 M | $11.7 M |

Based on the comparisons included in the evaluation of alternatives, proceeding with TPAD and dewatering is recommended at this time with use of a variety of disposition contracts to achieve the PMP's diversification goals. Installation of additional on-site processing facilities to achieve Class A biosolids should be deferred pending market or regulatory need for Class A biosolids. Multiple disposition contracts need to be developed, negotiated, procured and potentially renewed to meet the PMP multiple end product and contract diversification goals. This will require 1 FTE to develop and procure contracts and to monitor performance over the long run. Because these contracts will need to be integrated with other biosolids management facilities, operations, and programs, we recommend that the City establish a biosolids management team (BMT) to prepare and manage the disposition contracts. In addition, the BMT will monitor and track future conditions to enable the RWF to respond to changing regulatory and market changes and emerging technologies.

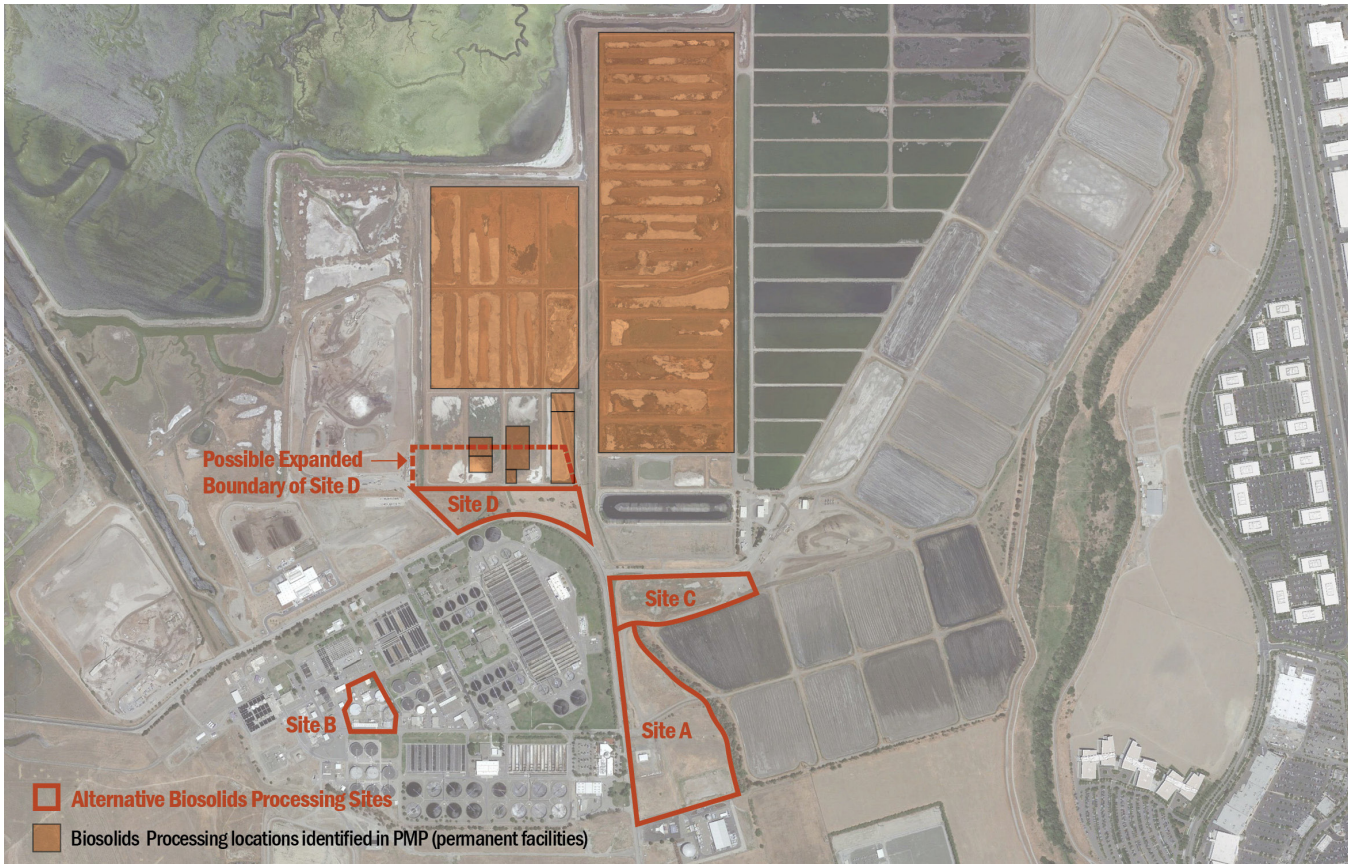
## Site Evaluations

The Biosolids Transition Study also included a review of four potential new sites for locating biosolids processing facilities since CEQA review of the locations recommended in the PMP revealed significant environmental permitting challenges at those locations.

The site evaluation considered a number of factors including the ability of sites to accommodate various biosolids processing facilities, efficiency of operations as indicated by proximity to related facilities, conflicts with existing facilities and utilities, access and traffic issues, and environmental / permitting limitations.

The evaluation identified **Site A** as the preferred site to be reserved for near-term and potential future biosolids processing facilities because it has sufficient space, and environmental resources can generally be avoided at this location.

**Site C** was identified as a potentially preferred location for any future thermal drying facility due to its relative proximity to the planned cogeneration facility, unless future design.



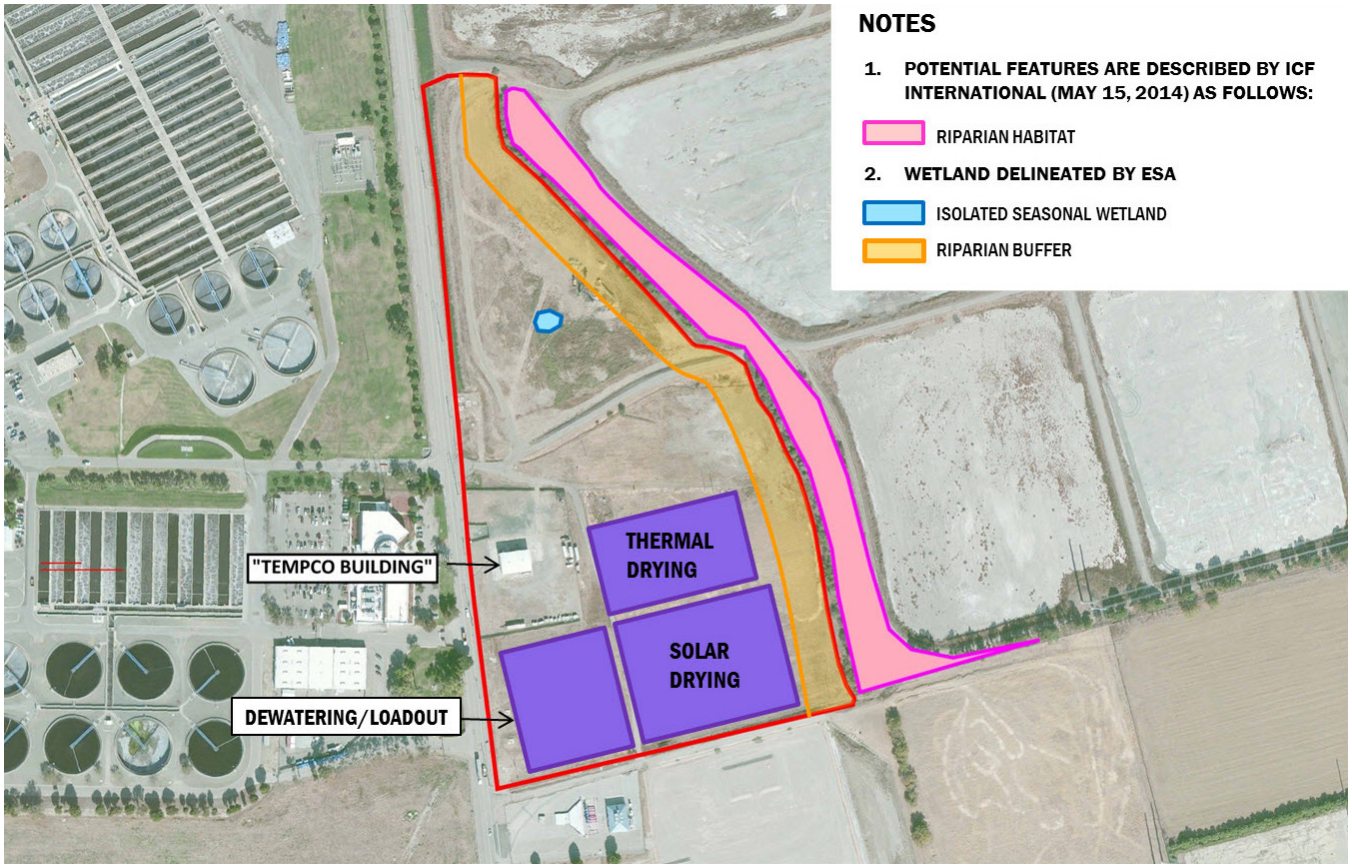

**Alternative Sites Evaluated as Part of Biosolids Transition Study**


Site Evaluation Criteria

work concludes that there would be sufficient space immediately adjacent to cogeneration. However, there is considerable uncertainty at Site C with respect to permitting jurisdiction and wetlands. These issues would need to be resolved before this site could be definitively selected, which would take considerable time. Therefore, we recommend initiating actions to resolve these issues well before final site selection for thermal drying.

Site D has similar issues to Site C; therefore Site D is recommended for future sidestream treatment since that facility, if ever needed, would be required over a much longer time frame.

Site B would only have sufficient space for dewatering and was not recommended due to other constraints such as the need to demolish and relocate existing facilities, construction conflicts with other planned projects, and long-term traffic congestion. However, other potential sites for dewatering that are close to the digesters, if available, should be considered during design due to the potential to enhance operational efficiency, reduce pipeline length, and mitigate deposition of struvite within the pipeline.




Site A: Preferred Location for Future Biosolids Processing Facilities

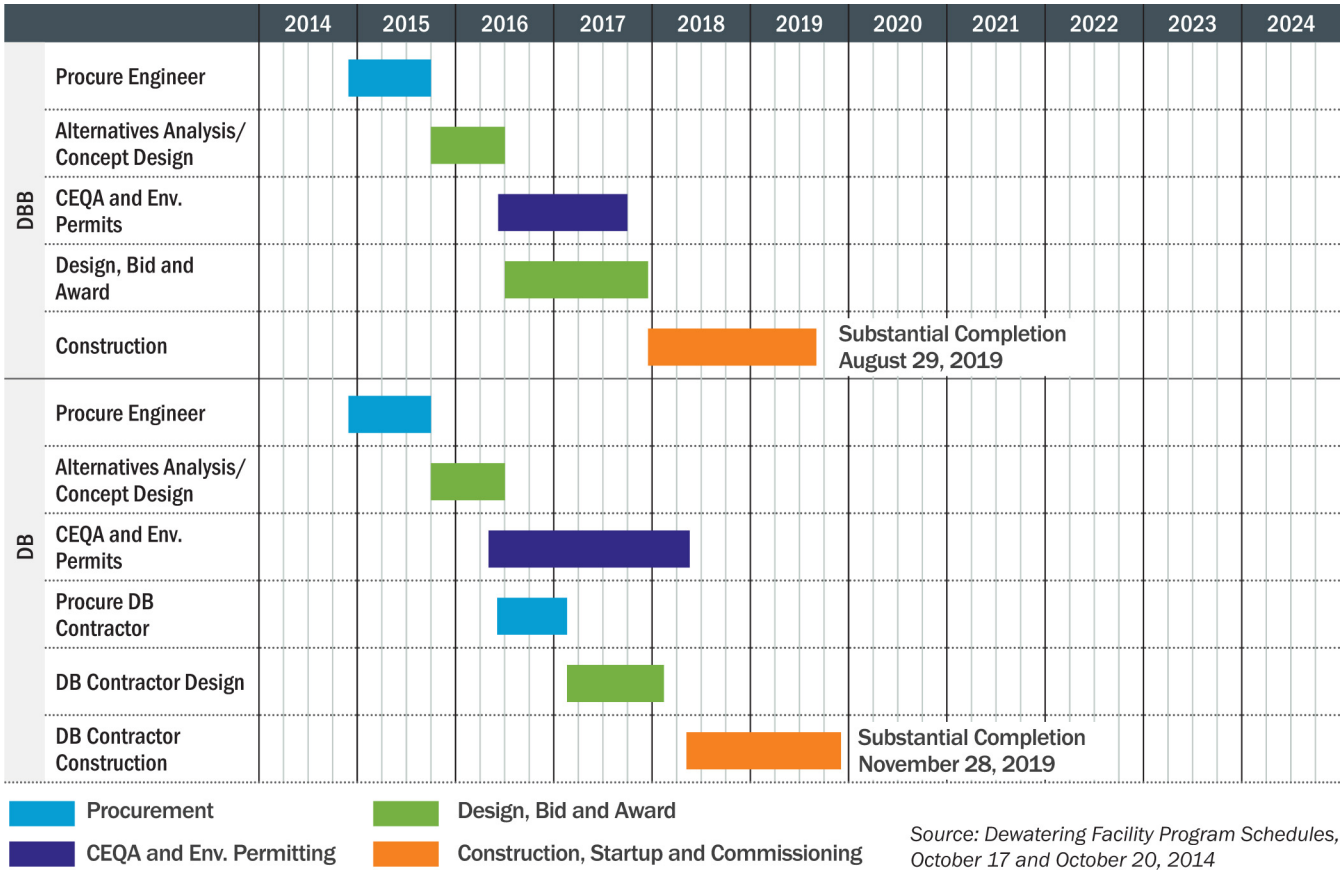
# Implementation and Project Delivery

The current program schedule shows dewatering expected to be on-line in 2019, resulting in a delay for ceasing discharge to the lagoons. Mobile dewatering could be used prior to the on-line date for a permanent dewatering facility. Preliminary discussions with potential vendors indicate such a system could be mobilized within 3 to 6 months following procurement and selection, but the overall time required could be 2 to 3 years including procurement, contract negotiation, mobilization, and installation of temporary piping and power. Further, mobile dewatering would be expensive (approximately $14M per year). It would involve vendor costs, costs for support facilities, and increased disposition costs because dewatered material would not meet the minimum requirements for use of Newby Island Landfill. In addition, mobile dewatering would not be equipped with odor control and may be subject to some of the same environmental permitting challenges affecting permanent facilities.

Alternative project delivery methods (specifically fixed price and progressive Design-Build) were also evaluated in terms of their ability to accelerate the project schedule and provide other benefits.

However, based on currently available schedule information developed by the program, Design-Build appears unlikely to accelerate the on-line date for a permanent dewatering facility. While a final decision on project delivery method will occur during conceptual design of the dewatering facility, further schedule analysis should consider the potential to select a Design-Build contractor at an earlier stage. Early procurement of equipment and paralleling design and construction potentially could also help accelerate the schedule.


**Potential Benefits of DB Delivery**




*Source: Dewatering Facility Program Schedules, October 17 and October 20, 2014*

**Design-Bid-Build vs. Design-Build Schedules**

# Conclusions and Recommendations

## Summary of Conclusions for Biosolids Transition Study

- There is no immediate driver for Class A or thermally dried biosolids.
- Deferring thermal drying results in substantial PV LCC savings.
- TPAD provides a future cost effective path to Class A biosolids via batch tanks; diversification can be achieved through service contracts.
- Site A provides sufficient space for dewatering and future biosolids processing facilities; Site C would be a candidate for future thermal drying due to proximity to cogeneration unless it can be demonstrated during design that there was sufficient space adjacent to the cogeneration facility.
- Based on the current program schedule, permanent dewatering appears unlikely to be on line by 2018 regardless of delivery method. To meet the target date of 2018, one of the options that could be considered would be mobile dewatering; however, this option is expensive, may not mitigate odor issues, and may be subject to permitting uncertainties.
- RFI responses confirm biosolids disposition availability in the Bay Area, with interest in short-term as well as long-term contracts.
- Sidestream treatment is feasible and can fit within the footprint of Site D.
- Waste heat recovery from the cogen facility is suitable for drying between 16 and 18 percent of the facility's annual biosolids production. A belt dryer or indirect dryer (such as a paddle dryer) would be required for practical use of waste heat for thermal drying. Locating the thermal dryer as close as possible to the cogen facility is recommended to reduce the risks associated with conveying high grade heat.

## Biosolids Transition Strategy: Near-Term Recommendations

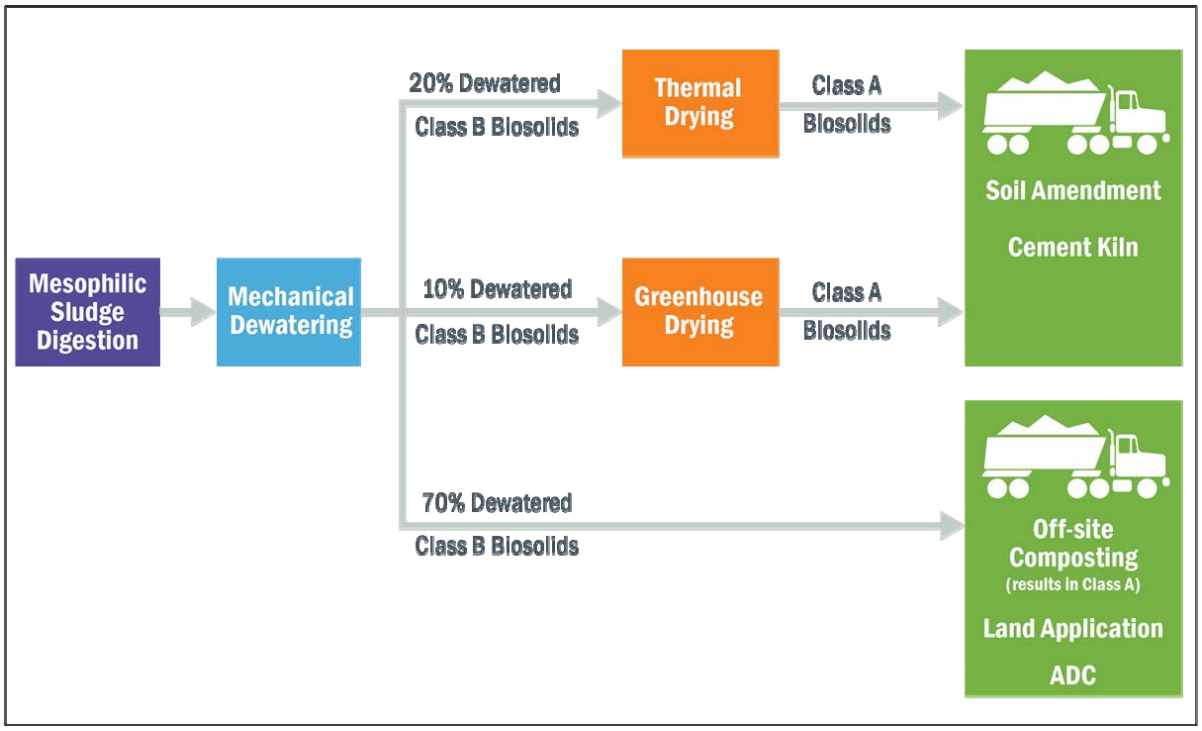
- Proceed with TPAD digestion followed by mechanical dewatering (Alternative 3) at this time and defer a decision on the best way to achieve Class A biosolids to a later date since there is no imminent need for Class A biosolids at this time.
- Defer thermal drying and greenhouse drying at this time for substantial cost savings.
- Further evaluate the potential for DB delivery to accelerate the dewatering on-line date specifically considering the potential to select the DB contractor at an earlier date, procure equipment earlier, and parallel design and construction activities.
- Consider provisions for 1-year O&M training and support for the biosolids dewatering facility.
- Locate dewatering facility at Site A unless further evaluation during conceptual design identifies a suitable location within the plant fence line.
  - Reserve Site A for future biosolids processing facilities.
  - Provide a safe means for O&M staff to access the a mobile dewatering facility at Site A if a suitable site within the fence line is not identified during conceptual design.
  - Reserve Site C for any future thermal drying facility.
  - Initiate resolution of jurisdictional issues at Site C.
- Investigate environmental and permitting issues associated with support facilities for mobile dewatering so that it can be used as a backup strategy in the event of significant delays in bringing a permanent dewatering facility on-line.
- Establish a biosolids management team (BMT) to begin developing and negotiating a diverse portfolio of disposition contracts in terms of end uses, qualified service providers, contract terms, and procurement, and to monitor market, and technology developments. The BMT should consist of one FTE dedicated to the development and management of disposition contracts as well as other participants including the overall biosolids program manager and representatives from operations and maintenance.

## Biosolids Transition Strategy: Long-Term Recommendations

- Implement an adaptive management approach with the BMT:
  - Tracking changing industry, regulatory, market and land use conditions, and conducts market research.
  - Conducting market research to better determine local demand and price for end products such as manufactured soil and dried biosolids.
- Implement additional future on-site processing facilities considering conditions at the time.
  - Start small with pilots, demonstrations, and phasing.
  - Potentially participate in regional facilities and emerging technologies.
- Through the BMT or designated biosolids contract manager, proactively oversee contract operations to ensure regulatory and contract compliance.

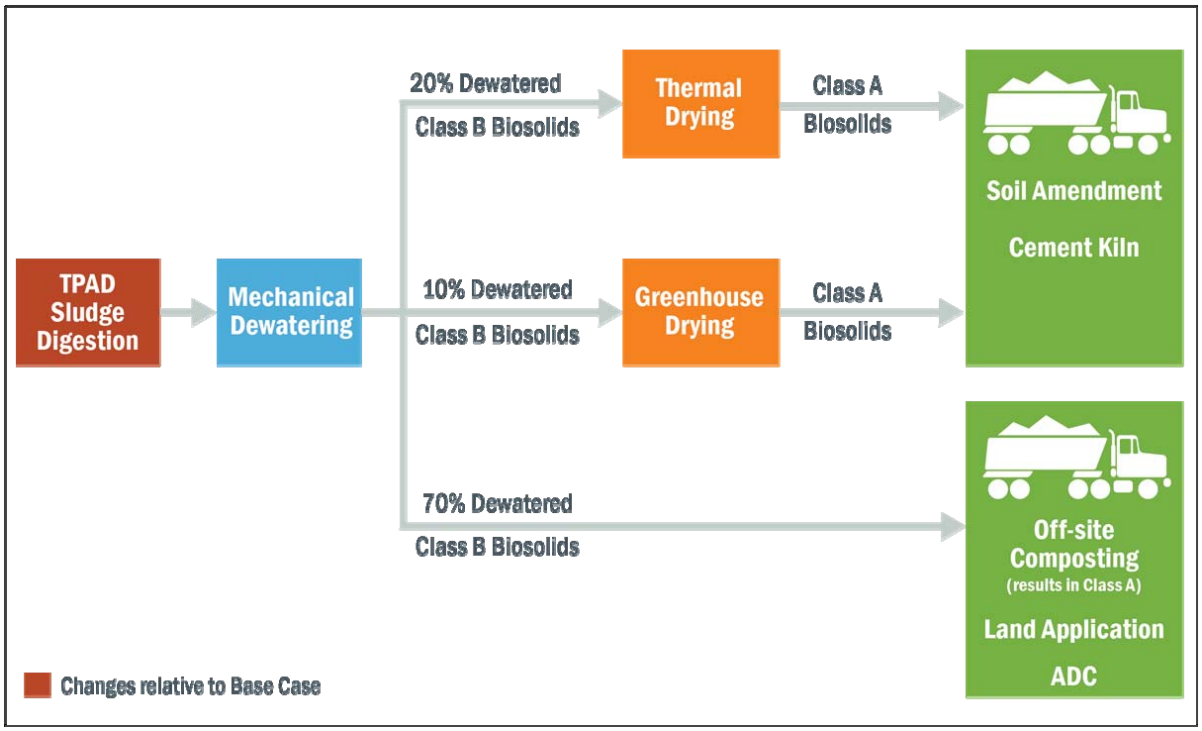
**Attachment 3**

**Figure 1: PMP Base Case with Mesophilic Digestion**



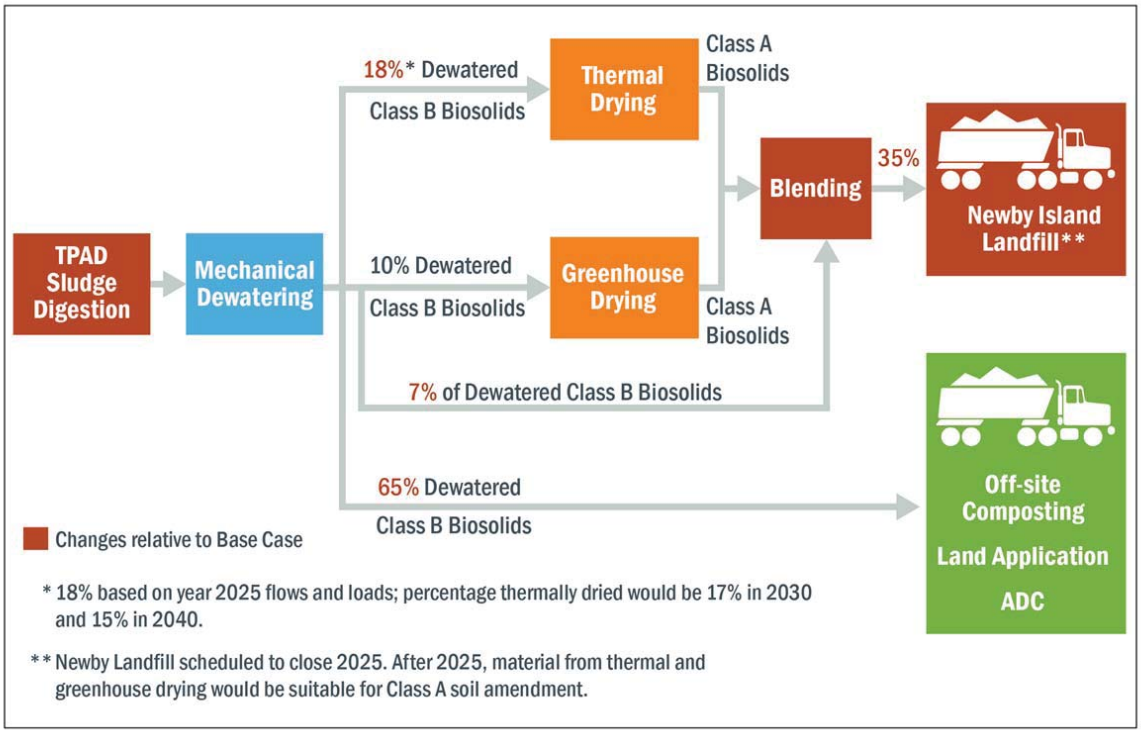
**Attachment 4**

**Figure 2: Alternative 1 – Modified PMP Base Case with TPAD**



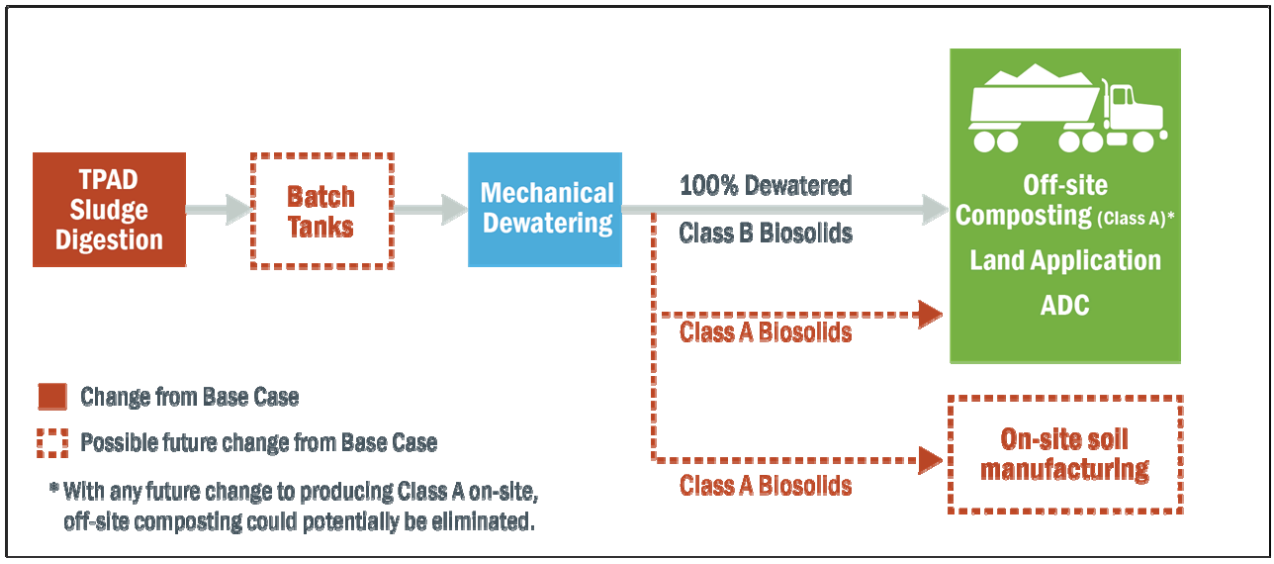
**Attachment 5**

**Figure 3: Alternative 2 – PMP Base Case with a Blending Option**



**Attachment 6**

**Figure 4: Alternative 3 – TPAD with Future Batch Tanks**



## Attachment 7

**Figure 5: PMP Biosolids Facility Locations and Alternative Sites**

**Attachment 8**

**Figure 6: Preliminary Biosolids Processing Facility Layout at Site A**