City of St. Joseph, Missouri

Facilities Plan

Technical Memorandum No. TM-WW-6

Biosolids Facilities

By

Work Order No. 09-001
B&V Project 163509

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Table of Contents

Tables

Figures

Biosolids Facilities

1.0 Executive Summary

The City of St. Joseph, Missouri (City) is developing a Facilities Plan to determine necessary improvements at the Water Protection Facility (WPF) to meet future treatment needs. As part of the overall evaluation, the current capacity of the existing WPF was analyzed. This technical memorandum (TM) discusses the capacity of the solids treatment facilities, including the following processes:

- Dissolved Air Flotation (DAF) Thickening
- Anaerobic Digestion (Thermophilic/Mesophilic System)
- Belt Filter Press (BFP) Dewatering

Future design conditions, as presented in TM-WW-4 – Nutrient Removal Facilities, were used to determine the capacity of the existing solids treatment equipment based on the original design parameters for each treatment process. Design flows from TM-WW-4 were used to calculate the solids quantities presented in Table ES-1. As shown in the table, two scenarios were evaluated. “Combined Influent Wastewater” would treat both municipal and wholesale industrial wastewater in the same liquid treatment process while “Separate Activated Sludge Systems” would provide separate liquid stream treatment for the municipal and wholesale industrial wastewater customers. Regardless of scenario, all solids generated through liquid stream treatment would be processed through the existing solids treatment equipment.

Table ES-1 includes both the projected solids production with and without chemical phosphorus removal. As the impact of chemical phosphorus removal results in a minimal increase in total dry solids, the production numbers without chemical phosphorus removal were used in this evaluation. Reduction in nutrient loading to the WPF might also allow biological phosphorus removal to be considered in lieu of chemical phosphorus removal.

Table ES-1 Projected Solids Production					
	Units	Combined Influent Wastewater		Separate Activated Sludge Systems	
		Maximum Month	Annual Average	Maximum Month	Annual Average
Plant Influent Flow	mgd	34.2	20.4	34.2	20.4
Primary Sludge					
Flow	mgd	0.14	0.08	0.14	0.08
Total Solids	%	2.70	2.70	2.70	2.70
Volatile Solids	%	60.0	71.0	60.0	71.0
Dry Solids	ppd	30,410	18,760	30,520	18,980
WAS (without chemical phosphorus removal)					
Flow	mgd	0.42	0.43	0.38	0.37
Total Solids	%	0.82	0.39	0.92	0.44
Volatile Solids	%	82.0	82.0	78.0	78.0
Dry Solids	ppd	28,840	13,980	29,040	13,560
Total Dry Solids (without chemical phosphorus removal)	ppd	59,250	32,740	59,560	32,540
WAS (with chemical phosphorus removal)					
Flow	mgd	0.48	0.51	0.42	0.43
Total Solids	%	0.82	0.39	0.92	0.44
Volatile Solids	%	68.0	68.0	68.0	68.0
Dry Solids	ppd	33,100	16,450	32,060	15,830
Total Dry Solids (with chemical phosphorus removal)	ppd	63,510	35,210	62,580	34,810

Existing equipment capacities as presented in the 2003 Design Memorandum for the Wastewater Treatment Plant Improvements project (Camp Dresser & McKee, Inc. (CDM), Delich Roth & Goodwillie, P.A. (DRG), and Snyder & Associates) are shown in Table ES-2. Since construction of these improvements, the thermophilic digestion process has been modified to use two thermophilic digesters in series with Digester No. 3, originally a mesophilic digester, converted to a thermophilic digester. This operational change is reflected in Table ES-2.

Table ES-2
Existing Equipment Capacities

Treatment Process	Value
Dissolved Air Flotation[1]	
Number of units	2
Design solids loading rate (each), ppd	80,640
Surface area (each), sf	1,680
Design solids loading rate, pph/sf	2
Hydraulic capacity (total), mgd	5.7
Feed solids concentration, %	0.5
Blend/Surge Tank	
Number of units	1
Volume (total), cf	5,380
Thermophilic Digesters	
Number of units (operated in series)	2
Active volume thermophilic digester (excluding cone), cf	258,000
Active volume Digester No. 3 (excluding cone), cf [2]	155,000
Design flow, mgd	0.191
Design volatile solids load, ppd	40,590
Design solids retention time thermophilic digester, days	10 [3]
Design solids retention time Digester No. 3, days	6 [3]
Mesophilic Primary Digesters	
Number of units	2 [4]
Active volume per tank (excluding cone), cf	155,000
Design solids retention time per tank, days	6 [2]
Two-tank design solids retention time, days	12 [3]
Integrated Digestion System (thermo + meso)	
Design volatile solids destruction, %	55 – 65
Secondary Digester	
Number of units	1
Active volume per tank (excluding cone), cf	155,000
Belt Filter Press	
Design solids loading rate, pph/meter	1,100
Design cake solids, % total solids	25
Operating schedule	
Days per week	3 to 4
Hours per day	6

1. Original DAF equipment has been replaced with EDUR pumped mix units.
2. Original design considered one thermophilic digester, three mesophilic digesters, and one spare/holding digester. Current operation is with two thermophilic digesters and one mesophilic digester.
3. Not identified in design documents. Value calculated by Black &Veatch.
4. Three mesophilic digesters are available; only one is currently in operation. One of the two units currently out of service is considered to be a secondary digester.

The capacity of the existing equipment plus the planned future additional BFP (budgeted for fiscal year 2013) was compared to the projected solids quantities at future conditions. The DAF thickening, thermophilic digestion, and BFP dewatering processes appear to have adequate capacity for the projected solids production, allowing for one spare DAF at annual average and maximum month conditions and one spare BFP at annual average conditions (three BFPs would be required at maximum month conditions). Based on two mesophilic tanks in service, the existing system cannot meet the original 18 day mesophilic solids retention time (SRT) as indicated in the 2003 CDM Design Memorandum at future conditions. However, with the current digester operating configuration, the actual mesophilic detention requirement may be less than the original 18 days. Total digestion SRT (thermophilic and mesophilic) is 24 days.

Several factors that impact the capacity of the digestion process include the primary and waste activated solids concentration and primary and secondary volatile solids. Part of the combined sewer overflow (CSO) control program will result in stormwater separation of two of the main wastewater collection system interceptors that contribute flow and inert material to the WPF. This separation will result in a change to volatile content of the primary solids. The exact impact of these changes cannot be fully determined at this time. This evaluation has been conducted using the lowest average historical primary solids concentration. Additional sampling will need to be completed as improvements are made to the wastewater collection system to confirm the primary volatile solids concentration. In addition, the City is working with both wholesale and other industrial users to reduce the flows and loads discharged to the WPF. Additional testing will need to be completed over time to verify the volatile content of the waste activated sludge as well.

A graphical comparison of process capacity and projected solids loadings (in terms of plant influent flow) is shown in Figure ES-1. As recommended in TM-WW-4 – Nutrient Removal Facilities, the City should continue to work with the wholesale industrial users to reduce loadings as well as conduct additional monitoring to verify future ammonia and nitrogen loadings as improvements are made at the WPF.

The capacity of the mesophilic digestion process is based on three tanks in service and the capacity of the belt filter press dewatering is based on three presses operating 5 days per week, 8 hours per day. Capacities for polymer equipment, pumps, equalization volumes, gas conveyance, heating and heat exchangers, and other ancillary equipment were assumed to match the capacities of the major process equipment and were not analyzed separately.

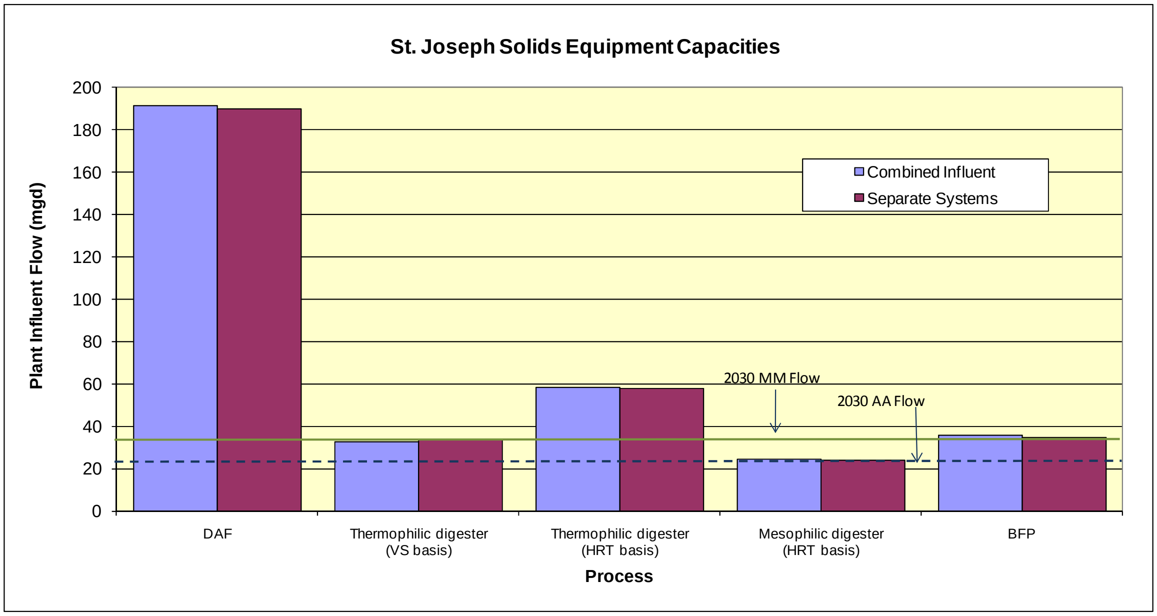


Figure ES-1 – Existing Solids Process Capacity as Function of Plant Influent Flow

2.0 Purpose of Technical Memorandum

The City of St. Joseph is developing a Facilities Plan to determine necessary improvements at the WPF to meet future treatment needs. As part of the overall evaluation, the current capacity of the existing WPF was analyzed. This technical memorandum addresses the capacity of the existing biosolids equipment at the St. Joseph WPF and identifies any capacity-based limitations.

3.0 Introduction

An evaluation of the liquid treatment process is presented in TM-WW-4 – Nutrient Removal Facilities. Projected solids productions through the year 2030 were used to evaluate plant capacity based on retaining the current biosolids treatment processes. This memorandum is limited to solids treatment at the St. Joseph WPF, and no external use, disposal, or application is considered outside of the plant's boundaries.

The information sources used for this evaluation include:

- Operations data for 2005 through August 2009. Data include primary solids (PS) and thickened waste activated sludge (TWAS) flow and total solids (TS) and volatile solids (VS) concentrations.
- 2003 Design Memorandum for Wastewater Treatment Plant Improvements (CDM, DRG, and Snyder & Associates).

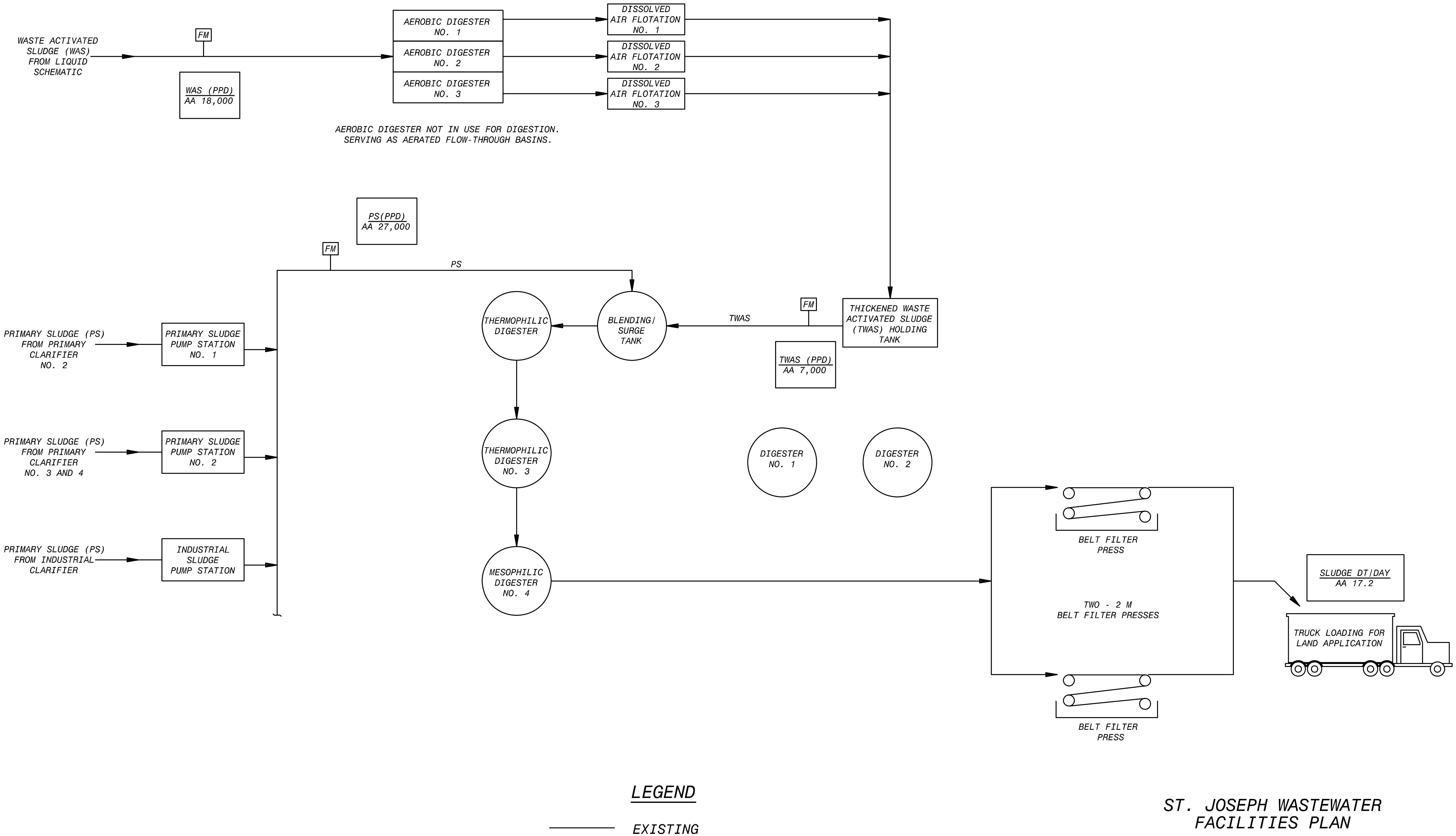
4.0 Current Conditions

An evaluation of the current conditions and solids process performance was conducted based on historical plant data. The following sections summarize this evaluation.

4.1 Existing Equipment and Facilities

The solids treatment process at the St. Joseph WPF is presented in Figure 1. Sludge and scum collected in the primary clarifiers are pumped by the primary sludge pumps to the blending/surge tank. The waste activated sludge (WAS) is pumped from the final clarifiers to the aerobic digesters using the return sludge pumps. The aerobic digesters are not currently used for digestion; instead, they serve as aerated storage basins. The WAS is pumped from the aerobic digesters to the three DAF units for thickening. The TWAS from the DAF is pumped to the blending/surge tank where it is mixed with the primary sludge.

The anaerobic digestion process consists of three tanks in series using a continuous process. Since construction of the thermophilic digester under the CDM project, the anaerobic digestion process has been modified by converting the first mesophilic digester (Digester No. 3) to thermophilic operation resulting in a two-stage thermophilic system. The combined solids are fed to the first thermophilic anaerobic digester which operates at 131.5° F. The second thermophilic digester (Digester No. 3)



ST. JOSEPH WASTEWATER FACILITIES PLAN

EXISTING SOLIDS SCHEMATIC
WATER PROTECTION FACILITY

BLACK & VEATCH
2010

FIGURE 1

BLACK & VEATCH Building a world of difference.

operates at a temperature of 122° F. The solids are then pumped to Digester No. 4, which has historically operated at a mesophilic temperature in the range of 110° F; however, the temperature varies depending on the quantity of biosolids transferred from the thermophilic stage. The mesophilic digester also provides storage for the downstream BFP dewatering process. Digester No. 1 and No. 2 are currently not in service. While the operating temperatures of the thermophilic digesters are controlled, the temperatures of the mesophilic digester and the storage tank are allowed to fluctuate.

The BFP dewatering process currently includes two presses and is operated 3 to 4 days per week, 6 hours per day. In fiscal year 2013 an identical third press will be added to the system. The dewatered cake is transported off-site for land application on agricultural fields surrounding the Rosecrans Memorial Airport, the landfill, and agricultural fields in Kansas. Landfill disposal is also used for some of the dewatered cake.

A summary of the existing equipment is listed in Table 1. Design criteria are based on information provided in the 2003 CDM Design Memorandum.

Table 1
Existing Solids Treatment Equipment

Treatment Process	Value
Waste Activated Sludge	
Total solids, ppd	29,100
Solids concentration, mg/L	6,000
Aerobic Digester Tank Storage	
Number of units	6
Volume (total), cf	139,000
Dissolved Air Flotation	
Number of units	3
Geometry	Rectangular
Surface area (each), sf	1,680
Surface area (total), sf	5,040
Sidewater depth, ft	10
Blend/Surge Tank	
Number of units	1
Volume (total), cf	5,380
Thermophilic Digesters	
Number of units	2
Active volume thermophilic digester (excluding cone), cf	258,000
Operating temperature thermophilic digester, ° F	131.5

Table 1 Existing Solids Treatment Equipment	
Treatment Process	**Value**
Active volume Digester No. 3 (excluding cone), cf	155,000
Operating temperature Digester No. 3, °F	122
Mesophilic Primary Digesters	
Number of units (Digester Nos. 1, 2, and 4)	3
Units in service	1
Active volume per digester (excluding cone), cf	155,000
Active volume in service (total), cf	155,000 [1]
Available active volume (total), cf	310,000 [2]
Operating temperature,° F	110
Belt Filter Press	
Number of units[3]	2
Belt width, meters	2
Operating schedule, days/week	3 to 4
Operating schedule, hrs/day	6

1. Based on current operation with one mesophilic tank in service.
2. Based on all mesophilic tanks (Digester Nos. 1, 2, and 4) in service with one tank acting as a secondary digester.
3. An additional identical press is budgeted for fiscal year 2013.

4.2 Existing Flows and Loads to Biosolids Treatment

Plant solids production (flows and loads) were reviewed from January 2005 through December 2008. The historic solids flows and loads are presented in Table 2 and Figure 2.

Table 2 Historic Solids Flows and Loads (January 2005 – December 2008)		
Parameter	**Range**	**Average**
Flow		
Primary solids, gpd	7,200 - 107,000	31,500
Thickened WAS, gpd	1,300 - 46,800	12,600
Combined, gpd	13,000 - 127,400	44,000
Total Solids		
Primary solids, %	2.7 - 30.2	7.2
Thickened WAS, %	3.2 - 18.9	7.4
Volatile Solids Content		
Primary solids, %	15.8 - 82.7	57.6
Thickened WAS, %	21.8 - 91.0	63.5
Primary Solids		

Table 2
Historic Solids Flows and Loads
(January 2005 – December 2008)

Parameter	Range	Average
Total solids, ppd	3,700 - 71,000	19,000
Volatile solids, ppd	2,600 - 40,100	10,900
Thickened WAS		
Total solids, ppd	680 - 29,700	6,700
Volatile solids, ppd	400 - 23,300	4,300
Loads to Anaerobic Digestion		
Total solids, ppd	6,700 - 127,500	25,600
Volatile solids, ppd	3,820 - 52,200	13,300

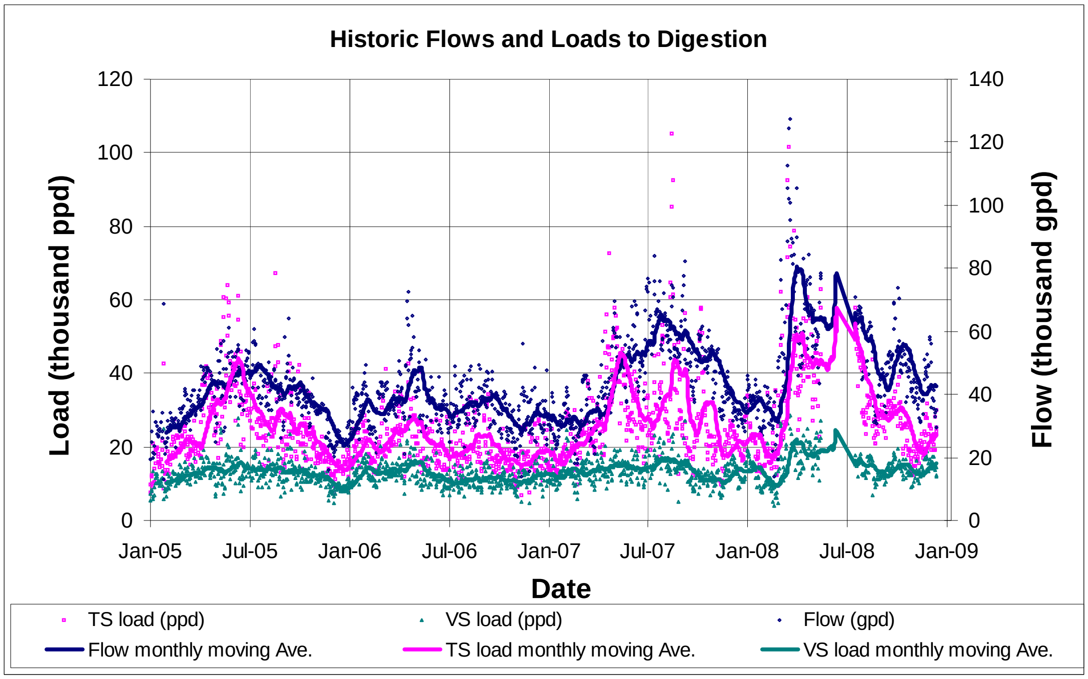


Figure 2 – Historic Flows and Loads to Anaerobic Digestion

Based on discussions with plant staff, data from June and July 2008 and all of 2009 were not believed to be representative of actual plant operations due to flowmeter questions and were removed from the data set. However, the remaining data were considered to be representative for this evaluation. The following are other assumptions that were used to analyze the historical data:

- Separate primary solids and TWAS solids quantities were not available for the entire period. For the periods between April 6, 2007 to November 30, 2007 and from March 5, 2009 to May 18, 2009, total and volatile solids information was only provided for blended solids rather than for the separate primary and TWAS components.

- There was no information available for digested solids flows and loads or digester volatile solids reduction (VSR). A VSR of 55 percent was used based on the 2003 CDM Design Memorandum. A lower actual VSR will result in greater solids loadings to the dewatering process.

The historical maximum month (MM) condition information is presented in Table 3. The MM condition is based on the April 2008 plant operating data.

Table 3
Historical Maximum Month Flows and Loads [1]
(April 2008)

Parameter	Value
Flow	
Primary solids, gpd	58,400
Thickened WAS, gpd	15,500
Combined, gpd	73,900
Total Solids [1, 2]	
Blend tank solids, %	7.8
Load, ppd	47,500
Volatile Solids [1, 2]	
Blend tank solids, %	41.3
Load, ppd	19,200

1. Data for June and July of 2008 and all of 2009 data omitted from this consideration.
2 % TS and % VS not available for PS and WAS during April 2008.

4.3 Existing Equipment Capacity

A summary of the equipment design capacities as presented in the 2003 CDM Design Memorandum and historical equipment loads are listed in Table 4. Design capacities are based on the solids production projected in the 2003 CDM Design Memorandum and do not reflect plant operating data.

Table 4
Existing Equipment Historic Operation and Design Capacity

Treatment Process	Historic Operation	Design Capacity
Dissolved Air Flotation		
Solids loading rate (each), ppd	4,800 [1]	80,640
Solids loading rate, pph/sf	0.12 [1]	2.0
Hydraulic loading rate (each), mgd	0.11 [1]	1.9
Feed solids concentration, %	0.11-0.78	0.5
Thermophilic Digesters		
Feed flow, mgd	0.074	0.191 [1]
Volatile solids load, ppd	19,200	40,590 [1]
Volatile solids loading rate, ppd/kcf	74.6	156 [1]
Thermophilic solids retention time, days Thermophilic digester Digester No. 3	 26 16	 10 [2] 6 [2]
Mesophilic Primary Digesters		
Number in service	1	2 [3]
Solids retention time, days	16	12 [2]
Integrated Digestion System (thermo + meso)		
Solids retention time, days	57 [4]	28 [1, 3]
Volatile solids destruction, %	Not available	55 - 65 [1]
Belt Filter Press		
Presses in operation	2	Not available
Operating schedule, days/week	5	3 - 4
Operating schedule, hrs/day	8	6
Solids loading rate, pph/meter	1,610	1,100
Cake solids, % total solids	19-56	25

1. From 2003 CDM Design Memorandum.
2. Not included in original design basis – Black & Veatch calculation.
3. Design basis of one thermophilic and three mesophilic primary digesters.
4. Based on two mesophilic digesters in operation (Digester Nos. 1, 2, or 4).

5.0 Design Conditions

Table 5 presents the future solids quantities developed for 2030 annual average and maximum month conditions. Solids projections were developed for the following five scenarios presented in TM-WW-4 – Nutrient Removal Facilities:

- Activated sludge treatment for domestic flows, activated sludge treatment for wholesale industrial flows.

- Integrated fixed-film activated sludge (IFAS) treatment for domestic flows, activated sludge treatment for wholesale industrial flows.
- IFAS treatment for domestic flows, membrane bioreactor (MBR) treatment for wholesale industrial flows.
- Activated sludge treatment for combined flows.
- IFAS treatment for combined flows.

The "Combined Influent Wastewater" scenario is based on treating a combined municipal and industrial raw influent. The "Separate Activated Sludge Systems" scenario is based on separate treatment of the municipal and the industrial portions of the plant influent. Solids generated through each of these scenarios are presented in Table 5. Regardless of whether the wholesale industrial and domestic influent are combined or treated separately in the liquid stream processes, the resulting solids would be combined for thickening, digestion, and dewatering.

Table 5 includes both the projected solids production with and without chemical phosphorus removal. As the impact of chemical phosphorus removal results in a minimal increase in total dry solids, the production numbers without chemical phosphorus removal were used in this evaluation. Reduction in nutrient loading to the WPF might also allow biological phosphorus removal to be considered in lieu of chemical phosphorus removal.

Table 5
Projected Solids Production

	Units	Combined Influent Wastewater		Separate Activated Sludge Systems	
		Maximum Month	Annual Average	Maximum Month	Annual Average
Plant Influent Flow	mgd	34.2	20.4	34.2	20.4
Primary Sludge					
Flow	mgd	0.14	0.08	0.14	0.08
Total Solids	%	2.70	2.70	2.70	2.70
Volatile Solids	%	60.0	71.0	60.0	71.0
Dry Solids	ppd	30,410	18,760	30,520	18,980
WAS (without chemical phosphorus removal)					

Table 5
Projected Solids Production

	Units	Combined Influent Wastewater		Separate Activated Sludge Systems	
		Maximum Month	Annual Average	Maximum Month	Annual Average
Flow	mgd	0.42	0.43	0.38	0.37
Total Solids	%	0.82	0.39	0.92	0.44
Volatile Solids	%	82.0	82.0	78.0	78.0
Dry Solids	ppd	28,840	13,980	29,040	13,560
Total Dry Solids (without chemical phosphorus removal)	ppd	59,250	32,740	59,560	32,540
WAS (with chemical phosphorus removal)					
Flow	mgd	0.48	0.51	0.42	0.43
Total Solids	%	0.82	0.39	0.92	0.44
Volatile Solids	%	68.0	68.0	68.0	68.0
Dry Solids	ppd	33,100	16,450	32,060	15,830
Total Dry Solids (with chemical phosphorus removal)	ppd	63,510	35,210	62,580	34,810

Historical data indicate that the reported MM condition (April 2008) had a total solids production of 73,900 ppd, which is greater than the projected solids quantities listed in Table 5. The historical MM conditions occurred during the spring, when the rains carry a high silt load to the WPF. New separation conduits discussed in TM-CSO-5 – Stormwater Separation Conduits are expected to reduce this inorganic load significantly, resulting in lower MM solids production. These separation projects will result in a change to volatile content of the primary solids. The exact impact of these changes cannot be fully estimated at this time. This evaluation has been conducted using the lowest average historical primary solids concentration. Additional sampling will need to be completed as improvements are made to the wastewater collection system to confirm the solids concentration. In addition, the City is working with both wholesale and other industrial users to reduce flows and loads discharged to the WPF. The reduction in loads will result in a change in the volatile content of the waste activated sludge. Additional testing will need to be completed over time to verify the volatile content of the waste activated sludge as improvements are made at the plant.

6.0 Capacity Evaluation Results

The solids projections listed in Table 5 (without chemical phosphorus removal) were applied to the process capacities listed in Table 4 to determine if the existing solids treatment processes have adequate capacity for future solids quantities. The comparison of future loads to design loading rates is shown in Table 6. The evaluation included the following assumptions:

- A 100 percent solids capture rate was used for the DAF process.
- TWAS concentration is assumed to be the average presented in Table 2 (7.4 percent total solids).
- Volatile solids destruction by the thermophilic plus mesophilic anaerobic digester combination was assumed to be the minimum value presented in the 2003 CDM Design Memorandum (55 percent).
- Volatile solids loading rates were based on loading on the first thermophilic digester only.
- Digester SRTs were based on using one of the existing mesophilic digesters (Nos. 1, 2, or 4) as a digested sludge storage tank upstream of dewatering. Detention in this tank does not count towards digester SRT.
- An identical third press is added, as budgeted, in fiscal year 2013. Dewatering operation is based on a 5 day, 8 hour schedule for normal operation. No spare BFP is provided at maximum month conditions (three presses required). If a BFP is out of service at maximum month conditions, extended operating hours on the remaining presses will be required.

The capacity of the existing equipment plus the future BFP budgeted for fiscal year 2013 was compared to the projected solids quantities at future conditions. The DAF thickening and BFP dewatering processes appear to have adequate capacity for the projected solids production, allowing for one spare DAF at annual average and maximum month conditions and one spare BFP at annual average conditions (three BFPs would be required at maximum month conditions). Based on the thermophilic digester design criteria, the digestion process will be at capacity at the projected future solids quantities based on denitrification conditions that are anticipated in 2030.

Table 6
Existing Equipment Design Capacities

Treatment Process	Units	Design Capacity[1]	Combined Influent Wastewater		Separate Activated Sludge Systems	
			Max Month	Annual Average	Max Month	Annual Average
Dissolved Air Flotation						
Units in operation	ea	2	2	2	2	2
Solids loading rate (each)	ppd	80,640	14,420	6,990	14,520	6,780
Solids loading rate	pph/sf	2.0	0.4	0.2	0.4	0.2
Hydraulic loading rate (each)	mgd	1.9	0.2	0.2	0.2	0.2
Thermophilic Digester						
Feed flow	mgd	0.191	0.182	0.106	0.182	0.106
VS load	ppd	40,590	41,890	24,780	40,960	24,100
VS loading rate	ppd/kcf	156	162	96	159	93
SRT	days	10	10.6	18.2	10.6	18.2
Thermophilic Digester (Digester No. 3)						
SRT	days	6	6.4	10.9	6.4	10.9
Mesophilic Primary Digesters (Digester Nos. 1, 2, or 4)[2]						
SRT 1 tank 2 tanks	days	12	6.4 12.8	10.9 21.9	6.4 12.7	10.9 21.8
Integrated Digestion System (thermo + thermo + meso tanks)						
SRT 1 tank 2 tanks	days	28	23.4 29.8	40.1 51.0	23.3 29.6	40.0 50.9
Belt Filter Press						
Presses in operation	ea	Not Available	3	2	3	2
Operating schedule	days/ week	3 - 4	5	5	5	5
Operating schedule[3]	hrs/day	6	8	8	8	8
Solids loading rate	pph/ meter	1,100	1,060	560	1,080	560

1. Per 2003 CDM Design Memorandum
2. Capacity based on one of the three tanks in use as a secondary digester
3. Must be extended in the event a machine is out of service

Graphically, the system capacity is shown in Figure 3 as a function of plant influent flow. This comparison assumes the solids production increases linearly with plant flow. Only major process equipment was evaluated to determine capacity. Ancillary equipment, such as feed and discharge pumps, filtrate return, polymer feed systems, and conveyance, were assumed to be designed to support the major process equipment and were therefore not evaluated separately. Available dewatering capacity was based on three presses operating 5 days per week, 8 hours per day.

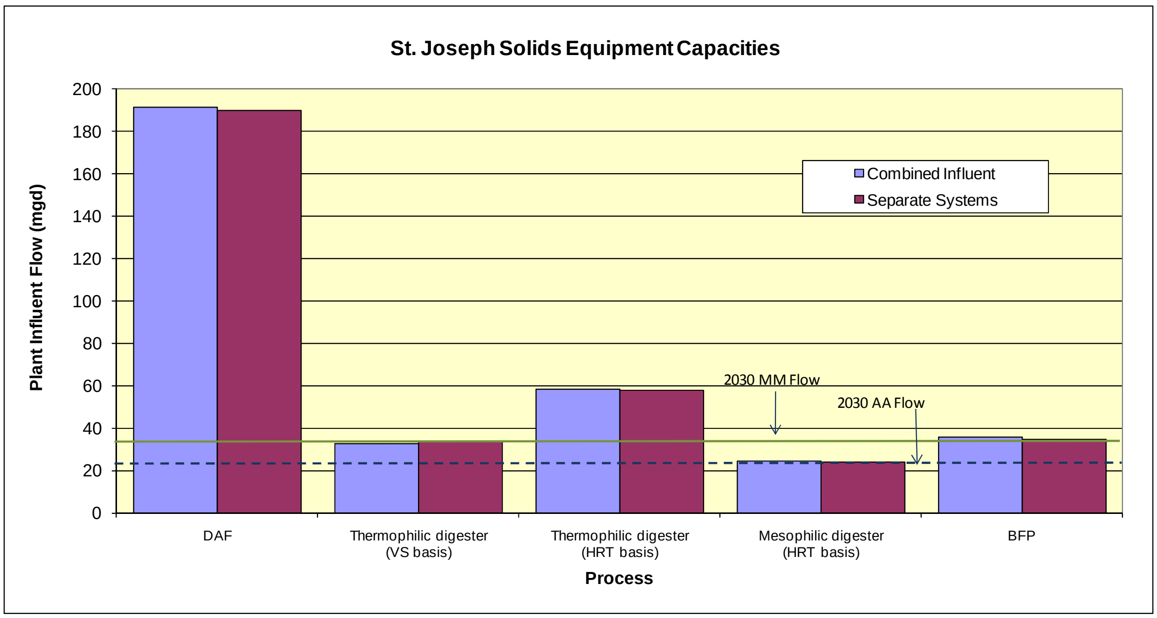


Figure 3 – Existing Solids Process Capacities as Function of Plant Influent Flow

As shown in Figure 3, DAF thickening, thermophilic digestion, and BFP dewatering have adequate capacity under both scenarios. The mesophilic digestion capacity, based on only two mesophilic tanks in operation, does not meet the original 18 day hydraulic retention time (HRT) design requirement at future conditions; however, with the addition of a second thermophilic digester, the mesophilic detention requirement would be expected to decrease. Total SRT is 23.8 days with one mesophilic digester and 29 days with two digesters in service. Therefore, one additional mesophilic digester may need to be brought back into service to meet the 28 day required SRT.

7.0 Conclusions and Recommendations

The DAF thickening, thermophilic digestion, and BFP dewatering processes appear to have adequate capacity for the projected solids production. Based on two mesophilic tanks in service, the existing system cannot meet the original 18 day mesophilic SRT at future conditions. However, with the digester configuration modifications, the actual mesophilic detention requirement may be less than the original 18 days specified. Total SRT is 23.8 days with one mesophilic digester and 29 days with two digesters in service. Therefore, one additional mesophilic digester may need to be brought back into service to meet the 28 day required SRT. In order to meet the desired dewatering schedule (5 days per week, 8 hours per day), installation of the third BFP, currently budgeted for fiscal year 2013, is required.

Future wastewater collection system separation projects will result in a change to volatile content of the primary solids. The exact impact of these changes cannot be fully estimated at this time. Additional sampling will need to be conducted as improvements are made to the wastewater collection system to confirm the solids concentration. In addition, the City is working with both wholesale and other industrial users to reduce the industrial flow and loading contributed to the WPF. The reduction in loads will result in a change in the volatile content of the waste activated sludge. Additional testing will need to be completed over time to verify the volatile content of the waste activated sludge as improvements are made at the plant. Therefore, the existing solids processing system appears to have sufficient capacity. Operational changes will need to occur as flows and loads change over time to ensure that adequate SRTs are maintained.

8.0 References

- Design Memorandum for Wastewater Treatment Plant Improvements (Camp Dresser & McKee, Inc., Delich Roth & Goodwillie, P.A., and Snyder & Associates, 2003).