# CHAPTER 4 - NON-PROCESS FACILITES

## 4.1 General

This chapter discusses the non-process facilities which support the process facilities at the Metropolitan Biosolids Center. The following support facilities will be discussed more in detail in this chapter because of their large impact on the operations of the main processes. These are the Wastewater Collection System, Odor Control System, and the Plant Water Systems (potable water, process water, reclaimed or utility water). Problems related to the Chilled Water System, Hot Water System and the Storm Water Drainage System are also discussed.

Other non-process or utility systems not discussed here are the following systems: Heating/ Ventilation and Air-Conditioning, Fire Protection Water, and the Natural Gas systems. These systems have no significant problems or concerns related to this condition and operational assessment.

The Electrical and Instrumentation and Control Systems are discussed later in Chapter 5.

## 4.2 WASTEWATER PUMPING SYSTEM (N-1)

### System Description

The MBC wastewater is collected from the plant's sanitary facilities, process blowdowns and drains, washdowns and other miscellaneous drains including sanitary drains from the Cogeneration Facility. The wastewater is collected and discharged to the Wastewater Pump Station (WWPS). This station has a typical box wetwell of 2,000 gallons capacity and was originally served by two (2) 5-hp non-clog submersible pumps. Each pump delivered a flow of 200 gpm at 40 ft head to Municipal Pump Station 86 located south of MBC across Freeway 52. The original wastewater pumps plugged frequently and did not have enough capacity to keep up with plant discharges. On numerous occasions, this caused overflows to the centrate wetwell. The pumps have been replaced with larger 350 gpm pumps.

### Problem

*Undersized PS 86:* Muni-PS86, equipped with two 800 gpm pumps (1 duty and 1 spare), was designed and constructed based on a projected ultimate flow of only 520 gpm from area subdivisions. Based on current area inflow this allows the WWPS to discharge at only 280 gpm, less than that sent now at 350 gpm and significantly less than the projected peak flow of 1,200 gpm from the MBC WWPS.

With the limited capacity of PS86, overflows from the WWPS into the centrate wetwell occur. The overflows distort the actual centrate flow sent to PLWTP which impacts the regulatory OPRA mass emission rate accounting required from the City. Overall, any future increase in the hydraulic and solids loading or expansion of facilities at MBC will increase the wastewater volume and exacerbate these present pumping and spill problems.

WASTEWATER PUMP STATION

**Recommended Improvement**

The WWPS still cannot fully handle the projected WW discharges. It is recommended that the pump capacity be increased and that a bypass for PS86 is constructed.

Due to the depth of the Muni PS86 wetwell, there is no plan to increase its pumping capacity so that it can send the combined area inflows and MBC wastewater flows to PLWTP. Alternatively, a diversion pipe has been proposed that will divert pumped MBC wastewater via a new 8-inch forcemain directly to the 15-inch diameter gravity trunk sewer main at Clairemont Mesa Boulevard. The Muni PS86 dual forcemains presently discharge to this gravity sewer main.

## 4.3 ODOR CONTROL FACILITIES (N-2)

### Facilities Description

Various solids treatment facilities are ventilated to remove the resulting odors from the biosolids processing and to provide a safe working environment for the plant staff. Foul odors are generated in the following areas of the solids processing facilities: Area 73 (Raw Solids Receiving and Thickened Solids Blending), Area 76 (Centrifuges), Area 80 (Digesters Complex), Area 86 (Biosolids Storage and Truck Loadout), and Area 94 (Centrate and Wastewater Pump Station).

The foul air from the process facilities is collected and conveyed by fans and fiberglass ducting to the Odor Control (OC) Facility in Area 60-Chemical Building. The Odor Control Facility consists of three treatment trains (2 duty and one standby), each train providing two- or three-stage treatment depending on the foul air source. All of the foul air drawn from Areas 73, 76, 80 and 86 (designed at 52,000 total cfm, the actual flow is lower) goes through packed-bed hydrogen sulfide chemical scrubbers, then through the carbon adsorption scrubbers and is finally discharged to the atmosphere through vertical stacks by fans. A total of 16,000 cfm of foul air is drawn from post-digestion areas is first treated by an ammonia scrubber before being sent to the hydrogen sulfide chemical and carbon scrubbers. The chemical scrubbers remove about 80 percent of the odor while the carbon adsorption units polish the foul air-stream to about 95 percent odor-free level.

The odor control system servicing Area 94 consists of two trains of 3-stage scrubbers. The flow diagrams for these odor control systems are shown in Figure 13 of Appendix B.

In 2003, MWWD's odor control consultant, Brown and Caldwell, conducted an evaluation of the existing foul air ventilation systems in the MBC process areas and identified a number of odor-related problems. Based on this evaluation, several improvements were recommended and are presented in summary herein. (For the complete report, see B&C's "Odor Control Modifications Assessment Report," November 2003).

Brown and Caldwell's evaluation of hydrogen sulfide readings concluded that the chemical scrubbers in Area 94 can be bypassed with minimal effect on treatment efficiency. Bypassing of the chemical scrubbers was recommended as part of the MBC OC facilities improvement project. The APCD has allowed MBC to temporarily bypass the chemical scrubbers.

ODOR CONTROL FACILITY

**Problems**

1. Area 60:

   a. *High system pressure/under capacity fans*: Odor control fans are operating under higher total static pressures than anticipated by the design, thereby exhausting and treating less volume of foul air than needed at the facilities and resulting in the fans being under capacity.

   b. *Inaccessible dampers*: In Areas 94 and 60, there is very limited or no access to repair motorized dampers at upper levels or to verify their damper positions including instrumentation status. Based on air flow measurement, most dampers are suspected of not fully opening or closing.

   c. *Moisture in the foul air stream*. There is difficulty in removing moisture from ducts, fans and carbon scrubber vessels due to inadequate negative pressure throughout the system (because the main OC fan is located downstream vs. upstream in the OC train).

      Moisture carryover from chemical scrubbers has also resulted in loss of capacity by the carbon scrubbers. It was also observed that loss of capacity is caused by backflows through OCS units that are out of service.

2. Area 76: *Inadequate foul air ventilation*. The Screening and Degritting Room has many open wastewater surfaces contributing as odor sources. Existing room foul air

ventilation rate is below the designed rate. Odor collection fans for this area are operating below their design capacities due to several pressure losses identified in item 1 above.

3. Area 86: *Ventilation imbalance*: There is a large imbalance between the volume of exhausted general ventilation air versus that of exhausted foul air in this very odorous facility. A large volume of building ventilation air (over 200,000 cfm) is being exhausted to the outside through the building roof fans while a meager amount of foul air (12,000 cfm) is being captured and sent to the odor control systems.

   a. *Ineffective foul air capture at truck bays*: Odors from the truck loadout lanes are ineffectively captured by the foul air exhaust ducts while work areas are insufficiently ventilated with fresh outside air.
   With ineffective capture of foul air, the presence of truck exhaust fumes and the lack of truck loading enclosures make this open work area an unpleasant working environment.

   b. *Non-capture of truck exhaust fumes*: Uncollected truck engine exhaust fumes disperse into the facility and create an unfavorable environment for the operators.

4. Area 94:

   a. *Under capacity fan*: The odor control exhaust fan is operating below its rated capacity and thus inadequately provides the necessary foul air removal rate for the pump station.

   b. *Uncovered wetwell trench*: The centrate wetwell trench is uncovered requiring the entire wetwell room to be ventilated at a higher rate. Covering the wetwell trench to contain odors and just exhausting this contained volume reduce the foul air volume to be treated.

**Recommended Improvements**

The following are the recommended improvements as also recommended in the B&C evaluation report. Implementation of these improvements will be in accordance with MBC/MWWD priorities.

1. Area 60:

   a. The capacity of the main odor control fans needs to be upgraded and the causes of the increased resistance to air flow in the ducts need to be identified and addressed.

   b. Provide maintenance access to the motorized dampers and provide visual position indicators for all dampers.

c. Remove excess moisture from odor control ducts by providing a deep (greater than 17 inches) in-line sump and gravity drain line prior to the carbon scrubbers. The location of the main foul air exhaust fans within the OC trains needs to be reviewed. Relocation to the upstream side may increase negative pressure in the system to prevent moisture collection.

2. Area 76: Implement B&C recommendations for Grit/ Screen Room Odor removal improvements. Replace 3 area odor fans to attain desired withdrawal rates.

3. Area 86:

   a. Evaluate foul air quantities in the Biosolids Storage Facility. Consider improvement of foul air collection at the truck loadouts by installing enclosures. Improve the ventilation air supply duct routing and location of supply registers in this facility. Consider constructing an independent loadout facility separate from the present building. This new loadout facility will be built with operator control rooms totally separate from the loadout area.

   b. Due to safety concerns associated with the truck exhaust fumes, the installation of an enclosure at the operator control station has become a high priority. Funding for the operators work station enclosure at the truck loadout has been provided and its construction will begin soon.

      To contain and immediately remove truck exhaust fumes, truck lane enclosures need to be considered.

4. Area 94:

   a. Investigate and correct causes of low air flow through the odor control system.

   b. Provide cover on the wetwell trench and withdraw air from under the cover. Provide general ventilation for the wetwell room so as to only require exhaust to the outside instead of treatment by the odor scrubbers.

## 4.4 PLANT WATER SYSTEMS (N-3)

### *4.4.1 Potable Water (PW) System* (N-3.1)

**System Description**

The Potable Water System provides the domestic water needs of the plant including those of the emergency eyewashes and showers. Two 16-inch PW mains feed into the MBC site and tie into a 12-inch piping loop around the MBC facilities. A 6-inch Water

Department (WD) connection, downsized from M&E's original 8-inch design, connects to a 6-inch magnetic flow meter, a backflow preventer and into the 6-inch PW main. A 6-inch branch pipe feeds the Energy Building and the Process Water (PRW) System air gap tanks. The 6-inch PW main then goes thru a pressure regulating valve (PRV) and continues into the plant's pipe gallery where it is downsized to a 4-inch main. Several 2- and 3-inch branch pipes feed into the various buildings throughout the plant.

A second PW source branches off the12-inch PW pipe loop and passes thru a 4-inch flow meter and a PRV device before connecting to the 4-inch backbone PW main in the pipe gallery which serves the entire plant. The Potable Water System piping schematic is shown in Figure 15 of the Appendix.

**Problem**

*Inadequate flow for peak PRW demand*: Aside from the primary goal of providing for the domestic PW demands of the plant, the PW system is configured to be the main water source for the PRW system. The downsized 6-inch PW flow meter cannot provide the peak 1,700 gpm maximum flow demand originally calculated for the plant's PRW system. The downsizing proved to be a critical error as current experience shows that the PW feed to the PRW system is inadequate during peak flow conditions when RW is not available. Excluding MBC's PRW demands, the existing PW system is adequate.

**Recommended Improvement**

It is proposed that a new 4-inch PW branch line be connected to the existing 4-inch PW main on the east side of the pipe gallery. This new 4-inch PW branch pipe will feed into one or two proposed new 3,000-gallon air-gap tanks served by two new 325 gpm (or larger) PRW pumps. The discharge piping of this new air-gap system will connect to the existing 4-inch PRW main in the pipe gallery by the Chemical Building. This proposed new 4-inch PW pipe connection and supplementary PRW equipment are shown in Figure 4-1.

### *4.4.2 Process Water (PRW) System* (N-3.2)

**System Description**

The Process Water System provides water for use on pump seals and area housekeeping. As mentioned in the PW System section, the PRW air gap tanks are fed from a 6-inch branch out of the 12-inch PW main loop. This 6-inch PW branch feeds three 3,000-gallon air-gap tanks (3 duty, no standby) in the Energy Building. Four PRW pumps (three 325 gpm and one 100 gpm units) draw from the air-gap tanks and feed into a 6-inch backbone PRW pipeline. This main pipe branches out to two bladder-type hydropneumatic tanks and connects to a PRV station. The backbone PRW main is routed to underground pipe gallery branching off to the various PRW users. For the PRW system's back-up water source, Utility Water (UW) is tied into discharge piping side of the PRW pumps. Vice-versa, with this tie-in connection, PRW can be fed into the UW system when the Reclaimed Water feed is not available.

**Problem**

*Under-designed PRW system:* The final design of MBC's PRW system was not as initially conceived. PRW demands were inexplicably reduced by the designer at the end of design resulting in a smaller PRW main (6-inch installed vs. 8-inch original) and fewer PRW pumps (3 @ 325 gpm installed out of 4 original). Thus, inadequate flows and pressures to the PRW users are routinely experienced. A malfunction of an air gap tank or pumping equipment reduces the PRW capacity and results in centrifuges and cake pumps tripping off-line, thereby reducing plant biosolids production and creating major operational problems in MBC.

During construction, a 6-inch connection spool was installed to allow the Utility (or Reclaimed) Water to feed into the PRW system or vice versa. Although this connection was intended to be temporary, it was made permanent when it was discovered that the downsized 6-inch PW supply was inadequately sized to meet the peak demands of the PRW system. (Refer to Figure 16 of the Appendix for the PRW flow diagram). However, UW supply to MBC can be shut off without notice by the Water Department. In such event, the undersized PRW, has to perform double-duty by supplying flow to the UW system. This event has occurred on several occasions in the past and has placed the plant operation in a critical condition.

This undersized PW main and its lengthy piping run in the pipe gallery have resulted in periods of low supply pressure causing tripping off of critical process equipment.

**Recommended Improvements**

As recommended in the PW System, the installation of a new 4-inch PW source connection and new PRW air-gap tanks and pumps will augment flow and provide an operating cushion on the existing PRW system. It is also recommended that an alternate feed from the RW system be provided. A new 8 or 6-inch branch pipe from the 8-inch RW line (for Peak Wet Weather Flow Management) can be installed and connected to both the existing 6-inch PRW and UW mains in the pipe gallery. This added connection will provide more capacity and flexibility to both PRW and UW systems. See Figure 4-1 for the PRW system flow diagram and recommended improvements.

### *4.4.3 Utility (or Reclaimed) Water (UW or RW) System* (N-3.2)

**System Description and Problems**

The Utility or Reclaimed Water System meets the demands at the truck wash, biosolids, centrifuges, and the chemical dilution facilities. A 12-inch RW main enters the MBC site, branches into two 6-inch lines with backflow preventers which then reconnects to become a 10-inch RW main. It then feeds into an 8-inch pipe loop around the entire MBC facility. An 8-inch line branches out of the west side of the loop to the Energy Building, goes thru a pressure reducing station and flow meter and connects to the 8-inch backbone UW main in the Pipe Gallery. The lengthy UW main coupled with large demands result in low supply pressures which cause process equipment to trip off many times in the past.

On the east side of the 12-inch RW loop line at the Operations Building, another 8-inch branch pipe was installed and routed to Digester No. 3 designated for peak flows management. This new 8-inch branch pipe does not tie-in with the 8-inch UW backbone main in the pipe gallery.

As stated above, a spool pipe for the tie-in connection with the PRW system is installed in the Energy Building. In the event the RW system is placed out of service by the Water Department, PRW can be fed to augment the UW system. The UW system can also be used to supplement PRW demands.

**Recommended Improvements**

The installation of a supplementary RW piping connection from the 8-inch RW pipe for peak flow management needs described in the Process Water System above is recommended to augment the plant's UW system in times when the reclaimed water supply from the Water Department is cut off. See Figure 4-1 for this piping improvement.

### *4.4.4 Other Plant Water System Problems/Recommendations*

(N-3.3): There is a general lack of all necessary shut-off valves to isolate piping sections for repair/maintenance work. Installation of these missing isolation valves will be very helpful to the O&M staff.

(N-3.4): The airgap tank inlet valves on the PRW system are missing its UPS connections proper automatic controls. The UPS connections must be installed.

### *4.4.5 Hot Water (HW) System* (N-4)

**Existing Condition**

Plant heating water is supplied from the Hot Water System. The system consists of primary and secondary loops - the primary loop providing the heat source and the secondary loop distributing the heat to load demands throughout the plant via variable speed pumps (See Figure 17 of the Appendix). The heat source comes from recovered heat from the CoGeneration Facility engines and is supplemented by two hot water boilers (each rated at 10 million Btu/hr heating capacity at 850 gpm flow). Aside from the plant's main demand for space heating, it is also used for digester heating. The operation with the CoGen Facility was not taken into consideration in MBC's original HWS design.

Biogas connections to the hot water boilers were recently disconnected. Only Natural Gas is currently fed into the boilers. This was also done to avoid annual source testing required by APCD on biogas emissions and to obtain higher annual NG usage allowances.

**Problems**

Two major problems currently being experienced are as follows:

1. *Faulty boiler control problem:* Boilers get stuck in low-fire mode when the system calls for maximum heating. Transitioning heat supply from the CoGen heat source system to the Secondary system and vice versa is not accomplished automatically and must be done manually instead. This transitioning problem is mainly due to the Cogen connections made at the secondary loop instead of the primary loop. With the Cogen connections on the Secondary loop, control of the temperature control valve on the secondary loop is dictated by timing algorithms instead of temperature and pressure sensors located at the MBC Operations Building.

2. *Inefficient boiler operation*. This is due to poor flow coordination between the CoGen hot water feed pumps and the MBC HWS secondary feed pumps. The constant speed pumps at the CoGen facility force the secondary loop pumps to operate at maximum speed resulting in wasted energy and unsafe high pressure in the system.

A minor leak has been observed in the pipe gallery. This is believed to come from the buried HW pipe in the transition area between the pipe gallery and the Operations Building. If this leak worsens to eventually warrant attention/ repair, accessing the leak location without undermining the building ground footing will be a very difficult task. Increased solids loading to MBC in the future will require an increase in digester heat demand and higher system operating pressures.

**Recommended Improvements**

1. Review HWS control strategy considering relocating Cogen pipe tie-ins to the primary piping loop.

2. Install variable speed drives on the CoGen HW pumps.

### *4.4.6 Chilled Water (CW) System* (N-5)

**Existing Condition and Problems**

Two 300-ton centrifugal chillers (lead-lag operation) provide centralized cooling for HVAC units at the various MBC buildings and facilities (See Figure 18 of the Appendix). The CWS equipment is located in the Energy Building and feeds into primary and secondary pumping loops. The latter loop supplies chilled water to the various MBC process areas.

Current problems associated with the chilled water system operation are the following:

1. *Lack of capacity.* The two existing chillers operate together to meet plant peak cooling demands during hot summer days. The back-up chilled water supply from the Cogen Facility has been decommissioned. Added CW demand from the CoGen facility and the "re-heat" HVAC system in the Area 51 Operations Building has saddled the MBC CW system with a large load that was not considered in original design.

2. *Inefficient operation of the system due to lack of a temperature control valve.* This is aggravated by the Cogen tie-ins to the secondary loop instead of the primary loop.

An increase in the plant hydraulic and solids loading will require additional electrical loads. MCC room cooling loads will increase and may require more cooling and enlargement of the existing CW system.

**Recommended Improvements**

1. With marginal capacity on hot days and lack of standby capacity, the installation of a third chiller is recommended.

2. The installation of a temperature control valve for better control of system operation is needed urgently. Review/ optimize existing controls.

## 4.5 STORMWATER DRAINAGE (SWD) SYSTEM (N-6)

**Existing Condition and Problems**

Storm water and surface drains are directed to two drainage structures located at the east and west sides of the MBC site. Current concerns with these drainage structures are as follows:

1. *Ground erosion at the West Drainage Structure.* Due to its steep slope, the downstream area is subject to severe erosion during discharges.

2. Accidental w*astewater and chemical spills*: Several process areas can directly discharge wastewater, biosolids or chemicals into the storm drains. These areas include the roof of the digesters and the blending tanks, the truck loadouts and the chemical storage tanks. By design, these unwanted materials can and do get flushed into the storm drain system.

3. *Access road erosion:* Due to poor CALTRANS drainage provisions, MBC's main access road is gradually being eroded during heavy rain events.

BIOSOLIDS RD

MBC ACCESS ROAD

**Recommended Improvements**

1. Elimination of the West Drainage Structure is part of a consultant's design project that has been recently completed. This project which revised MBC's stormwater drainage system is ready for construction.

2. Area grading will be revised to have all drainage directed to the East Drainage Structure. A diversion gate, a 10,000 gallon concrete holding tank and a return pump

station will be constructed to capture any spilled wastewater or chemicals and prevent them from entering the nearby creek.

3. Drainage improvements to intercept and redirect stormwater away from the access road needs to be constructed.