



Wastewater: The Basics

Basic information about wastewater, the San Mateo Wastewater Treatment Plant, and the Clean Water Program

March 2016





Introduction

“Wastewater” means water that has been used or contains dissolved or suspended waste materials₁.

Used water can carry bacteria and viruses that cause diseases, so it must be cleaned before going back into our environment.



Have you ever wondered where used water goes after it is flushed or drained from your home?

Did you know that after treatment, that water eventually reaches the San Francisco Bay?

Thankfully, wastewater must first travel through a sewer collection system and be treated and disinfected at the wastewater treatment plant in order to remove contaminants and harmful bacteria and make sure we are minimizing our impact on our environment.



The San Mateo Wastewater Treatment Plant

The San Mateo Wastewater Treatment Plant (WWTP) also treats wastewater from Foster City and the Estero Municipal Improvement District (EMID, the utility district for Foster City), the Town of Hillsborough, the City of Belmont, the Crystal Springs County Sanitation District (CSCSD), and other portions of unincorporated San Mateo County.

San Mateo WWTP operates under a **Joint Powers Agreement (JPA)** between the City of San Mateo and EMID.

- San Mateo currently owns approximately 75% of the WWTP and EMID currently owns approximately 25% of the WWTP.

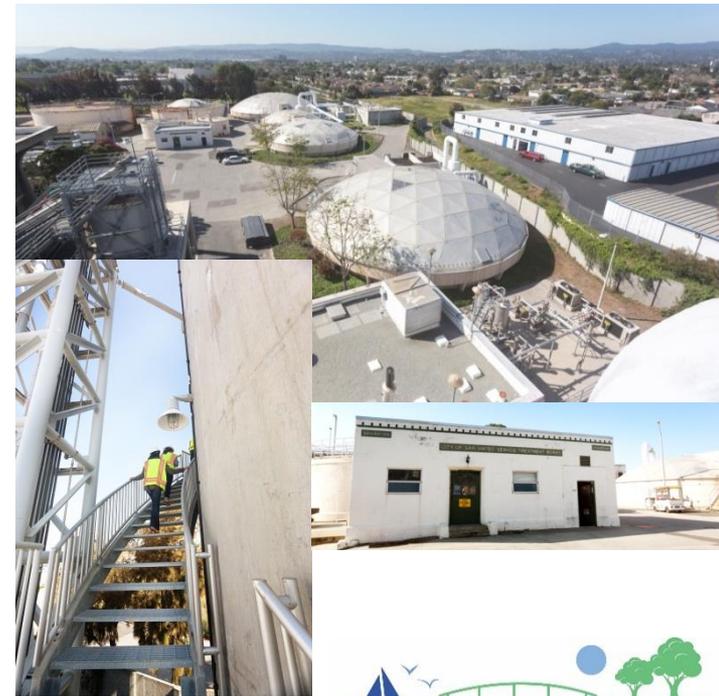
The WWTP components of the Clean Water Program are a joint effort between the cities of San Mateo and Foster City.



Wastewater Treatment

The basic concept of wastewater treatment is to use different methods to separate and remove any solid material from wastewater and disinfect the remaining liquid before releasing it back into our environment.

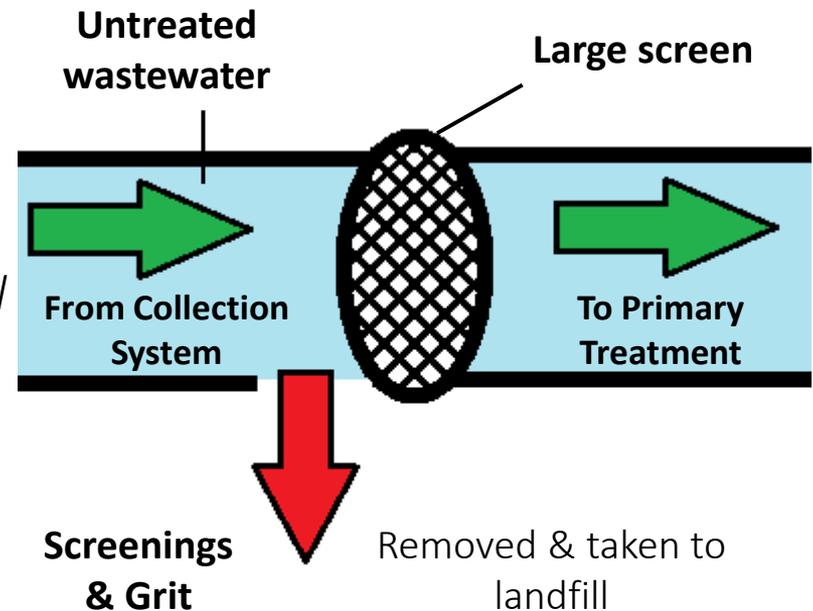
- Wastewater treatment occurs at wastewater treatment plants (WWTP's).
- Different WWTP's may use different technologies. This presentation provides an overview of the six wastewater treatment processes the San Mateo WWTP plans to use:
 1. *Preliminary Treatment*
 2. *Primary Treatment*
 3. *Secondary Treatment*
 4. *Biosolids Treatment*
 5. *Disinfection*
 6. *Effluent System*



1) Preliminary Treatment

Once wastewater is pumped into the WWTP, it contains a variety of solid materials that need to be removed in order to protect the equipment used in the later stages of treatment.

- Preliminary treatment removes **screenings** and **grit** from the raw wastewater to protect downstream mechanical equipment.
 - **Screenings** – large debris like rags, wipes, wood, toys, stones, etc.
 - **Grit** – fine debris and abrasive material like sand, gravel, egg shells, coffee grounds, etc.
- Removing these materials early in the treatment process can significantly reduce maintenance time and costs.

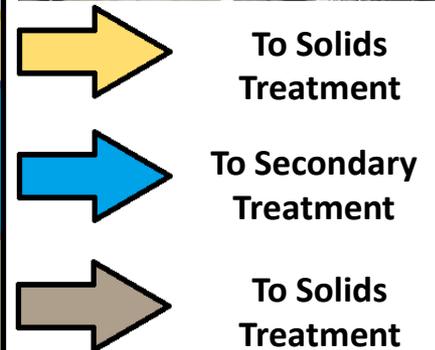
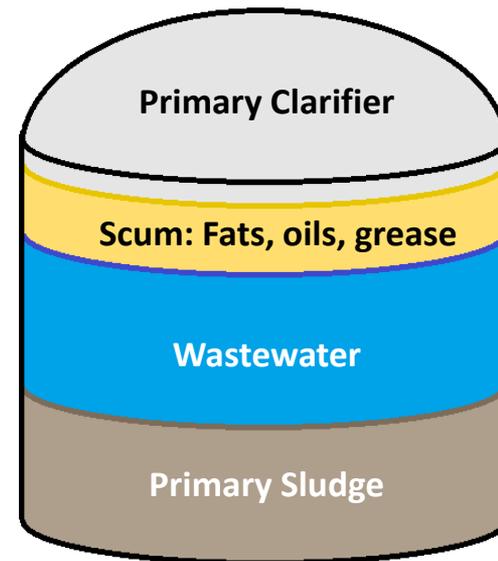


2) Primary Treatment

Wastewater is then passed through clarifiers so that gravity can naturally separate the bulk of the wastewater from the solids, fats, oils, and grease.

Primary clarifiers are very large tanks in which most of the primary treatment process takes place. During this process:

- Scum and garbage are removed using mechanical skimmers.
 - Scum - the term used to describe the fats, oils, and grease that float in wastewater
- Primary sludge is removed using mechanical scrapers and sent to a solids treatment system.
 - Primary sludge - the term for solid material which sinks in the wastewater during Primary Treatment, due to having a higher density than wastewater.



3) Secondary Treatment

After unwanted materials and solids are removed from the wastewater in the preliminary and primary treatment stages, bacteria are added to the wastewater during secondary treatment.

- Bacteria consume the waste & nutrients.
- Chemicals can be added to aid removal of certain nutrients like Phosphorus.
- At the end of the process, the bacteria is separated from the water by use of **membranes**.

— **Membranes** - special filters with extremely small holes that are smaller than the bacteria, so that only water can pass through.



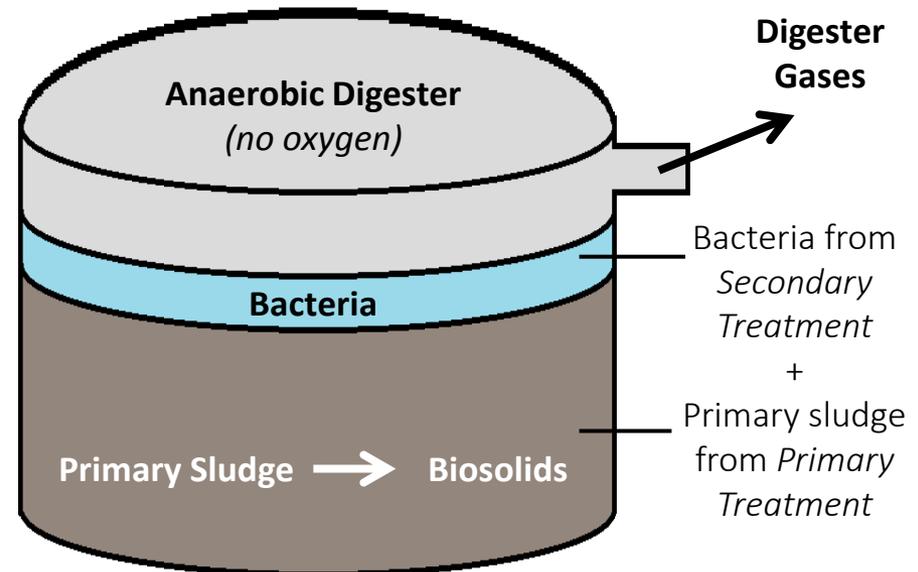
Liquid with bacteria

Liquid after pushed through a membrane

4) Solids Treatment

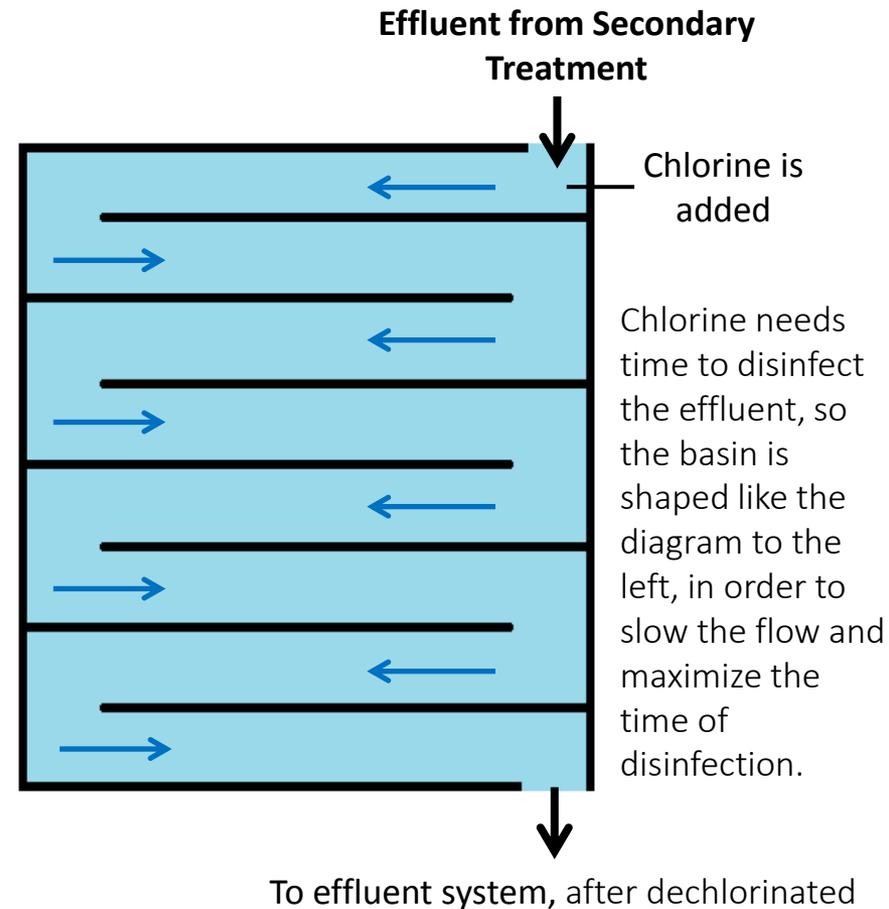
During solids treatment, the primary sludge which was removed during primary treatment gets combined with the bacteria used during secondary treatment in a large tank void of oxygen called an anaerobic digester.

- Inside anaerobic digesters, bacteria that live in an oxygen-free environment “digest” or “reduce” the material by converting solids to gas, including methane gas.
- The treated solids, now known as **biosolids**, are dewatered.
- There are possible uses for biosolids or gases produced during this solids treatment process.
 - *Biosolids can be used for soil or fertilizer.*
 - *Digester gases can be converted to compressed natural gas to fuel vehicles.*



5 & 6) Disinfection & Effluent System

- During the **disinfection** stage, harmful bacteria and viruses are inactivated to eliminate threats to humans and the environment.
 - **Chlorine** is added to disinfect the effluent in a large basin.
 - Once the water is disinfected, other chemicals are added which **dechlorinate** the effluent.
- Finally the treated water is pumped out through an **effluent system**.
 - **Effluent systems** -- the pump and piping systems which pump out the disinfected water from the WWTP into an outfall (water way).
 - **Effluent** means outflowing water, in this context it means the treated water flowing out of the WWTP into the SF Bay.



Clean Water Program Overview

The Clean Water Program is a comprehensive, 10-year plan to upgrade San Mateo's wastewater collection system and the San Mateo Wastewater Treatment Plant.

The goals of the Clean Water Program are to:

- Replace aging infrastructure and facilities
- Build wet weather sewer system capacity assurance to prevent overflows
- Meet current and future regulatory requirements
- Align with the City of San Mateo and Foster City's sustainability goals.



Staying Informed

An important component of the Clean Water Program is constant dialogue and communication. We want you to tell us how we are doing and how we can improve.

Below is a list of ways to keep in touch with the Clean Water Program:

- Check out the Clean Water Program website.
 - www.cleanwaterprogramsanmateo.org/
 - *Read Frequently Asked Questions & let us know if you have a question we haven't answered!*
 - *Keep in the loop for additional informational handouts, maps & fact sheets.*
 - *Contractors & Consultants – Keep in the loop about upcoming bid opportunities.*
- Sign up for email notifications through the City of San Mateo website (“Notify Me”).
 - <http://www.cityofsanmateo.org/list.aspx>
 - *Having difficulties? Instructions available on Clean Water Program website.*
- Contact the Clean Water Program.
 - info@cleanwaterprogram.org, (650) 727-6870.



References & Additional Information

References

- 1. Environmental Protection Agency, “Definition of ‘Wastewater’”.
<http://www.ecologydictionary.org/EPA-Glossary-of-Climate-Change-Terms/Wastewater>

Additional Information

- “Learn about Water”, United States Environmental Protection Agency.
— <http://www.epa.gov/learn-issues/learn-about-water>
- “Wastewater Treatment For Youngsters”, prepared by the Metropolitan Council (Minneapolis-Saint Paul Metropolitan Area, MN).
— [http://www.metrocouncil.org/Wastewater-Water/Services/Wastewater-Treatment-\(1\)/Wastewater-Treatment-for-Youngsters.aspx](http://www.metrocouncil.org/Wastewater-Water/Services/Wastewater-Treatment-(1)/Wastewater-Treatment-for-Youngsters.aspx) (**please note the wastewater treatment methods explained in the book are slightly different than the methods to be used in San Mateo – instead rely on this presentation for an overview of the technologies to be used at the San Mateo WWTP*).
- “Layperson’s Guide to California Wastewater”, prepared by the Water Education Foundation.
— <http://www.watereducation.org/publication/laypersons-guide-california-wastewater>

