

Continuous upgrades in Biological Nutrient Removal = Energy Savings



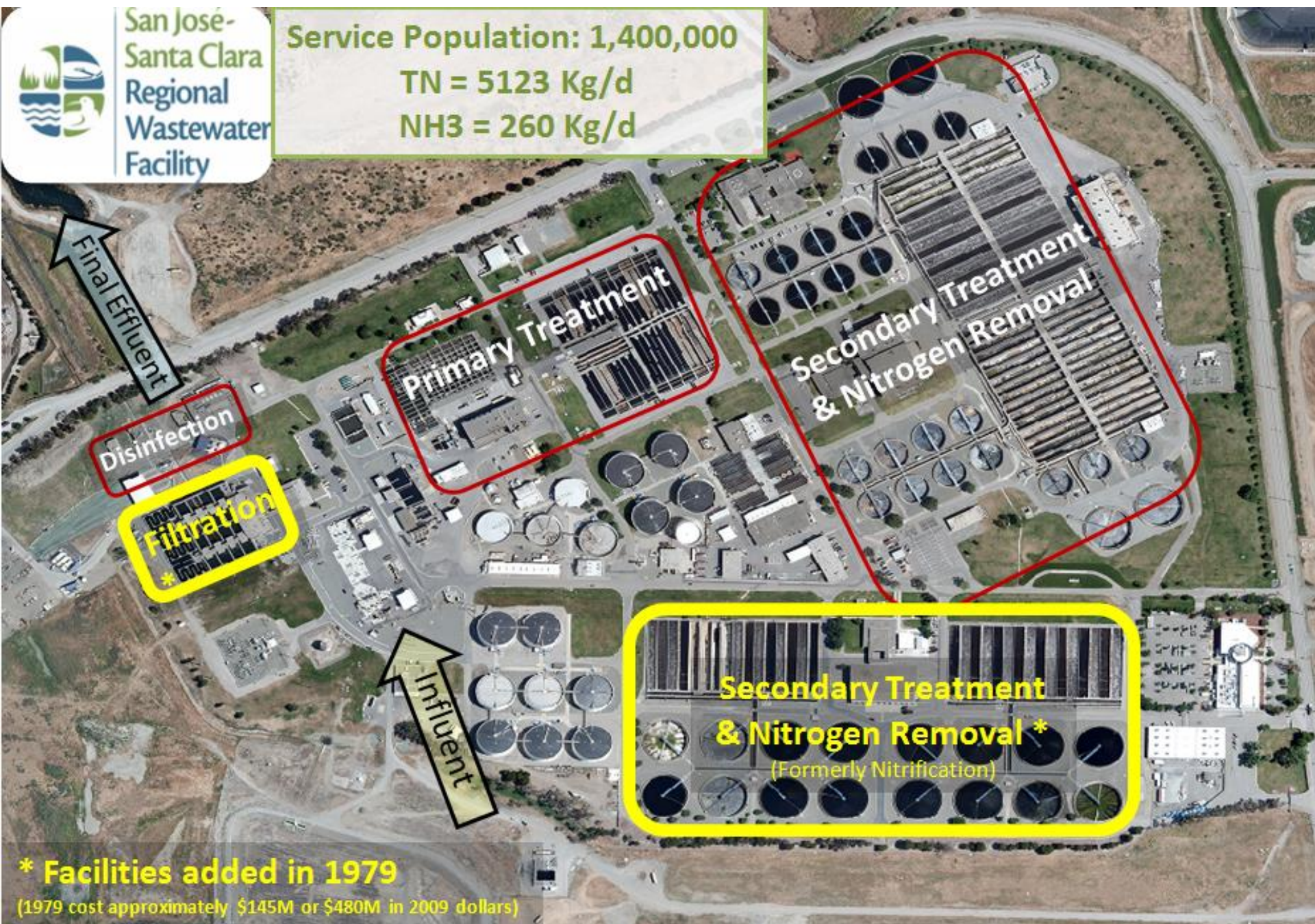


San José-
Santa Clara
Regional
Wastewater
Facility

Service Population: 1,400,000

TN = 5123 Kg/d

NH₃ = 260 Kg/d

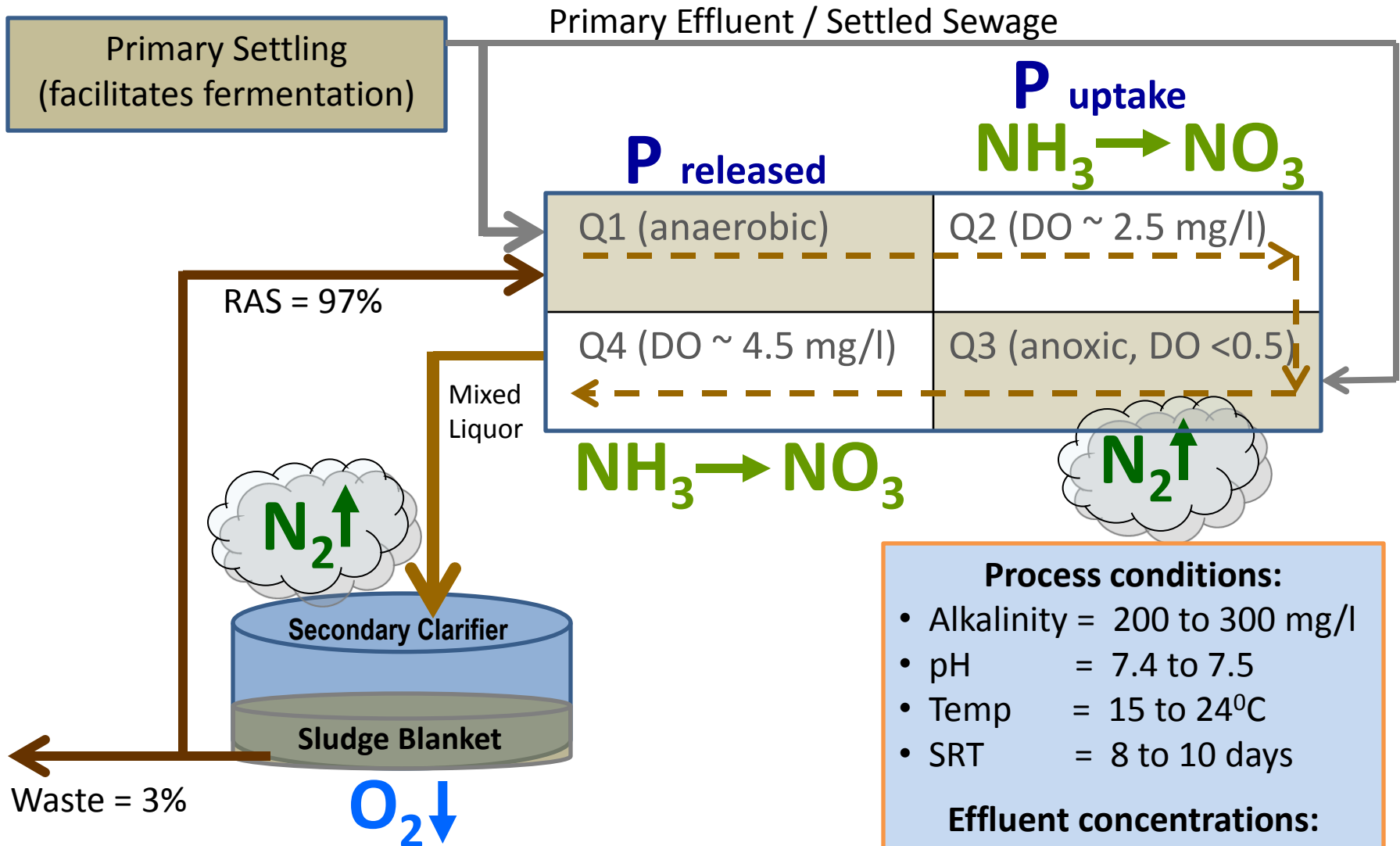


* Facilities added in 1979

(1979 cost approximately \$145M or \$480M in 2009 dollars)



Four-Stage Step-Feed BNR Process



Process conditions:

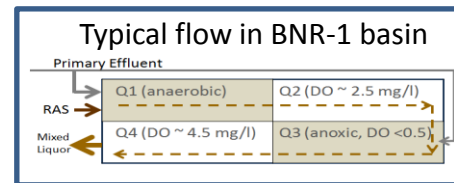
- Alkalinity = 200 to 300 mg/l
- pH = 7.4 to 7.5
- Temp = 15 to 24°C
- SRT = 8 to 10 days

Effluent concentrations:

- TN = 12 to 16 mg/l
- TP = 0.5 to 1.1 mg/l

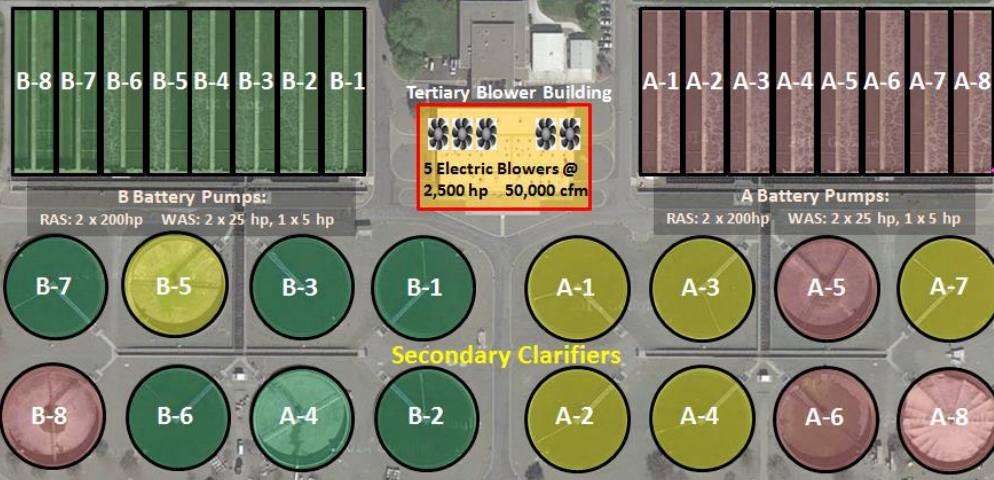
Facility has 2 BNR Areas

- Both areas are divided into A & B Batteries
- Each Battery has 8 Aeration Basins
- Basins are divided into 4 “Quad Tanks” (Q1 thru Q4)
- Anaerobic first Quad (Q1) serves as a “selector” that favors nitrifying bacteria.



BNR-2 “Nitrification Area” inaugurated in 1979

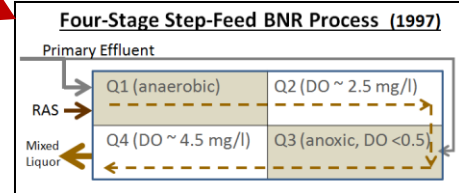
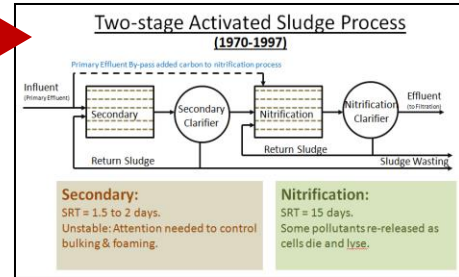
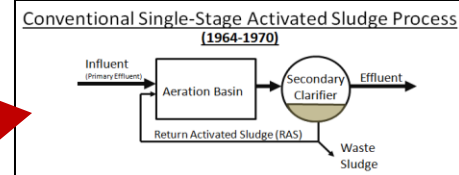
BNR-2 “Nitrification” Aeration Basins



BNR-1 “Secondary Area” inaugurated in 1964



Key Lessons Learned Over the Decades



Year	Change or Addition	Improvement
1964	Secondary (BNR-1) Area in Operation	Bay didn't stink as much, but aeration required much energy.
1979	Nitrification (BNR-2) Area in Operation	Bay stopped stinking altogether, but more energy required.
1980-1984	More electric blowers added	This increased treatment capacity because the Facility could not keep up with Summer-time demand.
1997	Converted to hybrid BNR process	Aeration became stable & efficient. - SRT of 8-10 days seems optimal. - Nutrients removed.
2002	Fine bubble diffusers tested	Aeration efficiency improved (50% less air required).
2003	Switched from EPDM rubber to polyurethane fine bubble diffuser sleeves	Polyurethane increased diffuser life from one to over three years.
2004	Different sizes of openings were tested in fine bubble diffusers from 1 to 6 mm	Smaller openings (1 to 2 mm) provide optimal aeration efficiency.
2009	Long (4') fine bubble diffusers tested	Long diffusers improve aeration but disrupt circulation. Short (2') diffusers provide optimal mixing.
2009-2011	Basins taken out of service for installation of automated valves, new butterfly valves, & stainless steel piping	Improved valve control saves energy.
2010	Pulse aeration tested	Pulse aeration saves energy in the aeration basins. - Pulsing mixed liquor channels disrupted TSS meters & was ceased. - Pulsing increases TSS and pin floc, but acceptable trade-off.
2013	Monitoring of electrical loads now tracked at each Motor Control Center (MCC)	Now able to accurately track power use.

Typical number of blowers needed at peak load

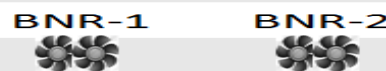
1979-1984



1997-2002



2002-Present





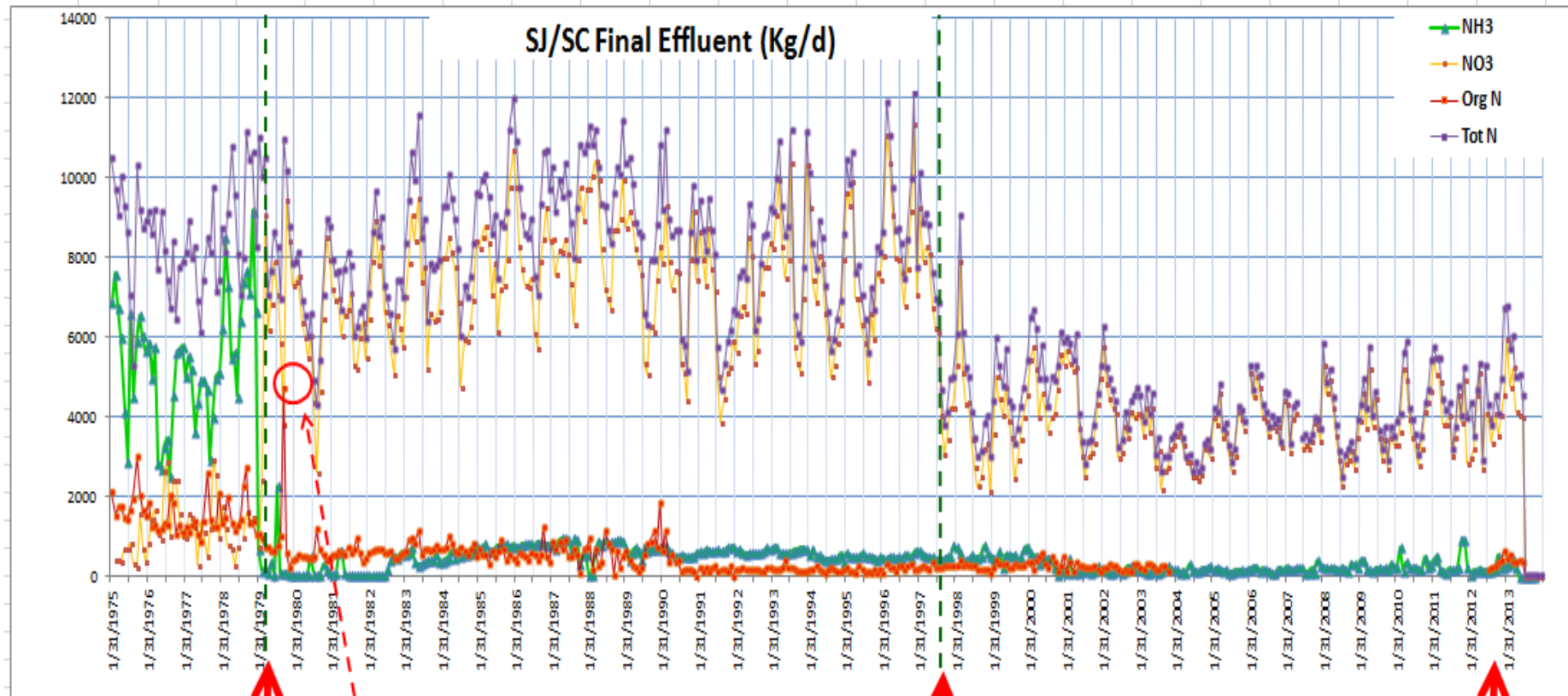
San José-
Santa Clara
Regional
Wastewater
Facility

Service Population: 1,400,000

Grams of nutrient
per capita in effluent

N 3.8g

P 0.2g



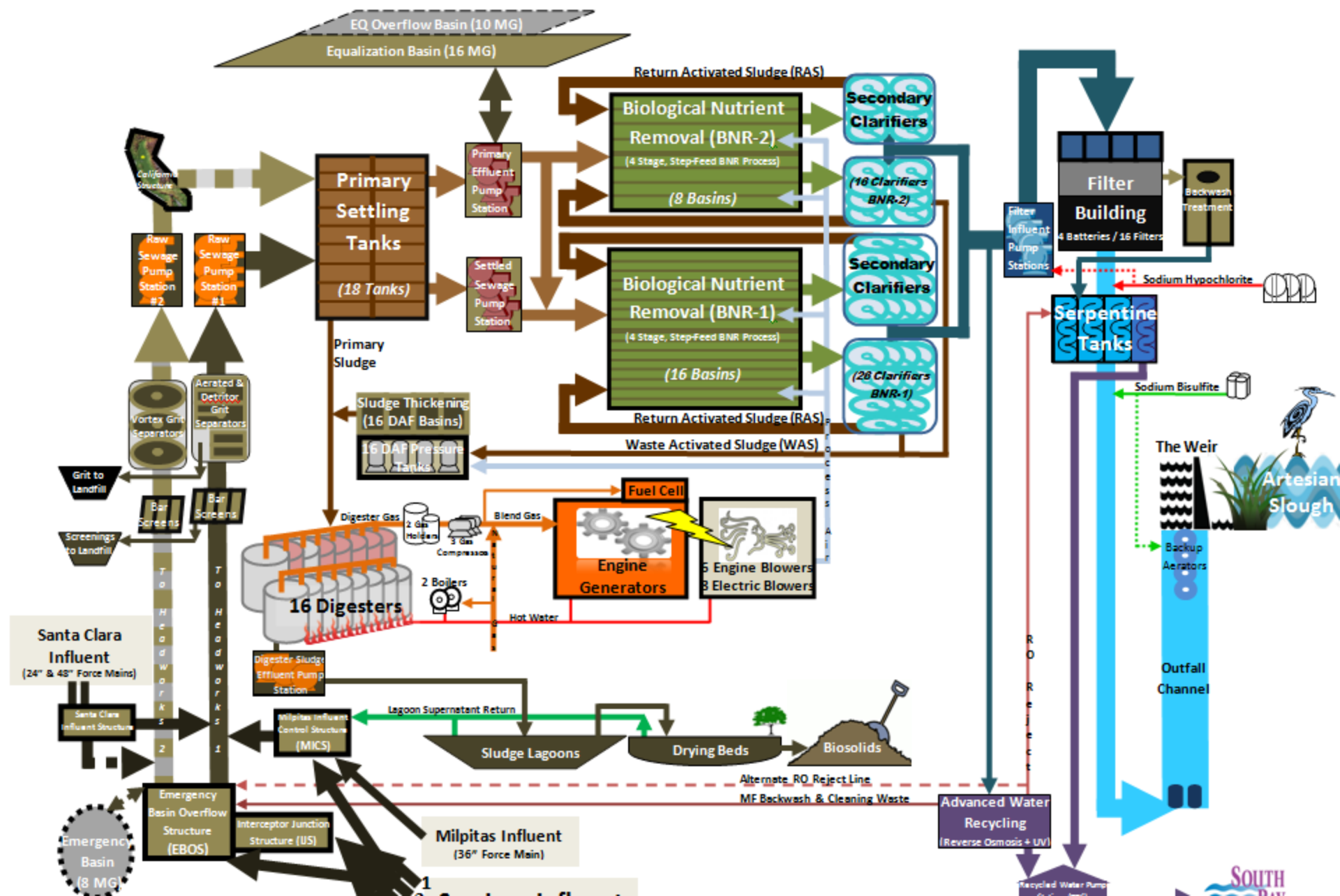
Feb 1979: San Jose implemented nitrification and filtration. NH3 was converted to NO3 in Plant.

San Jose suffered two huge bulking and bypass events in Sep 1979 and Aug 1980. The 1979 incident affected N loads

San Jose implemented BNR process in July 1997.

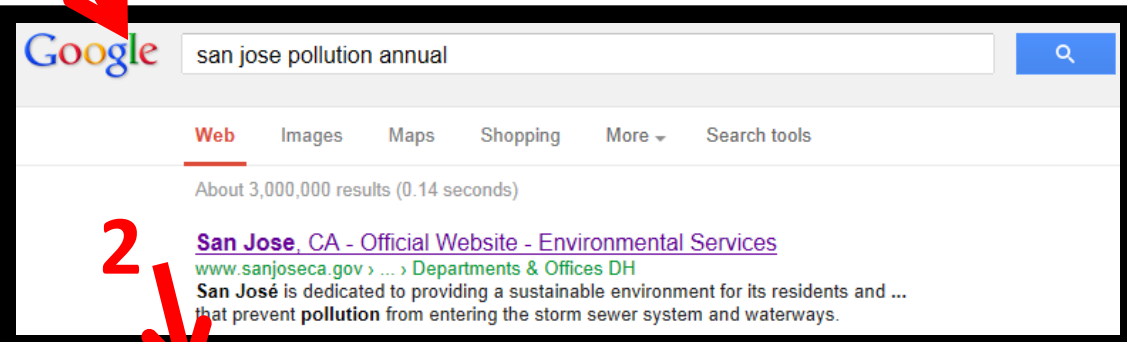
We are now measuring N using nutrient 13267 parameters. This recommended measurement of Organic N for first time since 2003.

Process Schematic

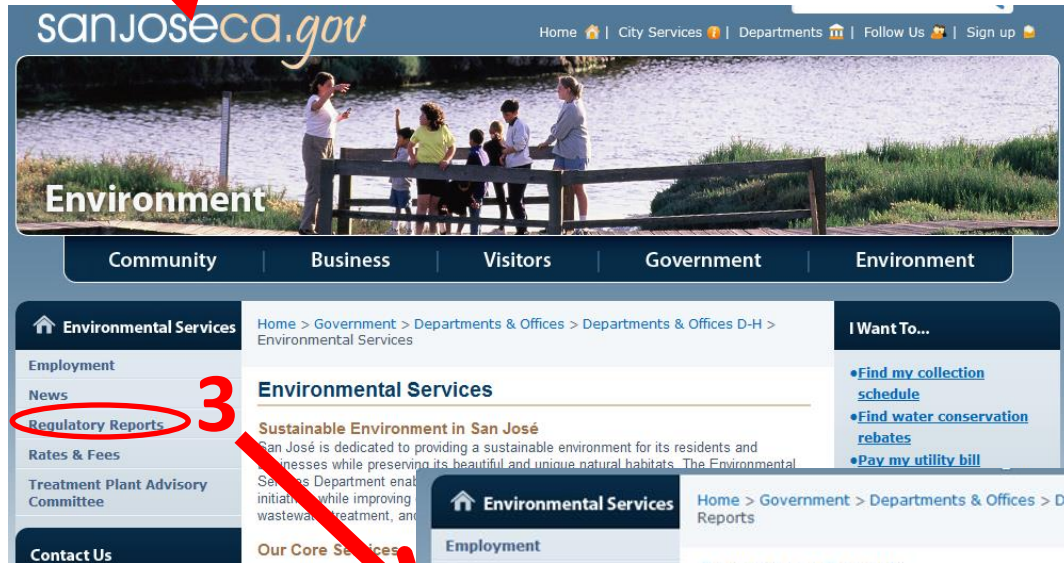


Would you like to know more?

1



2



3

4

