BACWA Nutrient Infoshare 1
Adventures in Optimization @ the San Jose / Santa Clara Regional Wastewater Facility (RWF)

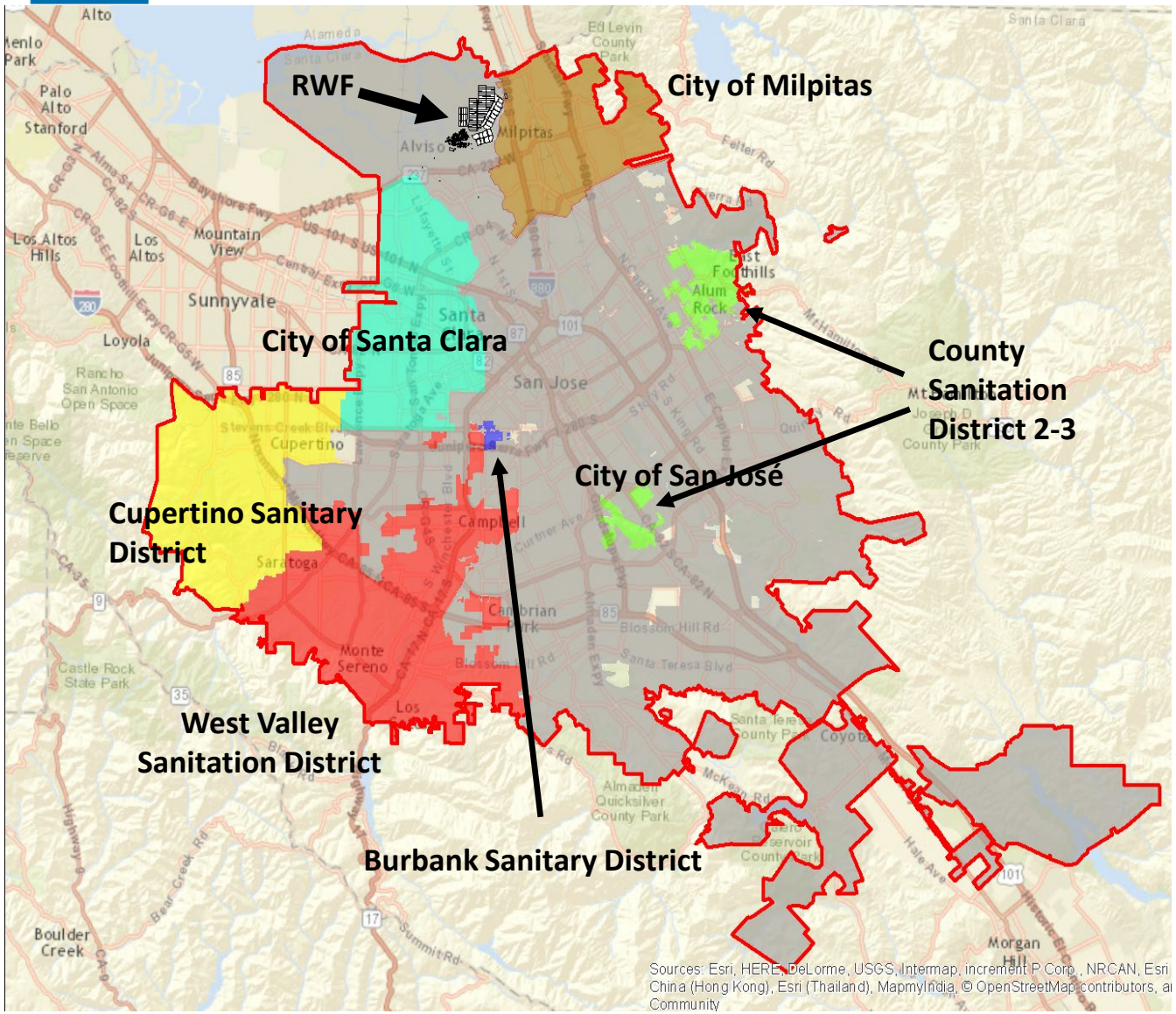
June 1st 2026

San José-Santa Clara Regional Wastewater Facility

The Lower South San Francisco Bay

Three wastewater treatment plants discharge to the lower South San Francisco Bay

San Jose – Santa Clara Regional Wastewater Facility



- Second-largest advanced wastewater treatment facility on the West Coast
  - 167 MGD capacity
  - ~2,600-acre site
  - ~ 210 acres inside the fence line, including new process areas
- Serves
  - ~1.4 million people
  - ~17,000 businesses
  - 8 cities & County areas
  - More than 2300 miles of collection system with 27 lift stations

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Regional
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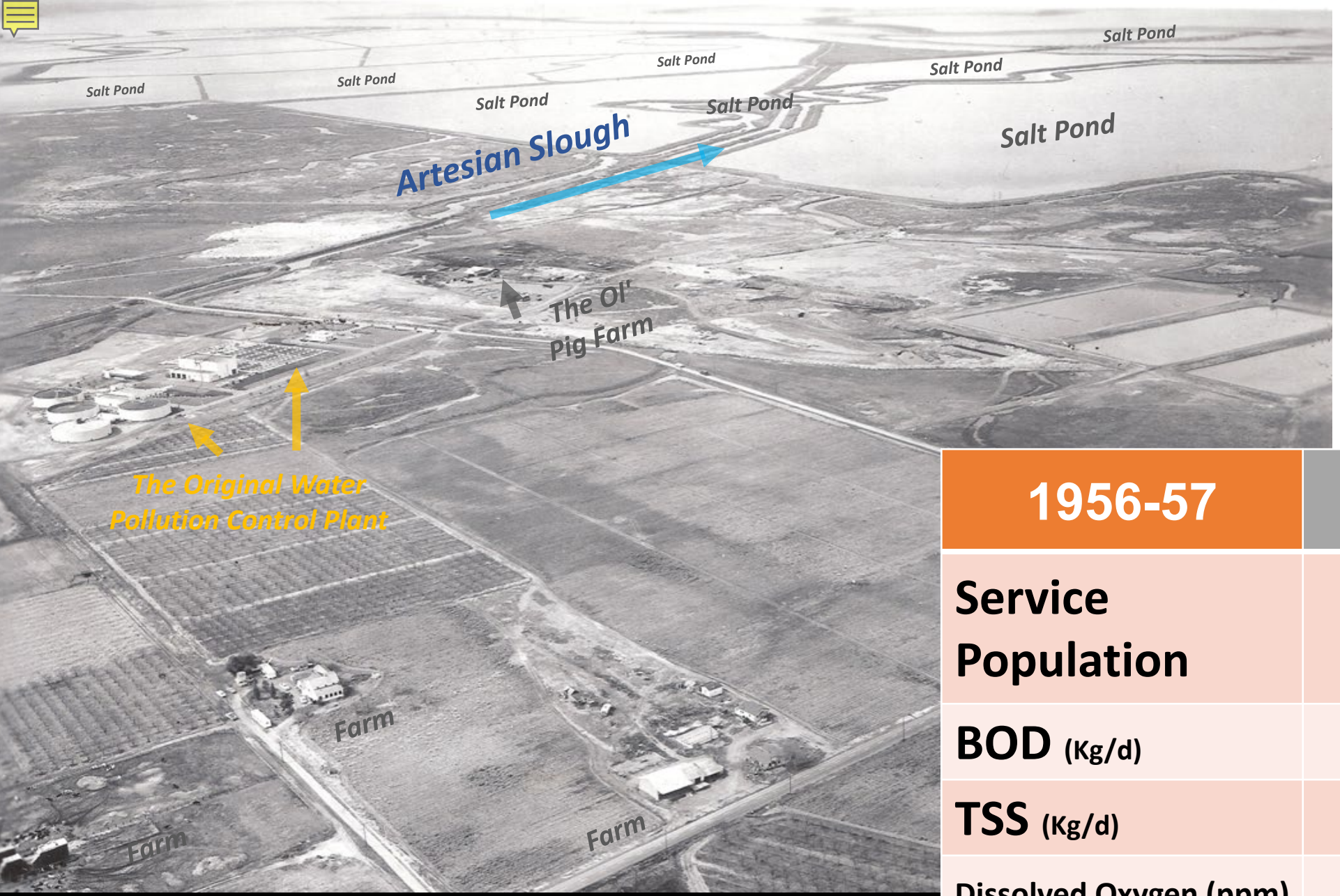
Facility



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1956-57	Then	Now
Service Population	380,000	1,430,000
BOD (Kg/d)	47,000	1,300
TSS (Kg/d)	25,000	600
Dissolved Oxygen (ppm)	< 1.0	> 6.2
Ammonia (ppm)	> 60	< 2.0

Wastewater Treatment Eras

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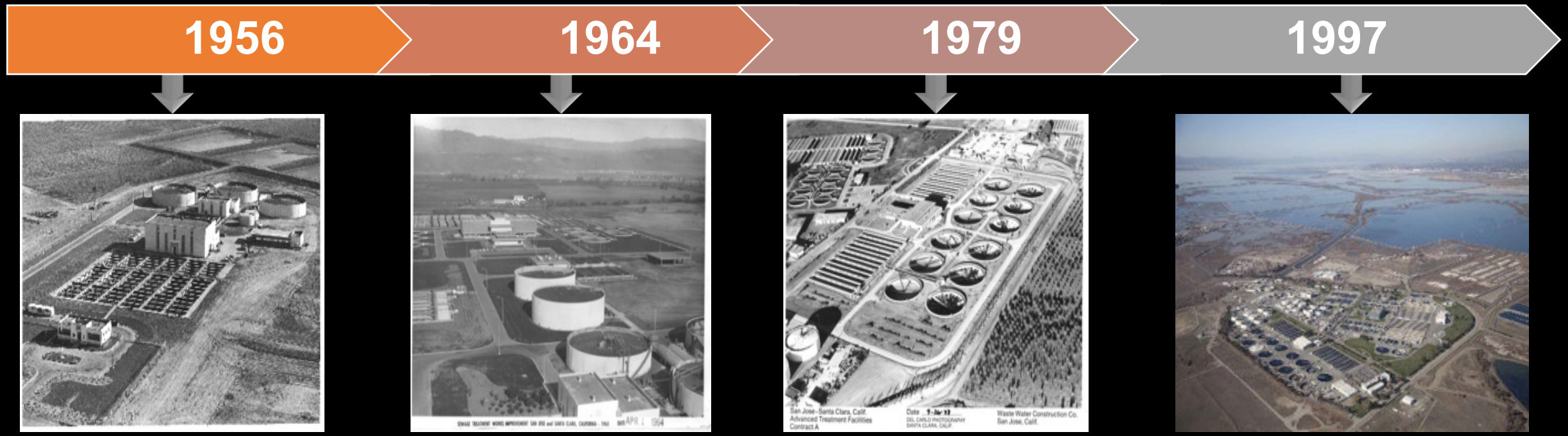
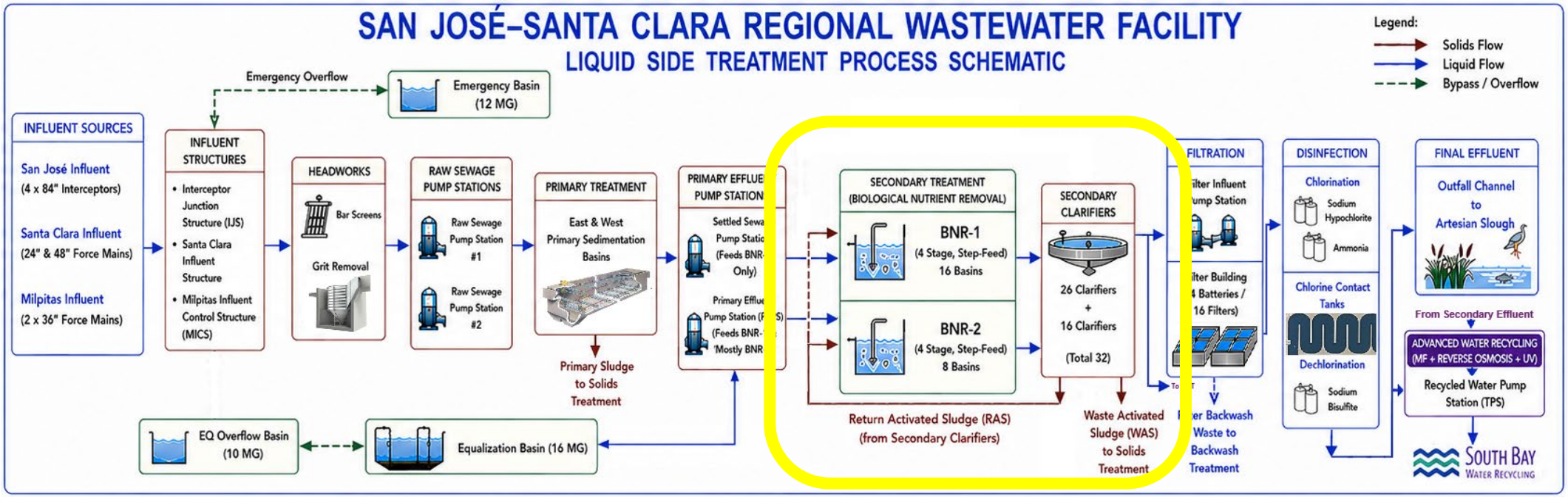
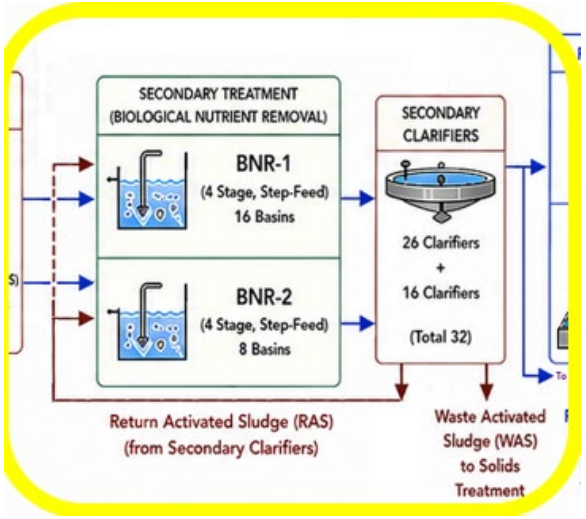
- **1957-1964**: primary treatment – ~ 50% BOD reduction
- **1964-1979**: secondary treatment - >90% BOD reduction
- **1979-1997**: tertiary/advanced treatment - >90% BOD reduction and >80% nutrient reduction
- **1997-NOW**: Biological Nutrient Removal (BNR) - >90% BOD reduction and >80% nutrient reduction AND energy savings by combining two biological systems into one



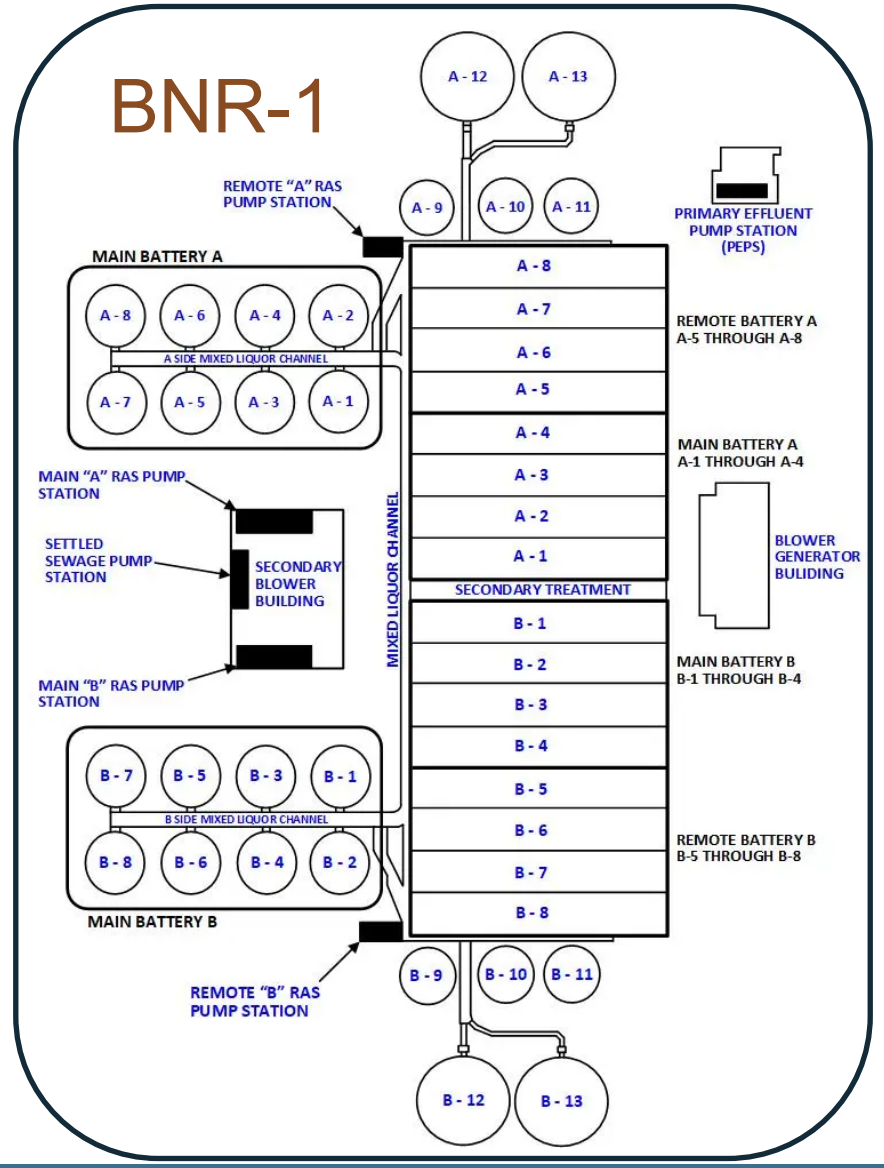
Simplified Process Flow Diagram

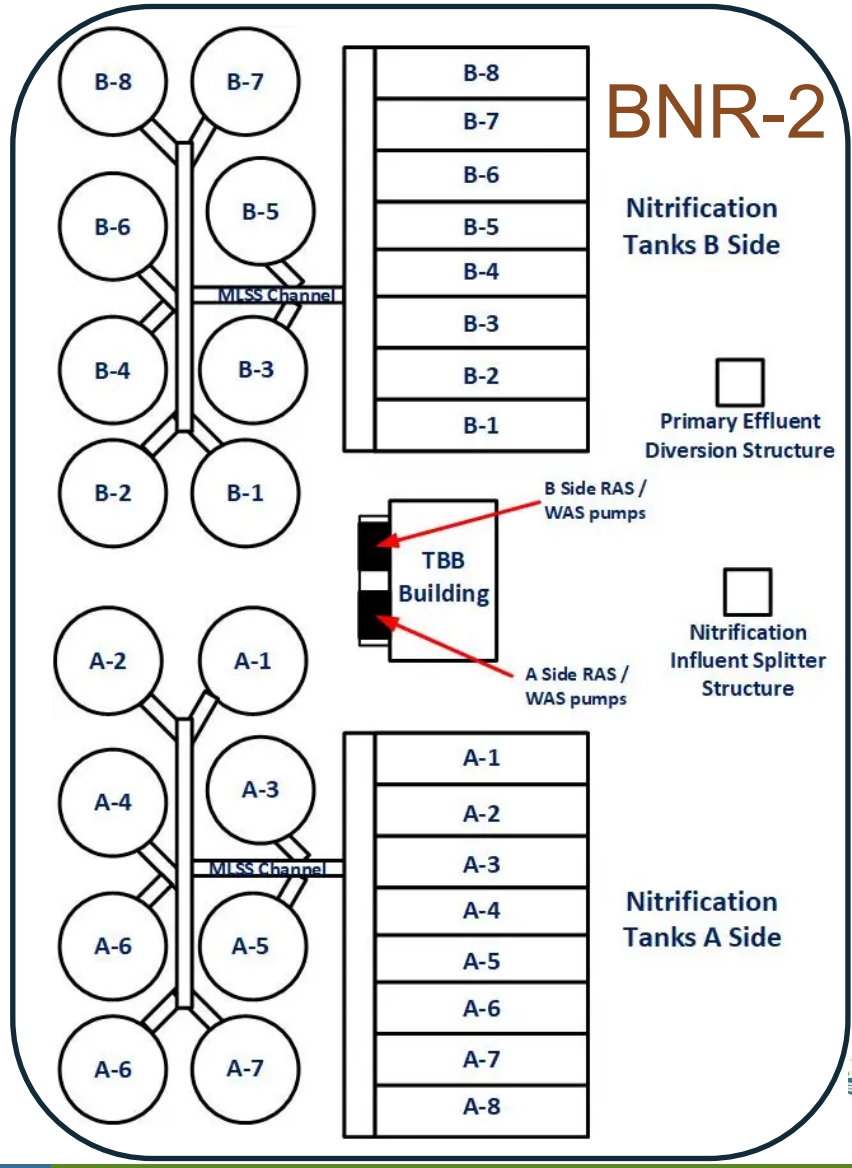


BNR at the RWF – A Closer Look



- Schematic views of the RWF's parallel BNR treatment processes.
- Primary Effluent Flow is typically split between the two, with BNR-1 @ ~60% and BNR-2 @ ~40%.





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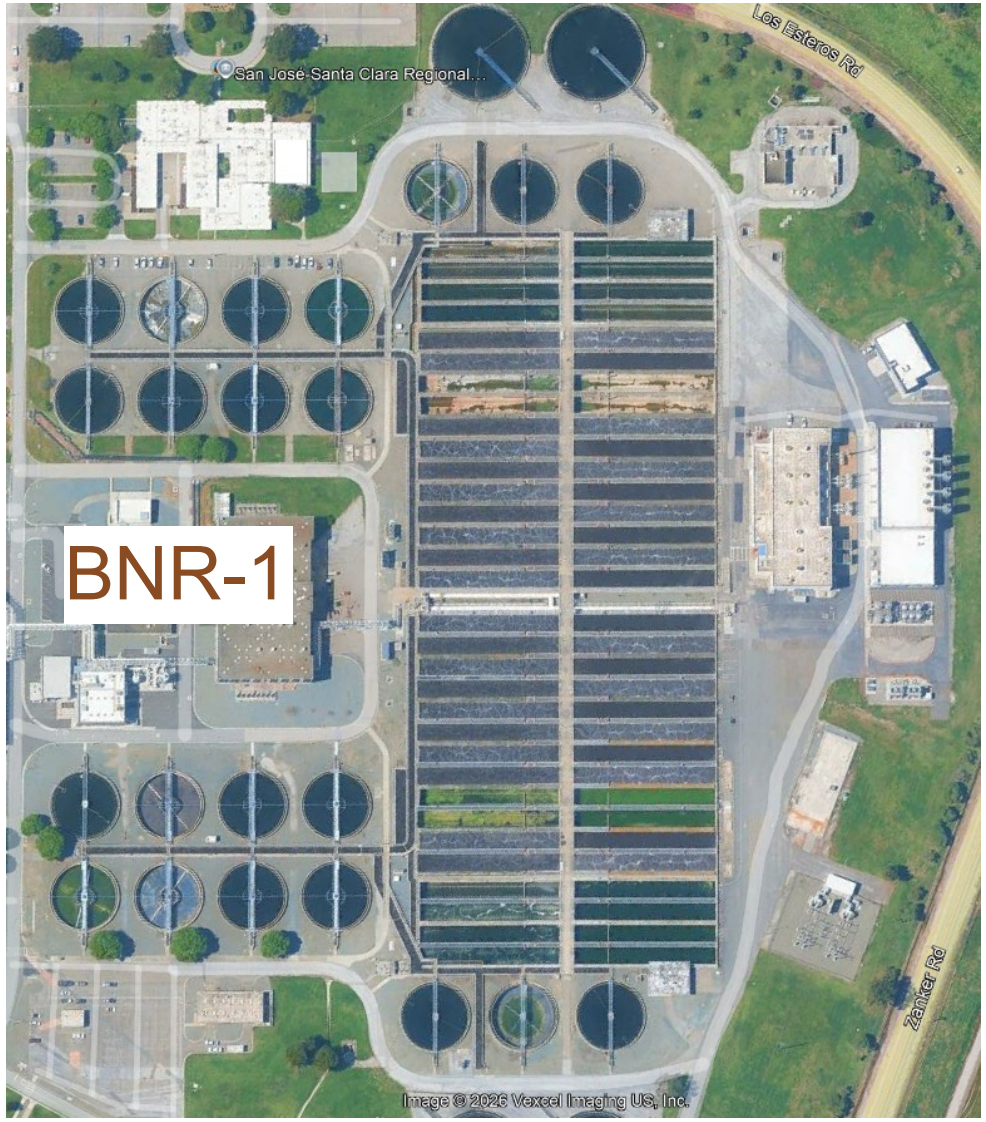
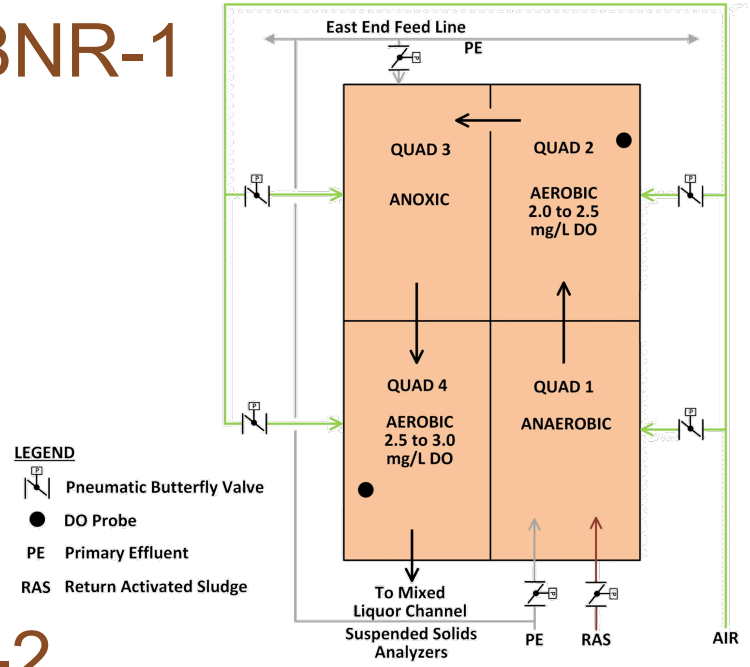
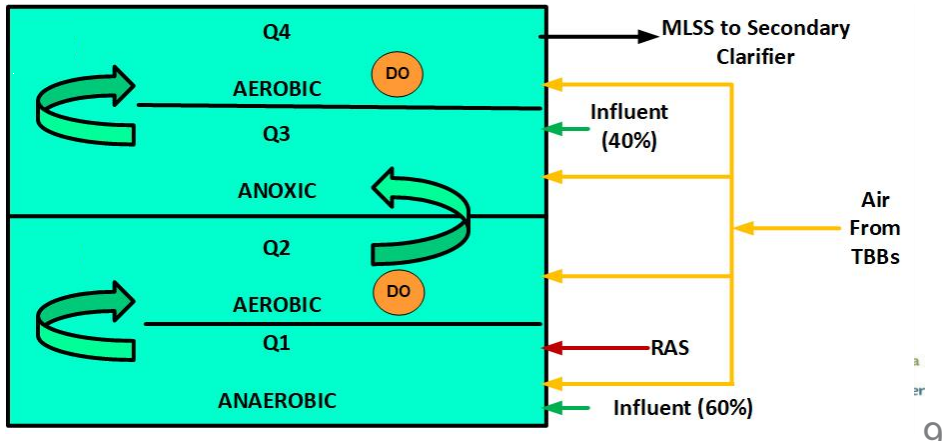
Aeration Tank Systems for both BNR-1 and BNR-2



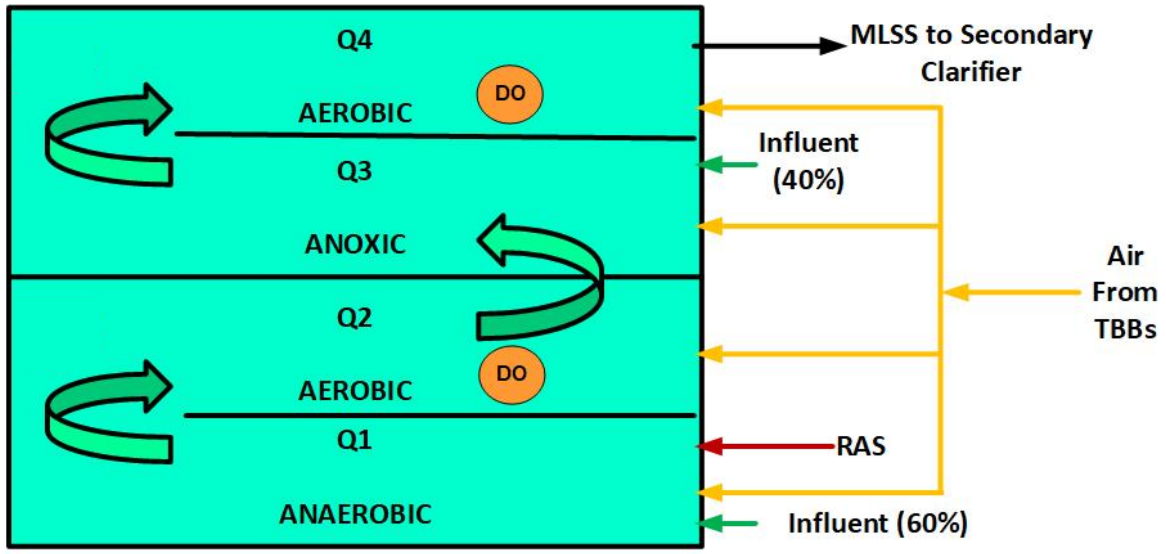
BNR-1



BNR-2

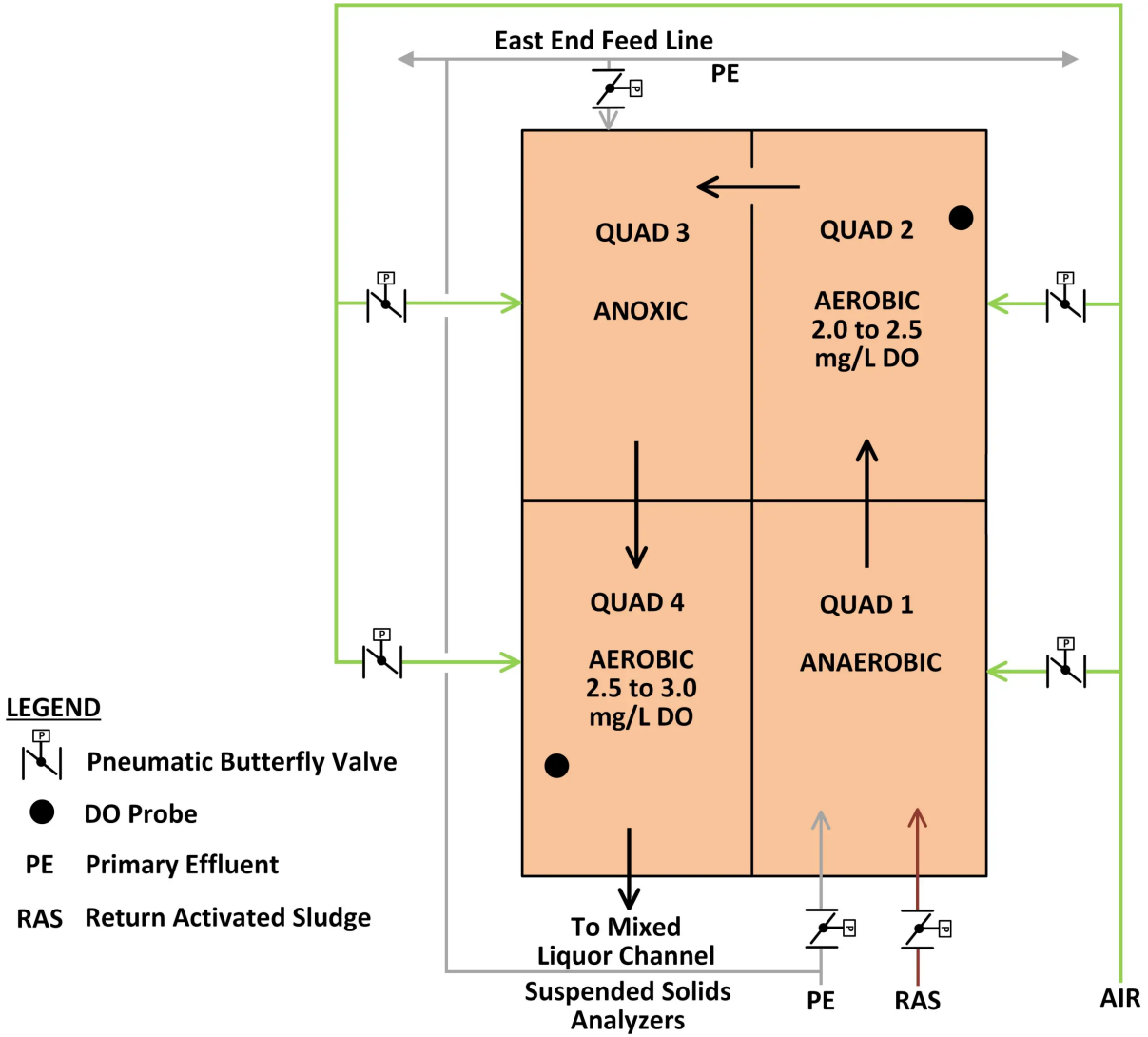


BNR Effluent Quality vs kg/day TIN



- Ammonia NH_3-N = <0.2 – typically **<0.1**
- Complete nitrification
- Nitrite, NO_2 = <0.2 – typically **<0.1**
- **Nitrate, NO_3 <14.0 – typically <12.0**
- [Q (110) X conc (12.0) X 8.34]/2.2=5004kg/day
- Current interim limit = 6400, ok for now
- The RWF adds a few parts of ammonia for *Chloramination* during disinfection
- Final limit* is 5000 kg/day, and the RWF will not be able to meet the final limit under the current configuration.

What the RWF has done in recent memory



- Take a look at the process air supply to all 4 quads. The RWF uses air to mix instead of mechanical mixers…
- Energy is at a premium, and in the late 2000s, the DOE was offering grants to come up with ways to save energy… So…
- Pulse air was applied in the anoxic and anaerobic zones where only enough air at specific intervals (on-3mins/off-5) was/is added to keep flocs in suspension.
- Settling rates were analyzed to ensure sludge did not accumulate in these zones.
- What could go wrong?
- **Is it worth it? We do not have a permit limit for phosphorus**

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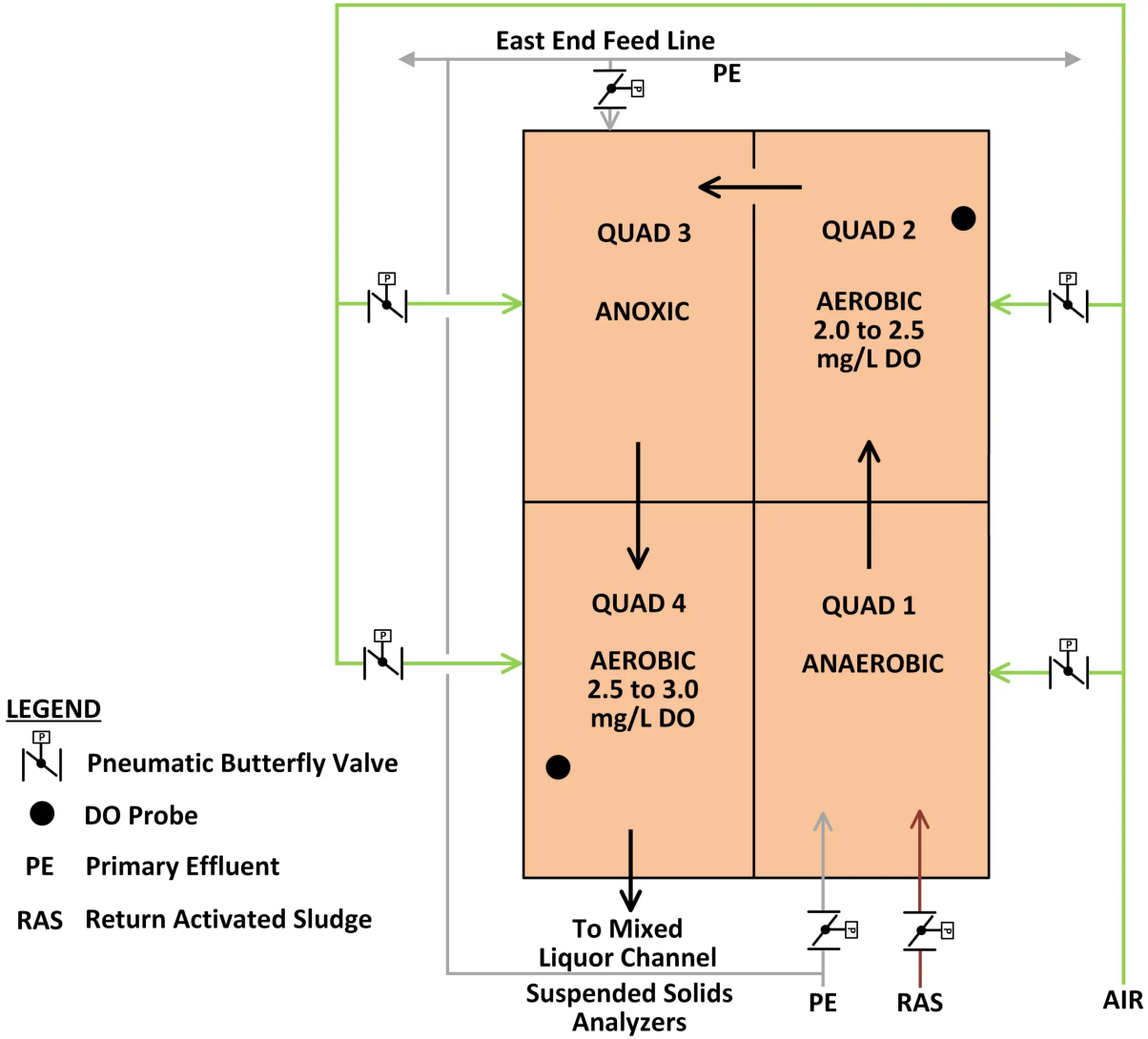
What the RWF has done in recent memory



- The RWF has very long mixed liquor channels that convey process to the clarifiers in each BNR system.
- These channels are also mixed using course bubble diffusers.
- Air has been decreased to reduce some nitrate with modest success.
- Unintended consequences for energy/nutrient optimization…
- Phosphate, PO4, has been a challenge due to the size of the anoxic/anerobic zones.
- These zones are 50% of the overall treatment train capacity…
- Struvite has been a challenge since the conversion to BNR and even more so when efforts to remove more nitrogen have been implemented…

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Only so much we can do…for now

- The RWF has adjusted DO targets, both lowering setpoints and changes to the levels in specific oxic zones.
- The RWF has adjusted mixed liquor channel air flows
- The most significant impacts have been the move from static air mixing (air supplied all the time to anoxic and anaerobic zones) to pulse air mixing.
- The unintended consequences have hit the RWF hard. Struvite is now a greater challenge due to the maximum phosphorus uptake resulting from these changes and the size of the anoxic and anaerobic zones.
- More tests to come, AND ABMP

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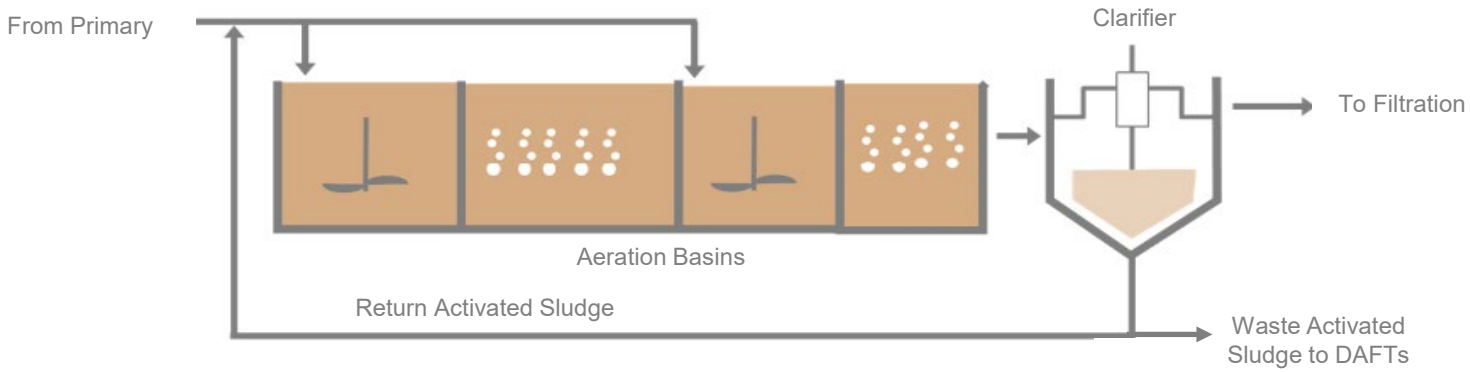
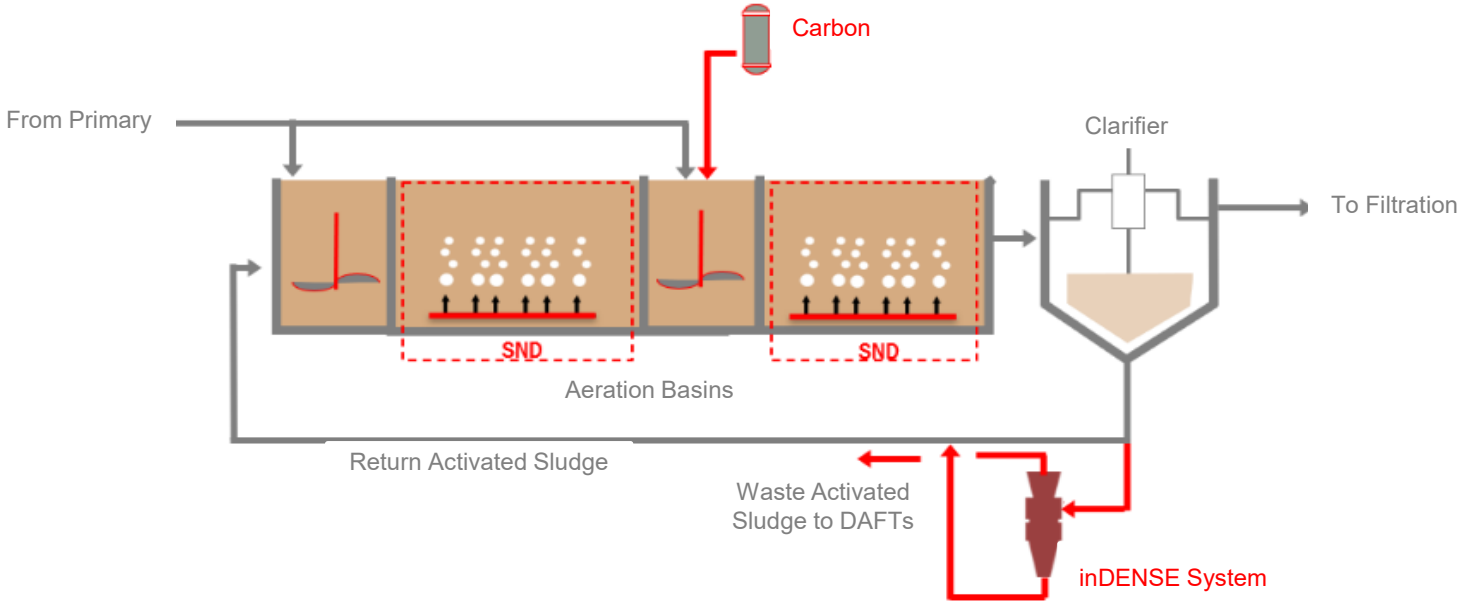
Existing and Future Secondary Treatment Process Schematic

Existing



Future

Process modifications in red are required to meet the new nutrient watershed permit.



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Use the resources – Thanks BACWA

BACWA BAY AREA CLEAN WATER AGENCIES

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NUTRIENT REMOVAL IN BAY AREA WATER RECLAMATION FACILITIES
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PRESENTATIONS

Workshop Booklet & Agenda

1 – Introductory and Concluding Remarks

2 – San Francisco Bay Nutrient Watershed Permit

3 –Developing a Nutrient Management Strategy or Roadmap

4 – Nitrogen Removal Fundamentals

5 – Split Treatment Nutrient Reduction at Sunnyvale

6 – USD Enhanced Treatment and Site Upgrade Program (ETSU) Program

7 – Hayward Water Pollution Control Facility Upgrades

8 – MABR design at Windsor WRF, CA

9 – Palo Alto Regional Water Quality Control Plant Secondary Treatment Upgrades

10 – Wastewater Intensification at a Large Municipal Airport

11 – DEMON Sidestream Treatment at Sunnyvale

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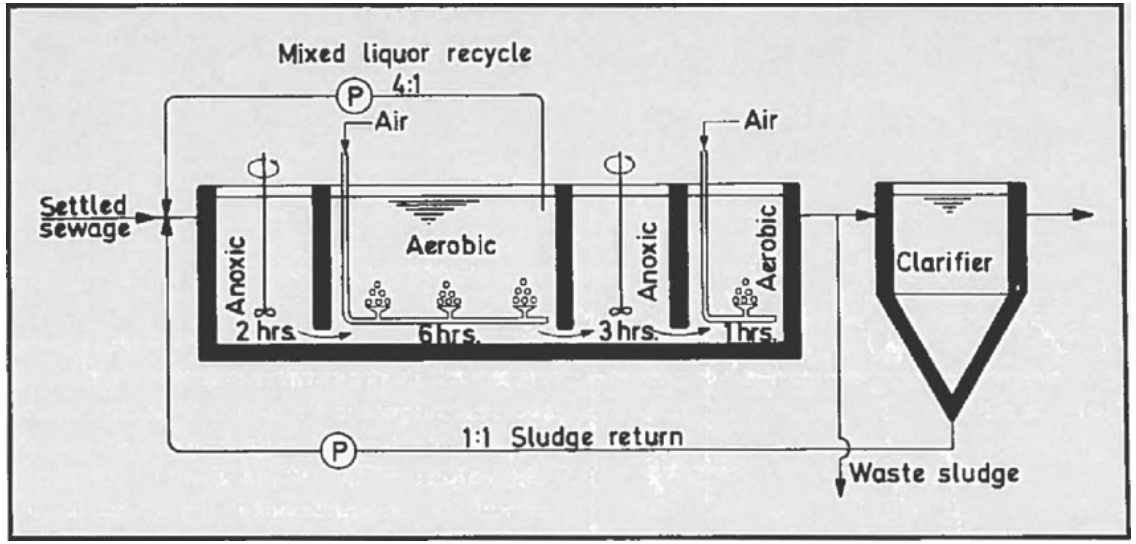
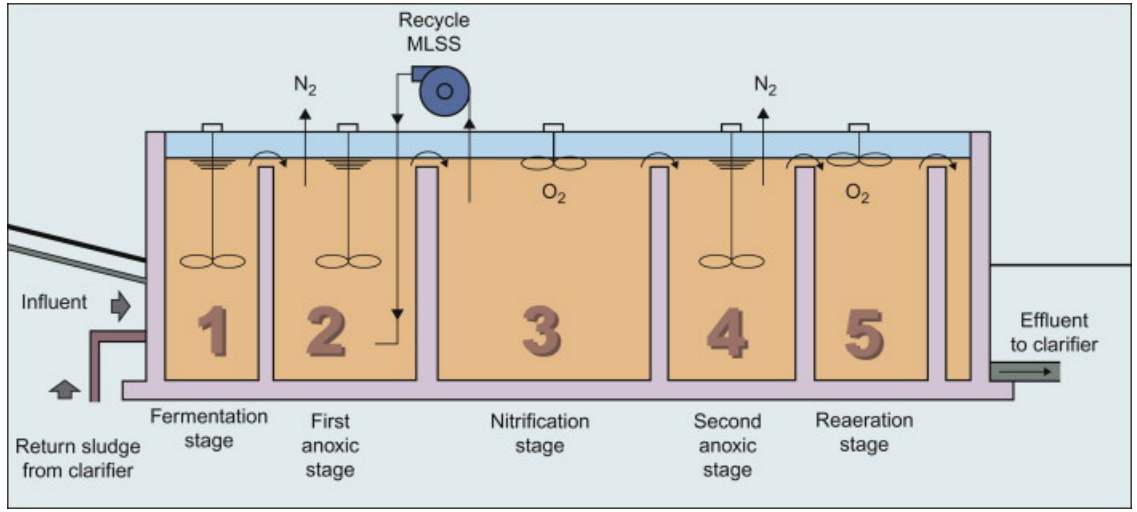
OR…


Mixed liquor recycle
4:1
P
Air
Air
Settled sewage
Anoxic
Aerobic
Anoxic
Aerobic
Clarifier
2 hrs.
6hrs.
3 hrs.
1hrs.
P
1:1 Sludge return
Waste sludge


Recycle MLSS
N_2
N_2
O_2
O_2
Influent
1
2
3
4
5
Effluent to clarifier
Return sludge from clarifier
Fermentation stage
First anoxic stage
Nitrification stage
Second anoxic stage
Reaeration stage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