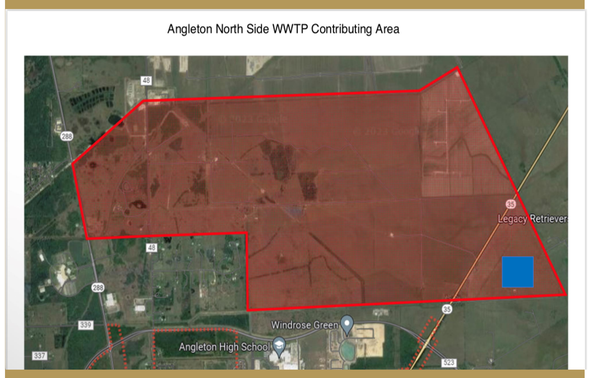
C2-06: City of Angleton Wastewater Treatment Plant

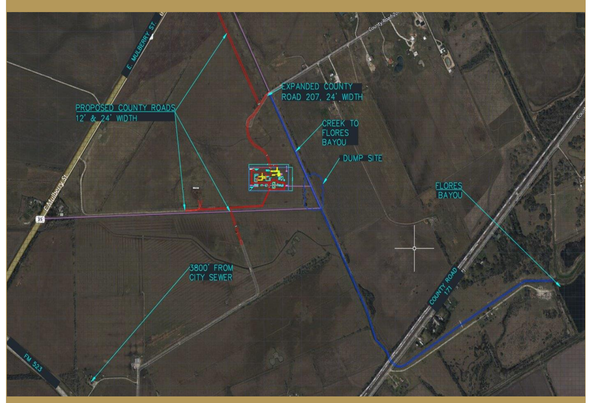
Caden Smith, Shawn Jasso, Jordon Gallego

Sponsored by: HDR Inc. - Todd Warrix

Problem Summary



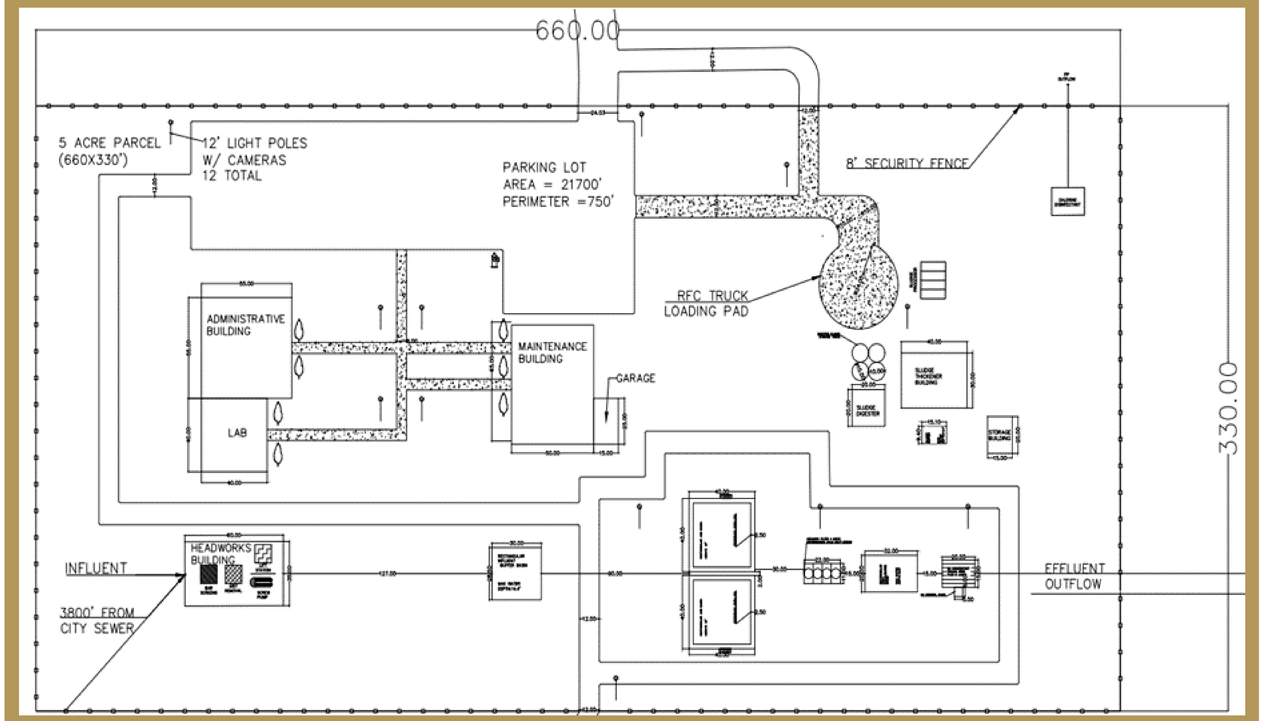
Due to Houston's expanding metropolitan area, the City of Angleton expects major growth in a mapped-out area north of the city over the next 40/50 years, necessitating a new wastewater treatment plant.



Standards & Guidelines

- TCEQ Chapter 217 (Design Criteria)
- TCEQ Chapter 309 (Effluent limitations)
- TCEQ Chapter 312 (Sludge Use, Disposal and Transportation)
- TCEQ Chapter 290 (Public Water Systems)
- Fundamentals of Hydraulic Engineering Systems 5th Ed. (Houghtalen, Akan, Hwang)

Engineering Solution



- Population Modeling and Forecasting.
- Design of AGS reactors that have superior treatment efficiency, compact design, and lower energy consumption.
- Gravity Sewer Main vs. Force Main.
- Site Security & Layout.

Future Expansion

1st Phase: Starting @ 500,000 GPD with one AGS reactor fully running with a back-up.

2nd Phase: Back-up reactor fully running with flow ranging from 1-1.5 MGPD.

3rd Phase: Introduces Chlorine & Purple Pipe System.

50 yr. Future: Room to accommodate additional reactors and odor control assets once surrounding area is further developed.

Aerobic Granular Sludge

System Features and Advantages

- Optimal biological treatment is accomplished in one effective aeration step
- Settling properties at SVI values of 30-50 mL/g allow MLSS concentrations of 8,000 mg/l or greater
- 25% of the footprint compared to conventional activated sludge systems
- Energy savings up to 50% compared to activated sludge processes
- No secondary clarifiers, selectors, separate compartments, or return sludge pumping stations
- Proven enhanced nutrient removal (ENR)
- Robust structure of granule withstands fluctuations in chemical spikes, load, salt, pH and toxic shocks
- Significant reduction of chemicals for nutrient removal due to the layered structure and biopolymer backbone of the granule
- Ease of operation with fully automated controls
- Lowest life-cycle cost

Typical Applications

- Retrofit of existing tanks to increase treatment capacity
- Upgrade of existing treatment systems to meet BNR requirements
- New construction plants
- Municipal and industrial

SVI$_{30}$ comparison of aerobic granular sludge (left) and conventional activated sludge (right)

Three AquaNereda® reactors show compact design, typically 50% of a conventional plant.

Granule sample following sieve testing at the AquaNereda® demonstration facility, Rockford, IL

Cost & Sustainability

- Cost Analysis

Equipment Median Cost in TX (2022)	
Bar Screens	$ 37,800
Vortex Grit Removal	$ 108,000
Lift Station	$ 481,250
Screw Pumps	$ 75,600
AquaNereda Equipment	$ 2,469,560
Aquadisk Filters	$ 306,680
Sludge Thickener	$ 135,000
Sludge Digestor	$ 540,000
Trojan 3000 UV	$ 207,000
Chlorine Disinfectant	$ 81,000
Administrative Buildings	$ 500,000
Contingency (+/- 20%)	$ 989,000
Total ADJ. 2024	$ 6,361,000

- Envision Sustainability Rating

SILVER
31%