Group C2.02 – Sedimentation Basin Design

Drew Simmonds, Patrick Figueroa, Orlando Torres, and Diego Aguilar
Sponsored By: STV, Felipe Gutierrez, and Keisuke Ikehata

TEXAS STATE UNIVERSITY
Ingram School of Engineering

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Project Overview

- Construction of a groundwater sedimentation basin for a 40 MGD water treatment system. It is to be designed for removal of current contaminants.

Overarching Issues:

- Surplus of Iron & Manganese found in the water.
- Current calcium and alkalinity levels are too low.

Constraints & Standards

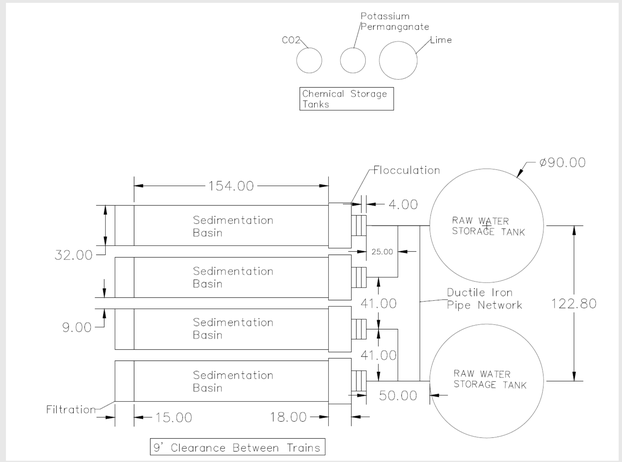
Raw Groundwater vs. Existing San Marcos Water

Parameter	Groundwater	San Marcos
Iron (mg/L)	6 average 10 maximum	<0.1
Manganese (mg/L)	0.1 average 0.3 maximum	<0.005
pH	6	7.8
TDS (mg/L)	190	350
Alkalinity (mg/L as $CaCO_3$)	20	220
Calcium (mg/L as $CaCO_3$)	30	200

- Texas Administrative Code 290.
- TCEQ regulations
- Primary and secondary MCLs followed from EPA for design considerations

Group Photo

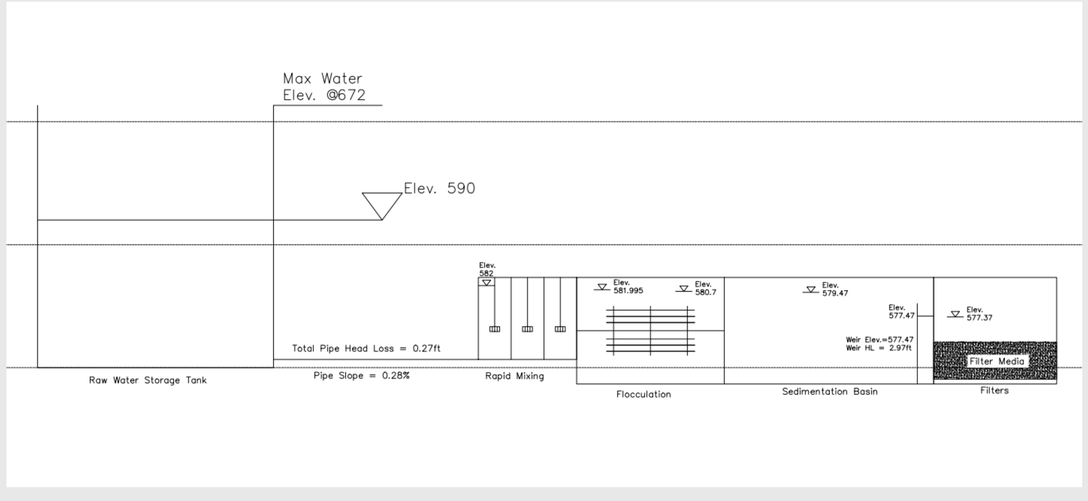
Design Layout



Site layout
(Dimensions in feet)

- Rapid Mixing: 16' x 4' x 10' per train
  - Detention time: 30 seconds per stage
- Flocculation: 18' x 36' x 13' per train
  - Detention time: 30 min per flocculation basin
- Sedimentation Basin: 32' x 154' x 13' per train
  - Detention time: 69.1 min
  - 322 plates
  - 4 train system

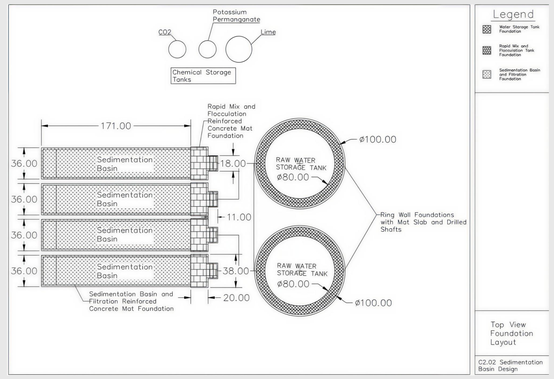
Hydraulic Profile



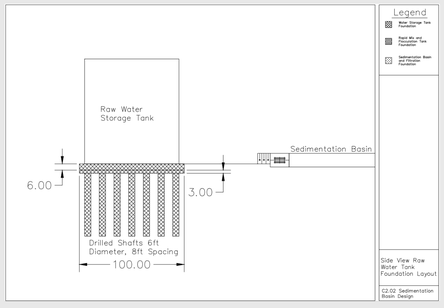
Stage	Head Loss (ft)
Piping	8.37
Rapid Mixing	0.005
Flocculation	2.525
Sedimentation	2.1
Discharge	5
TOTAL	18

We found these Head Loss calculations using:
- Darcy-Weisbach
- Mannings Equation
- Head Loss via Weir

Foundation Design



Top View of Foundations Throughout Site



Side View of Raw Water Tank Foundation

Capital & Life Cycle Costs

COST CATEGORY	CAPITAL COST ($) (2026 $)
Raw Storage Tanks	$ 28,500,000
Rapid Mixers	$ 4,000,000
Flocculation Basins	$ 6,800,000
Sedimentation Basins	$ 40,000,000
Sand Filters	$ 60,000,000
Effluent Tanks	$ 10,000,000
Chemical Systems	$ 8,000,000
Piping/Site Work	$ 40,000,000
Electrical/Controls	$ 25,000,000
Subtotal	**$ 222,300,000**
Engineering & Design (20%	$ 44,000,000
Contingency (25%)	$ 55,000,000
TOTAL PROJECT COST	**$ 321,300,000**

Total Capital Cost

COST CATEGORY	(2026 $)
Capital Costs	$ 321,300,000.00
O&M	$ 432,000,000.00
Replacement Costs	$ 38,000,000.00
TOTAL 30-YR LCCA AMOUNT	$ 791,300,000.00

Total Life Cycle / OEM Cost