DESIGN CHARACTERISTICS

The design flow of the treatment plant was obtained from the flow records of Rausch Creek over a one-year period. An average flow profile of the creek is shown on Drawing No. 6805-P-5. The minimum flow: recorded was three million (3 mgd) gallons and the maximum was thirty-seven million (37 mgd) gallons per day. The yearly average flow was calculated to be six and three-quarter million (6.75 mgd) gallons per day. An analysis of the flows of Rausch Creek is given in the table in the Appendix. An average f3row of ten million gallons (10 mgd) per day was concluded to be a realistic flow to be treated by the plant. The design flow was exceeded on five (5) consecutive days and on a total number of twenty-seven (27) days in one year's measurement. The treatment plant is designed to handle a maximum flow of twenty million (20 mgd) gallons per day during peak flow. If the creek flow exceeds twenty million (20 gpd) gallons per day, (this happened four (4) times during the year's measurements), the excess flow will be detoured from the head works into Parshall Flume No.2 where the waters will receive a sodium hydroxide treatment for neutralization before flowing into the

Polishing Lagoon. It is believed that because of the long detention time in the polishing lagoon, the quality of the effluent water will not deteriorate,

The construction of a storage reservoir at the head of the plant was given some consideration, but it was not deemed necessary to construct it at this t1me. However, the space for the reservoir is provided for at the plant site. It should be constructed at a future date if the flow of the creek would remain above twenty million (20 mgd) gallons per day for a prolonged period.

A sludge settling analysis was performed with the sludge obtained from the "Yellow Boy" pilot plant studies. The results are given in a table in the Appendix and graphically presented on Drawing No. 6805-P-6. The results indicate that the sludge could be reduced to one-fourth of its volume in approximately fifteen (15) hours of thickening. Of course, the sludge was obtained from the operation when a combination of lime and limestone were being used as neutralizing agents.

Design Calculations:

Flash Mixer--

Stream flow	=	10 mgd or 6,944 gpm
Supernatant and Sludge Recirculation	=	133,000 gpd or 92.36 gpm
Total flow	=	7,032 gpm
Mixing time	=	3 minutes
Capacity required (7,032 x 3)	=	21,096 gals.
Volume:		
$\frac{21,096}{7.5}$ =	=	2,820 ft.^{3}

Provide 1 tank = 17' x 17' x 10' deep

Actual Volume = 2,890 ft.^{3}

Equipment = use one 7.5 hp mixer

Aeration Tank

Total flow	=	7,032 gpm
Detention time	=	30 minutes
Capacity required (7,032 x 30)	=	210,960 gals.
Volume:		
$\frac{210,960}{7.5}$ =	=	28,200 ft.^{3}

Provide 2 tanks = 35' x 35' x 11.5' deep

Actual volume = 28,200 ft.^{3}

Equipment = use one 15 hp submerged turbine aerator in each tank. Air to be supplied from 20 hp--375 cfm. blower.

Clariflocculator--

Flow = 7,032 gpm

Flocculator--

Detention time = 30 minutes

Capacity required

(7,032 x 30) = 210,960 gals.

Volume:

$\frac{210,960}{7.5}$ = 28,200 ft.^{3}

Clarifier-overflow rate = 1,100 gpd/ft.^{2}

Required area:

$\frac{10.133 \times 10^6}{1100}$ = 9,200 ft.^{2}

Provide 2 clariflocculators @ 90'-0" diameter with 8.5' deep flocculator baffle @ 45'-0".

Actual flocculation time = 29 minutes

Actual clarifier area = 9,500 ft.^{2}

Detention time @ 12' (side water depth) = 120 minutes

Thickener

Production of sludge = 0.4 gal./30 gals. of water

(re: Yellow Boy Operation)

Quantity of sludge = $\frac{10 \times 10^6 \times 0.4}{30}$

= 133,000 gals./day

Using 10% solid content $= \frac{13,300 \times 62.4}{7.5}$

$= 111,000$ lbs./day

Assume 60 lbs./ft.^{2}/day loading

Required area $= \frac{111,000}{60} = 1,850$ ft.^{2}

Provide 1 tank @ 50' diameter

Actual area $= 1,960$ ft.^{2}

Detention time @ 12' side water depth =

$$\frac{1,960 \times 12 \times 7.5 \times 24}{133,000} = 31.8 \text{ hours}$$

After thickening, the sludge would be pumped either into tank trucks for hauling to the disposal site or into a sludge holding pond for temporary storage.

First Sludge Holding Pond--

Quantity of thickened sludge =

$0.35 \times 133,000 = 47,000$ gpd.

Assume a 3-day retention period.

Required volume

$$\frac{47,000 \times 3}{7.5} = 18,800 \text{ ft.}^3$$

Provide one pond 100' x 40' x 5' deep $= 20,000$ ft.^{3}

Second Sludge Holding Pond--

Assume a 30-day retention period.

Volume $\frac{47,000 \times 30}{7.5} = 188,000$ ft.^{3}

At 5' depth, required area =

$$\frac{188,000}{5} = 37,600 \text{ ft.}^2$$

Provide one 200' x 200' x 5' deep pond.

Polishing Lagoon

Flow = 10 mgd

Retention time = 1 day

Required volume = $\frac{10 \times 10^6}{7.5}$ = 1,333,000 ft.^{3}

Two polishing lagoons are provided:

Volume of Lagoon No. 1	920,000 ft.^{3}
Volume of Lagoon No. 2	492,000 ft.^{3}
TOTAL	1,412,000 ft.^{3}