

ABA-50

Revision 1

STUDY OF SEWERAGE ALTERNATES
FOR THE
STANFORD LINEAR ACCELERATOR CENTER (SLAC)

REPORT TO STANFORD LINEAR ACCELERATOR CENTER - NO. ABA-50
STANFORD UNIVERSITY SUBCONTRACT S-128
UNDER AEC CONTRACT AT(04-3)-400

Submitted by W. B. Biebesheimer
W. B. Biebesheimer

Approved by R. L. Sharpe
R. L. Sharpe

AETRON-BLUME-ATKINSON
A Joint Venture
ARCHITECT-ENGINEER-MANAGER

1455 California Avenue
Palo Alto, California

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General

Several means of sewage and waste disposal have been suggested and considered for the SLAC project. These means generally fall into two groups:

- I. Connection to a publicly owned and operated sewer system.
- II. Construction of a private disposal or treatment plant.

Discussion

Numerous group II devices are available of proven reliability. However, all of the group II devices require disposal of an effluent either by direct discharge to a stream or by percolation into the ground. The cost of the group II devices depends upon the requirements for the quality of the effluent. Because of the location of San Francisquito Creek, any effluent which must be discharged into it would have to be practically of domestic quality.

The State Water Pollution Board which must approve the designs of all sewage treatment plants has issued permits for only two such plants in Santa Clara County, one at Gilroy and the other at Morgan Hill, and then only after exhaustive efforts would indicate no other solution. The Board's recommendations in general favor direct connection to a public sewage system whose effluent discharge is already approved. In addition to the State Water Pollution Board, approval would also be required of the Santa Clara County Public Health Department, San Mateo County Public Health Department and the Stanford University Board of Trustees. Probably a year or more could be used up in canvassing these bodies for approval with no guarantee of positive results.

Septic tanks are not suitable for large concentrated loads such as exist in the main building complex and were considered only for the isolated sanitary facilities required for the alcoves along the Klystron Gallery. The percolation history, obtained from the San Mateo County Board of Health, of the ground in this area, would indicate the need for extra long leeching lines.

The cost of 30 septic tanks with connecting lines has been estimated at \$1,350 each or \$40,500. A 6" line 10,000 ft. long connecting to the main project sewer system would probably cost \$40,000. Since the terrain for each tank would be different, complete layouts and engineering effort would be required for each location. In addition, even spacing of the septic tanks is not compatible with the plans for the proposed Ladera Flood Control Dam. A sewer line is better adapted than septic tanks to take the peak surges from floor and equipment drains along the Gallery during maintenance operations and emergencies and also permits expansion for industrial wastes or added personnel at proposed takeoff points.

A search of group I possibilities revealed two sources of services.

1. Menlo Park Sanitary District
2. The City of Palo Alto

Since the City of Palo Alto's present policy is to furnish sewerage service only to its water customers and then only at a profit, and since their service involves going outside the city limits and crossing county lines, this did not appear to be a desirable solution.

From the above discussion we can narrow our choices to two:

1. A privately constructed plant with high quality effluent.
2. Connection to the Menlo Park Sanitary District System.

Cost Comparison

The capacity of the plant needed has been estimated at somewhere between 20 and 60 gallons per day per person. We think 40 gpd to be realistic. Using 40 gallons per day per person the sanitary requirements for initial operating conditions with 750 people would be 30,000 gpd. Assuming an industrial waste water load of 50 gpm adds 72,000 gpd for a total of 102,000 gallons per day or 71 gpm. Cost comparison for various plant capacities are given in Table I. In addition to the initial costs shown in Table I, maintenance costs, operating costs, and sludge removal are conservatively estimated at \$500 per month compared to the \$190 per month service charge for 2 million gallons per month by Menlo Park Sanitary District. Table II shows cost of connection to the Menlo Park Sanitary District System for similar capacities based on the schedule now in effect.

Table I
Private Plant Costs

gpd	15,000	30,000	70,000	100,000	150,000
Plant	\$20,000	\$35,000	\$75,000	\$105,000	\$155,000
Excess Line*	3,250	3,250	3,250	3,250	3,250
Land Costs	<u>10,000</u>	<u>10,000</u>	<u>10,000</u>	<u>10,000</u>	<u>10,000</u>
Total Cost	\$33,250	\$48,250	\$88,250	\$118,250	\$168,250

* Represents the additional piping costs required to carry the sewage to the plant site.

Table II
Estimated Connection Costs to MPSD

Annexation Charge (1)	37,500	37,500	37,500	37,500	37,500
Flow Charge (2)	<u>6,000</u>	<u>12,000</u>	<u>28,000</u>	<u>40,000</u>	<u>60,000</u>
Total Connection Charge	\$43,500	\$49,500	\$65,500	\$77,500	\$97,500

(1) \$625 per acre for 60 acres.

(2) 40 cents per gallon per day of estimated flow.

The line size required for both the MPSD extension and the on-site SLAC line to meet it are based on a peak sanitary flow of 2-1/2 times average and a peak industrial flow of 3 times average giving a total maximum flow of 202 gpm. Using modern joint material infiltration can be neglected. The capacity of a 6 inch line for the minimum slope encountered (1/2%) is 180 gpm indicating a need for an 8 inch line. The capacity of the 8 inch line under identical conditions is 390 gpm which is adequate for future requirements. The MPSD estimated connection charges shown in Table II are based on the furnishing of an 8 inch line to the site.

Estimated MPSD Costs to Furnish Service

The following data and calculations were used in the preparation of Table III which shows the estimated cost to the Menlo Park Sanitary District for providing plant and trunk main capacity for SLAC at various flow rates, and a comparison with the present schedule of connection charges (\$625 per acre annexation charge plus \$.40 per gallon of estimated and average daily flow).

Plant valuation \$1,340,000
 Plant capacity 4,000,000 gpd
 Plant valuation/gal. capacity $\frac{1,340,000}{4,000,000} = .335$
 Trunk line valuation 36,000 ft. @ \$30/ft. = 1,080,000
 Trunk line capacity 6,000,000 gpd
 Trunk line valuation/gal. capacity $\frac{1,080,000}{6,000,000} = \$.18$

Table III
 Equitable Connection Charge for Various Flows
 Based on Plant and Trunk Line Valuations

Avg. Flow gpd	15,000	30,000	70,000	100,000	150,000
Pk Trunk	22,500	45,000	105,000	150,000	225,000
Plant Alloc. @ .335	\$ 5,020	10,050	23,400	33,500	50,300
Trunk line @ .18	4,050	8,100	18,900	27,000	40,500
Feeder Line	<u>18,750</u>	<u>18,750</u>	<u>18,750</u>	<u>18,750</u>	<u>18,750</u>
Total	27,820	36,900	61,050	79,250	109,550
Present Schedule for Connection Charge	43,500	49,500	65,500	77,500	97,500

The attached drawing SK 651-001 shows the 60 acre annexation site, the on-site SLAC main sewer, and the MPSD main extension from Junipero Serra Boulevard along Sand Hill Road.

Recommendations

From the preceding discussion and cost comparison, we recommend annexation to the Menlo Park Sanitary District and the use of their sewerage service. The following recap of the advantages are:

- (1) Lowest initial cost at the minimum anticipated load figures.
- (2) Assures adequate sewer service in time to meet project schedules.
- (3) Minimum amount of maintenance.
- (4) Avoids discharge of effluent into San Francisquito Creek.