

# STAGED EXPANSION PROGRAM

*for the*

## STOCKTON REGIONAL WASTEWATER CONTROL FACILITY

*prepared for the*

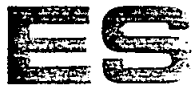
**CITY OF STOCKTON**  
Department of Municipal Utilities  
Stockton, California

30 November 1992

*Prepared by*

**ENGINEERING-SCIENCE, INC.**  
PLANNING • DESIGN • CONSTRUCTION MANAGEMENT  
1301 MARINA VILLAGE PARKWAY, ALAMEDA, CA 94501 • 510/769-0100  
OFFICES IN PRINCIPAL CITIES

ES ENGINEERING-SCIENCE



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30 November 1992

Ref: NC 362

Mr. Morris L. Allen, Director  
Department of Municipal Utilities  
City of Stockton  
2500 Navy Drive  
Stockton, CA 95206

Subject: Staged Expansion Program for City's Regional Wastewater Control Facility

Dear Mr. Allen:

In conformance with your request, Engineering-Science, Inc. is pleased to submit this Staged Expansion Program for the City's Regional Wastewater Control Facility. This work was authorized under the City's Purchase Order No. 45780, dated 8 June 1992.

The Expansion Program has been developed in six stages to achieve a future design capacity of 65 mgd by the year 2000. As requested, the first two stages are presented in detail herein. As presently envisioned, Stages I and II would be implemented by means of seven separate construction contracts, prepurchase of major equipment and several work items to be carried out by the City's staff.

The first two stages are estimated to cost approximately \$42 million out of a total Expansion Program (to 65 mgd) estimated cost of approximately \$158 million. Capacity at completion of Stage II would be 48 mgd.

Engineering-Science appreciates the opportunity to be of service to the City and looks forward to continuing to assist the City in the design and implementation of this important and challenging project.

Very truly yours,

Vinod M. Badani, P.E.  
Project Manager

T.G. Cole, P.E.  
Vice President  
Principal-in-Charge

VB/rd/26-49.R0

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# **STOCKTON RWCF EXPANSION**

## **STAGED PROGRAM**

### **INTRODUCTION**

Stage I and Stage II expansion projects for the RWCF consist of several elements. These elements include: (1) final design (preparation of plans, specifications and estimates); (2) design engineering and support services during construction and contract administration; (3) construction management services; and (4) construction of the facility. Estimated project cost for each stage of construction is provided in Table 1. The following sections describe the staged program for Stages I and II. Stages I and II are developed jointly to ensure the plant capacity will keep pace with projected capacity requirements. Any delay in the start of Stages I and II will result in a cascading short fall of available plant capacity as projected capacity needs increase. Therefore, it is imperative that the first two program stages start concurrently, immediately and remain on schedule as shown on Figure 1. Stages I and II have been further divided into Phases A, B and C, to phase design and construction activities for a "fast track" project. These Phases are described below.

### **STAGE I**

Phase A of Stage I consists of adding a belt filter press and truck loading facility to the existing sludge dewatering building. Phase B consists of adding two new digesters and primary chemical feed system. Phase C consists of adding a gravity sludge thickener and modifying and expanding the trickling filter pump station.

TABLE I

STOCKTON REGIONAL WASTEWATER FACILITY  
CONSTRUCTION STAGING STUDY  
PRELIMINARY PROJECT COST ESTIMATES<sup>(1)</sup>

Item Description	Cost in \$1,000's						TOTAL
	Stage I	Stage II	Stage III	Stage IV	Stage V	Stage VI	
Mobilization/Demobilization	1,000	1,000	400	800	800	800	4,800
Sitework/Yard Piping	1,500	1,300	3,500	1,700	1,700	1,700	11,400
Primary Clarifiers		1,400			800		2,200
Rehabilitation of Existing Primary Clarifiers		1,200					1,200
Chemical Addition Facilities	100						100
Trickling Filter Conversion		2,600					2,600
TFE Pump Station Modifications	1,600	500				500	2,600
Rehabilitation of Existing Power Generation Facilities <sup>2</sup>			[6,700]				[6,700]
River Crossing			2,000	800			2,800
Access Structure to Aerated Basin Pipeline				1,500			1,500
Digesters and Appurtenances	6,500		6,500		6,500		19,500
Sludge Dewatering Facilities	400			1,000			1,400
Sludge Thickener	800						800
Blower Building, Aeration Basins				3,700	3,700	3,700	11,100
Secondary Clarifiers				5,000	5,000	2,000	12,000
Tertiary Expansion				2,000	3,000	3,000	8,000
Electrical	1,000	1,400	500	1,600	1,600	1,600	7,700
Instrumentation	600	800	400	800	800	800	4,200
Power Generation Facilities <sup>2</sup>				[16,700]	[5,100]	[5,100]	[26,900]
Subtotal	13,500	10,200	13,300	18,900	23,900	14,100	93,900
Contingencies 25%	3,400	2,600	3,300	4,700	6,000	3,500	23,500
Subtotal	16,900	12,800	16,600	23,600	29,900	17,600	117,400
Contractor's Overhead and Profit 15%	2,500	1,900	2,500	3,500	4,500	2,600	17,500
Total Construction Cost	19,400	14,700	19,100	27,100	34,400	20,200	134,900
Engineering and Administration	4,900	2,500	2,900	4,100	5,200	3,000	22,600
TOTAL COST PER STAGE	24,300	17,200	22,000	31,200	39,600	23,200	157,500
Cumulative Project Cost	24,300	41,500	63,500	94,700	134,300	157,500	

(1) Cost estimate is based on ENR Cost Index of 6281, 1 September 1992 for San Francisco.

(2) Power generation system costs include; contingencies, contractor's overhead and profit and engineering and administrative costs, and are shown in [brackets] and are not included in the project costs.

## STOCKTON RWCF CONSTRUCTION STAGING STUDY PROJECT DESIGN AND CONSTRUCTION SCHEDULE

PROJECT DESCRIPTION	FISCAL YEAR								
	1992/1993	1993/1994	1994/1995	1995/1996	1996/1997	1997/1998	1998/1999	1999/2000	
<b>STAGE I</b> DESIGN CONSTRUCTION SLUDGE DEWATERING FACILITIES DIGESTERS (2) TF PUMP STATION MODIFICATIONS SLUDGE THICKENER SITE PREPARATION, YARD PIPING ELECTRICAL/INSTRUMENTATION CHEMICAL ADDITION FACILITIES									
<b>STAGE II</b> DESIGN CONSTRUCTION PRIMARY CLARIFIERS (2) BIOTOWER CONVERSION TF PUMP CAPACITY (1) SITE PREPARATION, YARD PIPING ELECTRICAL/INSTRUMENTATION EXISTING PRIMARY CLARIFIER REHABILITATION									
<b>STAGE III</b> DESIGN CONSTRUCTION POND NO. 1 PREPARATION SITE PREPARATION DIGESTERS (2) ELECTRICAL/INSTRUMENTATION [EXISTING POWER GENERATION FACILITIES REHABILITATION]									
<b>STAGE IV</b> DESIGN CONSTRUCTION AERATION BASINS AND BLOWER FACILITIES (5) SECONDARY CLARIFIERS (3) DAF CONVERSION (1) RAS/WAS PUMP STATION SLUDGE DEWATERING FACILITIES YARD PIPING AND RIVER CROSSING ELECTRICAL/INSTRUMENTATION TERTIARY MODIFICATIONS [POWER GENERATION (1)]									
<b>STAGE V</b> DESIGN CONSTRUCTION CONVERT EXISTING SECONDARY CLARIFIERS (2) AERATION BASINS (5) SECONDARY CLARIFIERS (3) YARD PIPING DIGESTERS (2) TERTIARY MODIFICATIONS ELECTRICAL/INSTRUMENTATION CHLORINE FACILITIES [POWER GENERATION (1)]									
<b>STAGE VI</b> DESIGN CONSTRUCTION AERATION BASINS AND BLOWERS (4) SECONDARY CLARIFIERS (1) TF PUMP CAPACITY (1) YARD PIPING TERTIARY MODIFICATIONS [POWER GENERATION (1)]									
PROJECT COST IN \$1,000 (1992 DOLLARS)	1,100	25,100	20,500	23,700	30,100	30,500	22,200	4,300	
PROJECT CUMULATIVE COST IN \$1,000 (1992 DOLLARS)	1,100	26,200	46,700	70,400	100,500	131,000	153,200	157,500	

[POWER GENERATION FACILITIES COSTS NOT INCLUDED]

## **Phase A - Design and Construction**

Phase A consists of extensive additions and modifications to the existing sludge dewatering building so that the facility can accommodate an additional belt filter press, and an expansion of the ancillary mechanical, electrical and instrumentation equipment. As part of this work, the existing belt press must be relocated in the building to accommodate the new press. The design will include preliminary design and preparation of construction plans and specifications, and construction cost estimates.

- 1) Building Modifications.
- 2) Mechanical Equipment (i.e. day tanks, piping, pumps, polymer feed system, sludge conveying and loading facilities).
- 3) Associated electrical and instrumentation work.
- 4) Geotechnical Investigations.
- 5) Surveying.

The City will provide the following:

- 1) Pre-purchased belt filter press.
- 2) Increased Sludge Hauling Contracts.
- 3) Chemical Feed System for existing gravity thickener.
- 4) Sludge Lagoon Dewatering

In addition, the City will prepare a negative declaration for the work of Stage I and II in conformance with the environmental review process .

### **Phase B- Design and Construction**

Phase B consists of two new anaerobic digesters and primary sedimentation chemical feed system. The design will include preliminary design for the new facilities and preparation of construction plans and specifications and construction cost estimates. The design will be accelerated by developing contract documents for two separate construction contracts. Civil and structural design will be completed and released for construction, while contract documents for mechanical, electrical and instrumentation design are being completed.

### **Phase C - Design and Construction**

Phase C consists of a new trickling filter pump station (TFPS) and a new gravity sludge thickener. The design will include preliminary design for the new facilities and preparation of construction plans and specifications and construction cost estimates. As with Phase B design, the design of both the TFPS and gravity sludge thickener will be accelerated by developing separate construction contracts for the civil/structural work and for the mechanical/electrical/instrumentation work. Civil/structural design will be completed and released for construction, while contract documents for mechanical/electrical/instrumentation design are being completed.

### **STAGE II**

Stage II will also be divided into three Phases A, B and C. Phase A consists of constructing two (2) new primary clarifiers. Phase B consists of converting one of the existing rock media trickling filters into a new biotower. Phase C consists of rehabilitating the four (4) existing rectangular primary clarifiers.

### **Phase A - Design and Construction**

Phase A consists of two (2) new rectangular primary clarifiers west of the existing square primary clarifiers. Civil and structural design will be completed and released for construction, while contract documents for mechanical, electrical and instrumentation design are being completed.

### **Phase B - Design and Construction**

Phase B consists of the conversion of one existing rock media trickling filter to a new biotower. A single construction contract will be developed for this work.

### **Phase C - Design and Construction**

Phase C includes structural rehabilitation of the existing rectangular primary clarifiers. The design project includes the preparation of construction plans and specifications and construction cost estimates for that rehabilitation. A single construction contract will be issued for this Phase.

## **CONSTRUCTION CONTRACTS**

Seven (7) construction contracts will be released for the Stage I and II work. The contracts to be released are as follows:

1. Sludge Dewatering Facility Modifications.
2. Civil/Structural for the sludge digesters, sludge thickener and TFPS.
3. Mechanical/Electrical/Instrumentation for the new sludge digesters, sludge thickener, TFPS and primary chemical feed system.

4. Civil/Structural for primary clarifiers.
5. Mechanical/Electrical/Instrumentation for new primary clarifiers.
6. Conversion of one rock media trickling filter into a new biotower.
7. Rehabilitation of the existing rectangular primary clarifiers.

In addition to the proposed contract packages, there may be opportunities to pre-purchase major mechanical equipment to save cost and time. Preliminary design will address this issue.

#### **MILESTONE SCHEDULE**

Preliminary Milestone Schedule for Stages I and II design and construction activities are presented in Figure 2.

#### **CONSTRUCTION COST ESTIMATES**

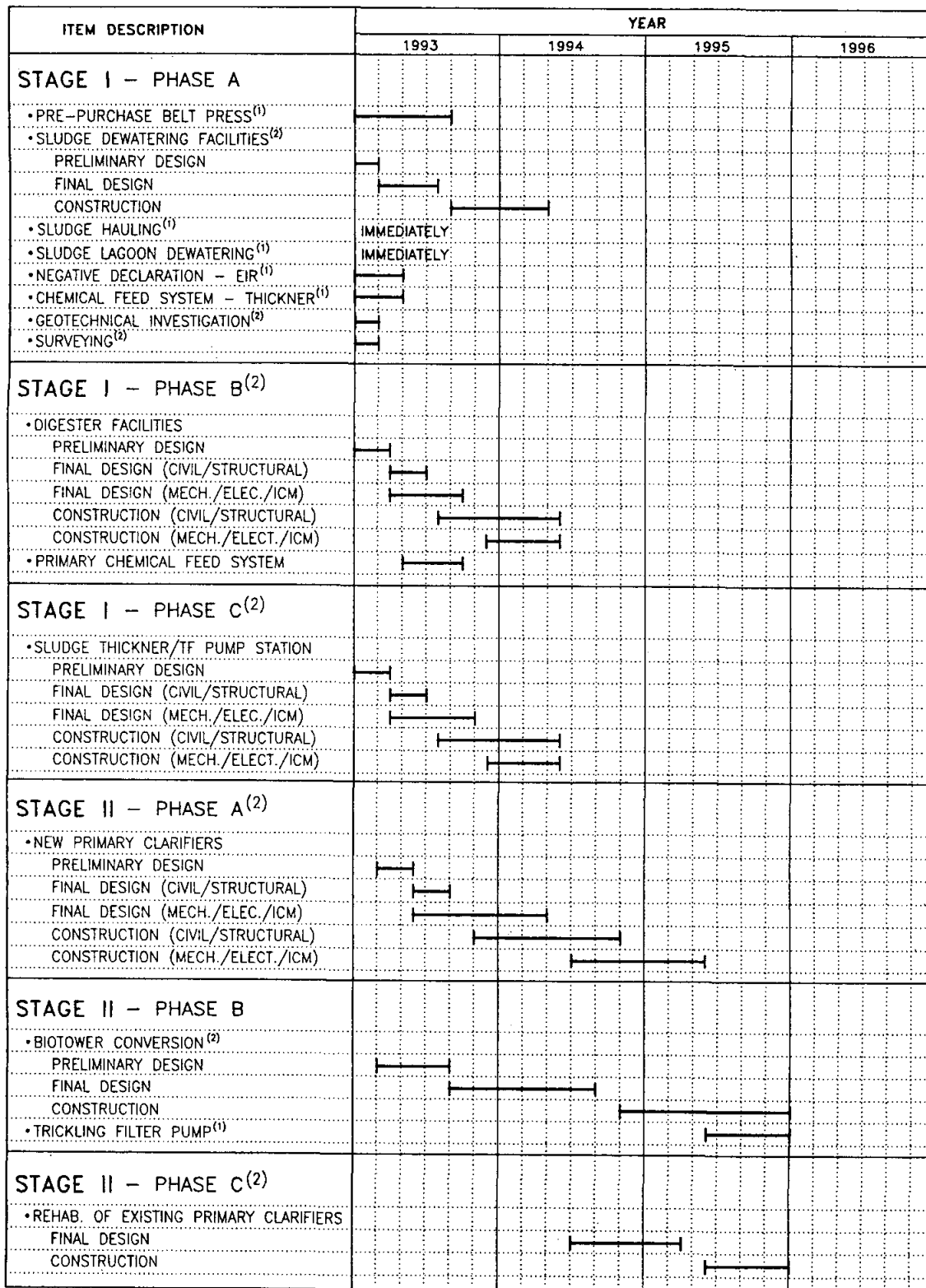
Preliminary construction cost estimates for Stage I through Stage VI, based on conceptual design information and on the construction staging program as described in this report, are presented in Table 1.

Construction cost estimates are based on "Engineering News Record" (ENR) Construction Cost Index for San Francisco of 6281 as of 1 September 1992 and no projection has been made for future increases in costs due to inflation. Based on the project schedule, costs should be escalated to the midpoint of the construction contract.

The cost estimates presented herein include 25 percent contingency to account for the preliminary status of the project. Contractor's overhead and profit has been applied at 15 percent.

## STOCKTON RWCF CONSTRUCTION STAGING STUDY

### PRELIMINARY MILESTONE SCHEDULE - STAGES I AND II



(1) WORK ITEM BY CITY TO START IMMEDIATELY

(2) WORK ITEM BY ENGINEER

Since ES has no control over the cost for labor, materials or equipment, or the general inflation of prices, or over the contractor's methods of determining prices, the estimated construction costs provided herein have been prepared on the basis of experience and judgment of an engineering professional, but ES does not and cannot guarantee that proposals for construction of the work will not vary from opinions of probable cost prepared by ES.

### **ENGINEERING AND ADMINISTRATION COST ESTIMATES**

Estimated engineering costs are shown in Table 2 and include the cost associated with: (1) preliminary design; (2) final design (preparation of plans, specifications and estimates); (3) design engineering support services during construction; and (4) construction management services. For budgetary purposes and due to the extensive modifications of existing facilities the engineering cost is estimated at twenty (20) percent of the construction cost for Stage I and fifteen (15) percent of the construction cost for Stages II through VI. Estimated costs for geotechnical investigations surveying and preparation of an EIR are included in the estimated costs presented in Table 2.

The estimates of engineering fees contained in Table 2 have been prepared for budgetary and financial planning purposes. Actual engineering fees will be based on the scope of work for each stage of the project.

TABLE 2

STOCKTON REGIONAL WASTEWATER FACILITY  
CONSTRUCTION STAGING STUDY

PRELIMINARY PROJECT ENGINEERING FEES ESTIMATE(1)

Services	Estimated Cost in \$1,000's						TOTAL
	Stage I	Stage II	Stage III	Stage IV	Stage V	Stage VI	
Preliminary Design(2)	400	300	300	400	700	300	\$2,400
Final Design	1,500	1,000	1,100	1,500	1,900	1,200	8,300
CM Including Design Engineering Support	2,000	1,200	1,500	2,100	2,600	1,500	10,900
Geotechnical	100		200				300
Surveying	50		150				200
EIR Preparation			500				500
<b>TOTAL ESTIMATED ENGINEERING FEES</b>	<b>4,050</b>	<b>2,500</b>	<b>3,750</b>	<b>4,100</b>	<b>5,200</b>	<b>3,000</b>	<b>\$22,600</b>

(1) For budgetary and financial planning purposes.

(2) The preliminary design effort is estimated at approximately 25% of total design effort.

