



3

DEPARTMENT OF  
PUBLIC WORKS

CITY OF SACRAMENTO  
CALIFORNIA

1391-35TH AVENUE  
SACRAMENTO, CA  
95822-2911

DIVISION OF  
FLOOD CONTROL AND SEWERS

916-449-5271

January 15, 1991

Budget and Finance Committee  
Sacramento, California

Honorable Members in Session:

**SUBJECT: APPROVING AMENDMENT TO CONTRACT WITH HDR ENGINEERING (CITY AGREEMENT 90-119), DEFUNDING OF VARIOUS CAPITAL IMPROVEMENT PROJECTS (XC41, WC91, AND XD11) AND TRANSFER OF FUNDS TO THE SEWER FUND CONTINGENCY AND DRAINAGE FUND CONTINGENCY RESERVES, AND APPROPRIATING FUNDS FROM THE RESERVES TO CAPITAL IMPROVEMENT PROJECT XD41, COMBINED SEWER SYSTEM REPLACEMENT**

**SUMMARY**

The California Regional Water Quality Control Board (RWQCB) issued a Cease and Desist Order to the City of Sacramento on June 22, 1990. The order requires the City to cease creating a threat to public health and the environment from overflows of sewage from the Combined Sewer System. To this end, the Order requires a Detailed Technical Report describing how the Combined System will be modified to prevent, or minimize, both street flooding and overflows to the Sacramento River.

In order to meet this requirement, this report requests that the City Council authorize the City Manager and City Clerk to execute the attached contract amendment with HDR Engineering for consultant services not to exceed \$654,746. The original contract with HDR Engineering was for \$132,538, bringing the present total not to exceed amount to \$787,284. Staff recommends that the necessary funds be appropriated by defunding Capital Improvement Projects XD11, WC91, and part of XC41, to the Sewer Fund Contingency Reserve and the Storm Drainage Fund Contingency Reserve, then appropriating the needed funds from these reserve accounts into CIP #XD41, Combined Sewer System Replacement.

This item is scheduled to be heard by both the Budget and Finance Committee and City Council on the same day due to the time constraints imposed by the Cease and Desist Order.

**BACKGROUND INFORMATION**

See the attached City Council report.

**FINANCIAL DATA**

See the attached City Council report

**MBE/WBE EFFORTS**

See the attached City Council report.

**POLICY CONSIDERATIONS**

See the attached City Council report.

**RECOMMENDATION**

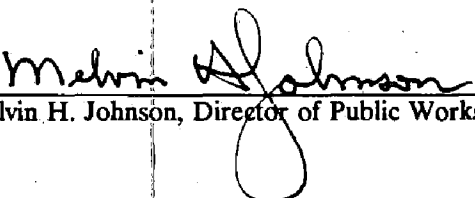
It is recommended that the Budget and Finance Committee forward to the City Council, with a recommendation for approval, the attached resolution. The resolution authorizes the City Manager and City Clerk to defund certain Capital Improvement Projects and appropriate funds from the Contingency Reserve to fund consultant services.

Respectfully submitted,

  
\_\_\_\_\_  
Albert E. McCollam, Jr., Division Manager

**RECOMMENDATION APPROVED:**

  
\_\_\_\_\_  
Jack R. Crist, Deputy City Manager

  
\_\_\_\_\_  
Melvin H. Johnson, Director of Public Works

Contact Person:  
Gary Reents, Sr. Engineer  
449-2047

January 15, 1990  
All Districts



DEPARTMENT OF  
PUBLIC WORKS

DIVISION OF  
FLOOD CONTROL AND SEWERS

CITY OF SACRAMENTO  
CALIFORNIA

1391-35TH AVENUE  
SACRAMENTO, CA  
95822-2911

916-449-5271

January 15, 1991

City Council  
Sacramento, California

Honorable Members in Session:

**SUBJECT: APPROVING AMENDMENT TO CONTRACT WITH HDR ENGINEERING (CITY AGREEMENT 90-119), DEFUNDING OF VARIOUS CAPITAL IMPROVEMENT PROJECTS (XC41, WC91, AND XD11) AND TRANSFER OF FUNDS TO THE SEWER FUND CONTINGENCY AND DRAINAGE FUND CONTINGENCY RESERVES, AND APPROPRIATING FUNDS FROM THE RESERVES TO CAPITAL IMPROVEMENT PROJECT XD41, COMBINED SEWER SYSTEM REPLACEMENT**

**SUMMARY**

The California Regional Water Quality Control Board (RWQCB) issued a Cease and Desist Order to the City of Sacramento on June 22, 1990. The order requires the City to cease creating a threat to public health and the environment from overflows of sewage from the Combined Sewer System. To this end, the Order requires a Detailed Technical Report describing how the Combined System will be modified to prevent, or minimize, both street flooding and overflows to the Sacramento River.

In order to meet this requirement, this report requests that the City Council authorize the City Manager and City Clerk to execute the attached contract amendment with HDR Engineering for consultant services not to exceed \$654,746. The original contract with HDR Engineering was for \$132,538, bringing the present total not to exceed the amount to \$787,284. Staff recommends that the necessary funds be appropriated by defunding Capital Improvement Projects XD11, WC91, and part of XC41, to the Sewer Fund Contingency Reserve and the Storm Drainage Fund Contingency Reserve, then appropriating the needed funds from these reserve accounts into CIP #XD41, Combined Sewer System Replacement.

This item is scheduled to be heard by both the Budget and Finance Committee and City Council on the same day due to the time constraints imposed by the Cease and Desist Order.

**BACKGROUND INFORMATION**

The City of Sacramento's Combined Sewer System is the portion of the City's sewer system that conveys both sanitary sewage and stormwater in the same pipeline. The Combined System encompasses approximately 7,000 acres of the Downtown, East Sacramento, and Land Park areas. An additional area of approximately 2,200 acres encompassing the River Park, California State University, and Far Eastern Sacramento areas contribute only sanitary sewage flows to the Combined System. At present, development and redevelopment is occurring within the Combined System service area which will both rely on, and impact, the Combined System.

In the late 1800's and early 1900's, untreated sewage from the City flowed directly to the Sacramento River by gravity. After the construction of a levee system around Sacramento, untreated sewage and stormwater from the central portion of the City was pumped directly into the Sacramento River using Sump 1, which was constructed in 1908. Sump 2 was constructed in 1916 to pump untreated sewage and stormwater originating from development to the south and east of the City directly into the Sacramento River.

Historically, combined sewer systems were the most economical construction method for sewers to serve the City in the early to mid-1900's because it conveyed municipal sewage and stormwater run-off in a single pipeline. The City discontinued the practice of using combined sanitary sewage and stormwater sewer systems in 1946. In the 1950's, the City initiated an improvement program where new separated storm sewers were constructed in a few selected areas, with the existing combined sewer system continuing to be utilized for sanitary sewage flows only.

Sewer design, material, and equipment standards have changed dramatically in the past 40 years, leaving Sacramento's Combined System antiquated and substandard as compared to today's requirements. Much of the City's Combined Sewer System and its pumping facilities are nearing, or exceed, 100 years in age. The system has deteriorated to a state requiring a major rehabilitation effort. Additionally, due to the inherent design of combined systems, the City's Combined System is subject to flooding and overflows due to lack of capacity during moderate rain storms. These overflows of combined wastewater occur both within the system area and to the Sacramento River, resulting in threats to both public health and the environment.

Historically, the City has undertaken significant steps to analyze and mitigate a variety of conveyance and treatment problems within the Combined Sewer System. These steps can be summarized as follows:

- |         |  |
|---------|--|
| 1946    | City implements policy of no new combined sewer construction.  |
| 1954    | Construction of City Sewage Treatment Plant.   |
| 1965-74 | Separation of approximately 2100 acres from the Combined Sewer System.   |
| 1985    | Connection to Regional Wastewater Treatment Plant, construction of Pioneer Reservoir, and modification of Combined System utilizing Combined Wastewater Treatment Plant, Pioneer Reservoir and Sump 2. |
| 1987-90 | Over 20 individual Capital Improvement Projects to replace or rehabilitate sewer lines in the Combined System.   |
| 1990    | Conceptual Master Plan for Sewer/Storm Drain Separation, Richards Boulevard-North Core Study Area for the City of Sacramento, Nolte and Associates.  |
| 1990    | Expansion and request for implementation of a 5-year, \$50 million Capital Improvement Program of the City's sewers.   |
| 1990    | Adoption of a 68% rate increase in the Sewer Fund for Fiscal Year 1990-91.   |

Literally billions of dollars are being, and will be, spent by numerous municipalities across the nation to control Combined System overflows and flooding, and to rehabilitate their systems. The Environmental Protection Agency (EPA) estimates that at least 1000 cities across the United States have combined systems requiring substantial modifications to comply with present EPA requirements. Sacramento is one among many Cities that will have to implement a costly program to comply with State and Federal regulations and to improve its deteriorating system. Notably, the cities of San Francisco, Seattle, and Chicago are all involved in major programs. Chicago is in the midst of a planned \$4 billion program. San Francisco has spent \$1.1 billion over the last 10 years and plans to spend another \$250 million in the next three years. Seattle has spent \$72 million over the last six to ten years and plans to spend \$343 million over the next 20 years.

On January 12, 1990, Sacramento experienced a significant storm event with rainfall intensities as high as one and one half inches per a two hour period. The probability of return of a storm containing this intensity is once every 100 years. This storm caused flooding throughout the Combined System area, as well as in outlying areas, with the obvious presence of sanitary wastes in some areas. As a result of media coverage of the January 12 storm, the California Regional Water Quality Control Board (RWQCB) issued a Cease and Desist Order to the City of Sacramento to cease overflow of sewage. The RWQCB and the State Department of Health Services determined that flooding which occurs in the Combined System during moderate storm events is a threat to public health. The Cease and Desist Order required the City to submit a Technical Overview Report by October 1, 1990. The Cease and Desist Order also requires the City to submit a Detailed Technical Report by July 1, 1991.

The October 1st Technical Overview Report included an evaluation of the present system, recommended interim operational measures to minimize flooding, and outlined a workplan for developing the Detailed Technical Report which will identify solutions for the Combined System problems. As part of the report, a new Plan of Operations was developed which describes an interim mode of operations to minimize flooding in the Combined System. Although the Plan of Operations will decrease flooding, it potentially increases the amounts of combined waste water discharged to the river during moderate to significant storm events.

A Detailed Technical Report is required by the Cease and Desist Order by July 1, 1991. The Report will include further computer model development; collection and analysis of water samples; evaluation and assessment of existing facilities and infrastructure; development, evaluation, and screening of engineering alternatives to improve the system; and a recommended system-wide improvement project and implementation plan.

In order to accomplish these tasks for the Detailed Technical Report, HDR was selected as the City's consultant for this large project through an open RFP process. HDR Engineering aided the City in developing the October 1, 1990 Technical Overview Report (Phase 1 - City Agreement No. 90-119 approved July 24, 1990) and will aid the City in developing the Detailed Technical Report (Phase 2) for the Combined Sewer System. The Phase 1 contract with HDR was for \$132,538. The Phase 2 contract with HDR totals \$654,746. The total contract amount will now be \$787,284.

In conclusion, the Cease and Desist Order requires substantial efforts by the City. To accomplish these requirements for the remainder of fiscal year 90/91 will necessitate substantial consultant support. Obtaining these resources will require funds totaling \$654,746.

**FINANCIAL DATA**

It is proposed that the following Capital Improvement Projects be defunded:

1. William Land Park Main Replacement (PN:XD11): \$480,000  

This project originally was placed in the capital improvement budget because there were several problems needing to be solved within the scope of the project. Since the "Cease and Desist" Order, this project must be re-evaluated for its priority to the full range of projects within the combined system after the Detailed Technical Report has been prepared. This project can be defunded; should the Detailed Technical Report identify additional reconstruction or rehabilitation work in this area, it will be as part of the overall work within this section of the system. Defunding this project will return \$50,000 to the Sewer Fund Contingency Reserve and \$430,000 to the Storm Drainage Fund Contingency Reserve.
  
  2. Sacramento Metro General Drainage Investigation (PN:WC91): \$168,000  

This project was initiated to fund the City's cost-share of a study to recommend improvements to the Sacramento River System. This project deals with West Sacramento and the Yolo Bypass and the City and SAFCA are not participating in this study, therefore, the funds are no longer needed. Defunding this project will return \$168,000 to the Storm Drainage Fund Contingency Reserve.
  
  3. Miscellaneous Sewer Improvements Downtown (PN:XC41): \$6,746  

This project is funded for the purpose of performing sewer line expansion and reconstruction relating to other development-related projects in the downtown, or combined system, area. Many such projects have been scaled back because of impacts on the combined system, and these will be re-evaluated after the Detailed Technical Report has been prepared. In addition, less than 10% of the funds authorized for the current fiscal year have been expended; the current budget, including funding from previous years, is \$385,122, of which \$322,716 is unobligated. Therefore, the department is willing to defund \$6,746, leaving an unobligated balance of \$315,970, sufficient for the remainder of the fiscal year. Defunding this amount will return \$6,746 to the Storm Drainage Fund Contingency Reserve.
- TOTAL** \$654,746

The total amount of funds returned to the Sewer Fund Contingency Reserve (414-710-7012-4999) is \$50,000, and the total amount of funds returned to the Storm Drainage Fund Contingency Reserve (425-710-7012-4999) is \$604,746. The estimated cost for the amendment to the contract with HDR Engineering, Inc., for Phase 2 is \$654,746. It is recommended that \$50,000 for this contract amendment be appropriated to CIP #XD41, Combined System Replacement, from the Sewer Fund Contingency Reserve (414-710-7012-4999), which is equal to the amount defunded; it is also recommended that \$604,746 for this contract amendment be appropriated to CIP #XD41, Combined System Replacement, from the Storm Drainage Fund Contingency Reserve (425-710-7012-4999), which is equal to the amount defunded above. This appropriation represents no impact on rates because of the projects defunded.

MBE/WBE EFFORTS

During the open selection process, MBE/WBE firms were encouraged to apply, although none did. Also, affirmative action efforts were part of the selection criteria. Although the selected firm of HDR Engineering is not an MBE/WBE firm, the contract project manager is a woman.

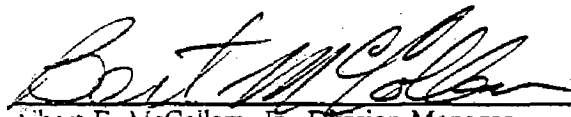
POLICY CONSIDERATIONS

The funds being requested to accomplish the tasks described are a result of a State enforcement order. Failure to take the recommended actions will result in violation of the Cease and Desist Order, possibly resulting in fines, a building moratorium, or both. Producing the Detailed Technical Report will lead to long term plans and commitments to rehabilitate and redesign the Combined System which will significantly reduce, or remove, threats to both public health and water quality.

RECOMMENDATION

It is recommended that the City Council approval the attached resolution. The resolution authorizes the City Manager and City Clerk to defund certain Capital Improvement Projects and appropriate funds from the Contingency Reserve to fund consultant services.

Respectfully submitted,

  
Albert E. McCollam, Jr., Division Manager

RECOMMENDATION APPROVED:

---

Walter J. Slipe, City Manager

---

Melvin H. Johnson, Director of Public Works

Contact Person:  
Gary Reents, Sr. Engineer  
449-2047

January 15, 1990  
All Districts

# RESOLUTION NO.

ADOPTED BY THE SACRAMENTO CITY COUNCIL

ON DATE OF \_\_\_\_\_

RESOLUTION TO DEFUND CERTAIN CAPITAL IMPROVEMENT PROJECTS; TO APPROPRIATE FUNDS FROM THE SEWER FUND CONTINGENCY RESERVE AND THE STORM DRAINAGE FUND CONTINGENCY RESERVE; TO AUTHORIZE THE CITY MANAGER AND CITY CLERK TO SIGN AND EXECUTE AN AMENDMENT TO THE CONTRACT WITH HDR ENGINEERING, INC.

BE IT RESOLVED BY THE CITY COUNCIL OF SACRAMENTO THAT:

1. Capital Improvement Project WC91, Sacramento Metro General Drainage Investigation (425-500-WC91-4802) is hereby defunded and funds of \$168,000 transferred to the Storm Drainage Contingency Reserve (425-710-7012-4999).
2. Capital Improvement Project XD11, William Land Park Main Replacement, is hereby defunded as follows:

414-500-XD11-4820:	\$ 50,000
425-500-XD11-4414:	\$ 34,000
425-500-XD11-4802:	\$ 24,000
425-500-XD11-4820:	\$284,000
425-500-XD11-4831:	\$ 28,000
425-500-XD11-4880:	\$ 36,000
425-500-XD11-4881:	<u>\$ 24,000</u>

TOTAL: \$480,000

---

FOR CITY CLERK USE ONLY

RESOLUTION NO.: \_\_\_\_\_

DATE ADOPTED: \_\_\_\_\_

8

and funds transferred to the contingency reserves as follows:

Sewer Fund Contingency Reserve (414-710-7012-4999):	\$ 50,000
Storm Drainage Fund Contingency Reserve (425-710-7012-4999):	\$430,000

3. Funds in the amount of \$6,746 are defunded from Capital Improvement Project XC41, Miscellaneous Sewer Improvements Downtown (425-500-XC41-4820) and transferred to the Storm Drainage Contingency Reserve (425-710-7012-4999).
4. Funds totaling \$654,746 are appropriated to Capital Improvement Project XD41, Combined Sewer System Replacement, as follows:

From Sewer Fund Contingency Reserve:

414-710-7012-4999: (\$50,000)

to: 414-500-XD41-4802: \$50,000

and from Storm Drainage Fund Contingency Reserve:

425-710-7012-4999: (\$604,746)

to: 425-500-XD41-4802: \$604,746

5. The City Manager is authorized to sign an agreement with HDR Engineering for an amount not to exceed \$654,746 for Phase 2, Detailed Technical Report, for the Combined Sewer System, and the City Manager and City Clerk are authorized to execute said agreement.

\_\_\_\_\_  
MAYOR

ATTEST:

\_\_\_\_\_  
CITY CLERK

\_\_\_\_\_  
FOR CITY CLERK USE ONLY

RESOLUTION NO.: \_\_\_\_\_

DATE ADOPTED: \_\_\_\_\_

AMENDMENT #2

TO CITY AGREEMENT NO. 90-119 WITH HDR ENGINEERING INC.

Amendment #2 adds the Phase 2 Scope of Work/Work Element Description to the original contract and Amendment #1. This Amendment #2 will result in an additional authorized amount not to exceed \$654,746 for Phase 2 added to the original authorized amount not to exceed \$132,538 for Phase 1 for a total authorized amount not to exceed \$787,284.

City Agreement No. 90-119/PN/PJ: XD41 Combined Sewer System Improvement and Implementation Plan between the City of Sacramento and HDR Engineering Inc., original contract dated July 24, 1990, and Amendment #1 dated December 17, 1990, is hereby amended to add the following Phase 2 Scope of Work/Work Element Description:

Exhibit A

Added to Scope of Work/Work Element Description, Phase 1 - Task No.'s 1, through 4 (pages A2 to A13), is Attachment 1, Amendment #2, Scope of Work/Work Element Description, Phase 2 - Task No.'s 1, through 9. (Phase 2, Amendment #2, pages A2 to A26).

Exhibit B

Delete Exhibit B (page B1) of original contract and replace with Attachment 2, Amendment #2, Exhibit B (Phase 2, Amendment #2, page B1).

Executed this \_\_\_\_\_ day of January 1991

THE CITY OF SACRAMENTO  
A Municipal Corporation

CONSULTANT

\_\_\_\_\_  
(Title)

*Robert S. Williams*

SR. VICE PRESIDENT

(Title)

ATTEST:

\_\_\_\_\_  
CITY CLERK

ATTACHMENT 1  
AMENDMENT #2

SCOPE OF WORK - PHASE 2  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

This attachment describes the work to be completed by the Consultant and its subcontractors under Phase 2 of the Sacramento Combined Sewer Improvement and Implementation Plan. Phase 2 consists of performing detailed analyses of alternative improvements and developing the Detailed Technical Evaluation and Analysis of Mitigation Alternatives Report, which the City must deliver to the Regional Water Quality Control Board by July 1, 1991.

The Phase 2 work is divided into 9 tasks:

- Task 1: Project Management
- Task 2: Model Development and Baseline Statistics
- Task 3: Sampling Program
- Task 4: AutoCADD Base Maps
- Task 5: Pumping Station Evaluation
- Task 6: Collection System Evaluation
- Task 7: Specific Project Alternatives
- Task 8: Improvement Plans and Screening
- Task 9: Detailed Technical Report



WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2  
TASK NO.: 1  
DESCRIPTION: Project Management and Coordination  
TASK MANAGER: Paula Arsenault  
SCHEDULE: Start - January 16, 1990.  
WORK PRODUCTS: Monthly Progress Reports.  
Bi-weekly Coordination Meetings.

SCOPE:

- 101) Coordinate activities with the City staff to ensure that the project is on schedule and budget, and to ensure that the work products delivered reflect the work plan and agreed upon level of effort. Coordinate all contacts within the City through the City's Project Manager.
- 102) Prepare monthly contract and project status reports and invoices. These status reports provide the basis for any needed work plan modifications as well as identification of any potential impacts to the overall project budget or schedule.
- 103) Schedule and attend coordination meetings every two weeks. HDR will provide minutes of these meetings to the City.
- 104) Coordinate with the City's Project Manager to obtain information provided by City staff and other consultants performing studies relevant to this project, such as the current activities relating to stormwater management (Brown and Caldwell), the North Core Separation Project (Nolte), and the Regional Wastewater Treatment Plant Facility Plan (Corollo). The objective is to make the best use of existing information and information currently being developed by the City staff and other consultants.
- 105) Attend meetings with the Regional Water Quality Control Board as necessary.
- 106) During Phase 1, a survey will be completed of combined sewer system improvement plans being (or to be) implemented by other cities in the United States. The objective of the survey is to collect technical information on solving combined sewer system problems (flooding, CSO, rehabilitation) and to provide a survey of design criteria, costs, regulatory issues, engineering technologies, financing schemes and scheduling techniques that are being used by other metropolitan areas which have combined sewers. Receiving water quality considerations and

issues which impacted CSO control solutions will also be identified.

During Phase 2, the information presented in the survey technical memorandum, particularly the recommendations relating to design criteria, may need to be refined. This task will include refining the criteria suggested by the technical memorandum prepared in Phase 1.

- 107) Provide overview assistance/recommendations to the City's data collection and monitoring programs, including the manhole depth monitoring program, floodwater sampling and flood depth data collection.
- 108) Provide general coordination services. This includes additional coordination, fieldwork, or evaluations (e.g. additional sewer videotaping or surveying), which may be needed to develop alternative improvements or prepare the final report.

WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2  
TASK NO.: 2  
DESCRIPTION: Model Development and Baseline Statistics  
TASK MANAGER: Paula Arsenault  
SCHEDULE: Start - January 16, 1991.  
Technical Memorandum (statistical modeling options) -  
January 16, 1991.  
Technical Memorandum (statistical model description) -  
February 14, 1991.  
Draft Technical Memorandum (baseline conditions) -  
March 5, 1991.  
Final Technical Memoranda - July 1, 1991.

WORK PRODUCTS: Technical memorandum describing options for performing statistical modeling of the combined sewer system.  
Technical memorandum describing the statistical rainfall/runoff model selected and used to evaluate storage and treatment facilities operating in continuous simulation model.  
Technical memorandum describing extension of the SWMM model input file, recalibration (if possible), and resulting baseline conditions.

SCOPE:

The objective of this task is to expand the City's version of SWMM to be used for detailed analyses, which is an extension of Phase 1, Task 3. In addition, a statistical model will be developed to analyze existing and proposed facility performance using long-term hourly rainfall records. This latter model is critical to the proper selection and sizing of alternative storage and treatment projects, since the use of singular design events does not completely analyze system operation.

The basis for the modeling work will be to use the City's available model and input files (SWMM90 version) for design storms, as modified by Phase 1 Task 3.

For the purposes of this scope of work, the collection system is defined as the pipelines which collect local flows from residential/commercial/industrial connections and are 10 inches or less in diameter. Laterals and mains are larger than 10 inches in diameter.

## SWMM Extension

201) Perform sewer surveying to develop the necessary information for adding laterals and mains to the SWMM90 model. The attached map identifies the pipelines that will be added to the model, on which the corresponding survey will be performed. The following parameters will be surveyed for the manholes identified on the attached map:

- Manhole rim elevations
- Pipe invert elevations for main and lateral pipes entering the manhole
- Diameter of main and lateral pipes entering the manhole.

Pipe segment lengths will be determined from the Sewer Book.

202) Expand the SWMM input files to include the main combined sewer laterals and interceptors extending to the boundary of the combined sewer area (served by Sump 2 and Sump 1A), for pipelines of 15 inches and larger. For basins (existing delineations) which are subdivided in order to model flow through a newly added pipeline, hydrologic basin characteristics (e.g. impervious area) will be allocated on an area-weighted basis.

203) Calibrate the model, if possible, to water level data collect during the upcoming wet season. A maximum of 5 rainfall events will be considered.

204) Perform sewer surveying in order to perform the analysis described in 205). The following parameters will be surveyed for the manholes within three representative basins (similar to those identified on the attached map):

- Manhole rim elevations
- Pipe invert elevations for all pipes entering the manhole
- Diameter of all pipes entering the manhole

Pipe segment lengths will be determined from the Sewer Book.

205) Evaluate small-diameter collection system hydraulic capacity for up to 3 representative areas. This will be a desktop assessment. The purpose of this assessment is to estimate flooding causes and restrictions presented by drainage inlets and local collection systems, and to provide a basis for the baseline condition analysis in 206). The three areas to be evaluated will be recommended and then agreed upon by the City staff.

206) Run the model to establish baseline flooding conditions for existing and future scenarios, not including modifications to the small-diameter collection system. Run future condition assuming a 10-year (or other specified) design storm conveyance capacity for the small-diameter collection lines and inlets. Map these on the sewer system maps to be developed in Task 4. (Use approach similar to the Sacramento Combined Sewer Study, dated 1988.)



- 207) Prepare a draft technical memorandum describing the model expansion and recalibration results. Summarize the baseline flooding conditions, collection system assessment, and flood mapping.
- 208) Prepare a final version of 207).

#### Statistical Model

- 209) Obtain hourly rainfall records for the National Weather Service gage in downtown Sacramento. Convert the data from NWS records format to a format usable by the statistical model.
- 210) Develop a rainfall frequency curve in order to define the relationship between rainfall depth and frequency for events less than the 1-year return period. Considering the fact that the system overflows approximately 4-5 times per year, the modeling of more frequent, smaller events is essential to characterizing the existing system and developing alternative improvements, rather than utilizing only single, large (e.g. 5-year) design rainfall events.
- 211) Research possible continuous simulation models which would be applicable for use on the Sacramento system. Possible considerations would include SWMM or PROVE. Summarize the options in a brief technical memorandum for review by the City.
- 212) Based on the review described in 211) and subsequent discussion with City staff, develop the statistical model for the evaluating the Sacramento combined sewer system and alternative improvements.
- 213) Validate the model by comparing the results to SWMM calibrated outputs and to flow measurements, where possible.
- 214) Prepare a technical memorandum describing the model and its use in the detailed alternatives analysis.

WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2  
TASK NO.: 3  
DESCRIPTION: Sampling Program  
TASK MANAGER: David Christophel  
SCHEDULE: Start - January 16, 1991.  
Final Sampling Program - Completed during Phase 1.  
Draft Technical Memorandum - exact schedule will depend on the occurrence of significant, representative rainfall events.  
Final Technical Memorandum - July 1, 1991.  
WORK PRODUCTS: Technical memorandum describing the results of the sampling program.

SCOPE:

The objective of the sampling program is to evaluate the quality of street floodwaters, of combined sewage in the system, and of the Sacramento River during a discharge (CSO or CWTP treatment event). There are several uses for these data:

1. Establish/quantify the level of health hazard posed by flooding;
2. Quantify, in general, the impacts to the Sacramento River during an overflow occurrence;
3. Collect combined sewage and Sacramento River quality data relevant for evaluating system operational changes; and
4. Collect data relevant for evaluation CWCS alternative improvements, such as treatment, storage and sewer separation; and
5. NPDES permit compliance.

There are two main parts to the program. The first part, which was completed during Phase 1 Task 4, involved identifying the appropriate locations for taking samples in the Sacramento River through the implementation of a dye study. The objective was to identify the mixing zone in the River downstream of the Pioneer Reservoir, Sump 2 and CWTP outfalls. Based on the results of the dye study, River samples during two CSO events will then be taken at locations where the discharges would be fully mixed throughout the River cross-sections.

The second part of the program consists of the combined sewage and River sampling and analysis, which includes sampling:

- Street floodwaters;
- Discharge from Pioneer Reservoir;
- CWTP influent (at the Sump 2 wet well);
- Sump 2 CSO discharge (at the wet well);
- Pioneer Reservoir influent (at the Sump 1 wet well);
- A baseline River location upstream of all combined sewer discharges (upstream of the Pioneer Reservoir outfall, downstream of the American River confluence); and
- River locations downstream of the discharge (Pioneer Reservoir, Sump 2 and CWTP) outfalls.

The exact locations on the River will be determined by the results of the dye study.

A complete and detailed description of this program can be found in the document Sampling Program - Combined Sewer Improvement and Implementation Plan, dated November 2, 1990. First flush sampling will not be performed due to the scheduling of Phase 2 work.

The program assumes that two (2) storm events can be captured during the 1990-1991 wet season which are large enough in rainfall depth and intensity to induce street flooding, overflows from Pioneer Reservoir and Sump 2 and CWTP operation (effluent discharge).

301) The following locations have been identified for sampling along with the storm periods to be sampled for each location:

Sacramento River (upstream and downstream of the CWTP, Pioneer Reservoir, and Sump 2 outfalls). Sample upstream before the discharge and downstream during/after the discharge to determine changes in water quality due to the discharge. The samples will be collected and composited across the River transect locations determined during the dye study. The exception to this transect compositing procedure will be the samples taken for analysis of volatile organics, which will be a grab taken from center water column, halfway between the water surface and the River bottom. If appropriate locations are indicated by the dye study, samples may be collected from the left bank of the River.

Sump 1A (into the reservoir) and Pioneer Reservoir (out of the reservoir). Sample at Sump 1A during inflow to the reservoir and outflow (during the CSO) to quantify, if possible, the treatment effectiveness of the reservoir and to compare CSO quality to the River quality at the mixing zone. The Reservoir discharge will be one-time grab samples taken at the beginning of the overflow event. The samples taken at Sump 1A will be taken in 30-minute increments and composited according to pumping rate at the station, i.e. flow-based composites. The manner in which the discrete samples are composited will depend on the storm-specific conditions and the operation of the pumps. Samples will be composited at flows of 40, 80, 120, 80 and 40 mgd (rise and fall of the hydrograph). This

corresponds to the on/off sequence of the three 40-mgd pumps during an event. A maximum of 5 composites will be made from the 30-minute discrete samples.

Sump 2 Wet Well. Sample in 30-minute increments and composite according to the total pumping rate at the station. For the purposes of this program, total station pumping rate will be assumed to equal total influent rate. Compositing will be flow-based and performed according to the total station flow rate, taken from the strip chart recorder on the Sump 2 control panel. The following flow ranges will determine the compositing time-frames:

- < 60 mgd (flow to SRWTP)
- 60 - 190 mgd (flow to CWTP and SRWTP)
- > 190 mgd (CSO from Sump 2)
- 60 - 190 mgd (flow to CWTP and SRWTP - storm recession)
- < 60 mgd (flow to SRWTP - storm recession)

A maximum of 5 composites will be made from the 30-minute discrete samples. Grab samples will be taken for analysis of volatile organics. The results will be used to evaluate treatment and storage alternative improvements and, for the peak flow/CSO period, to compare combined wastewater quality to the River quality downstream of the outfall.

CWTP effluent. A grab sample will be taken during the first 4 hours of the treatment plant discharge event. These will be collected by the CWTP operators.

Five (5) street floodwater locations. City personnel will sample floodwater, both where sewer backups are suspected and where flooding is known to be caused only by drainage inlet restrictions (i.e. standing water and not sewer backups). These samples will only be analyzed for bacterial content.

- 302) Based on the sampling description in 301), and including quality assurance samples delivered to the laboratory (spike, duplicate, and spike-duplicate), a maximum of 36 samples will be analyzed for each event.

City staff will be stationed at Sump 2, Sump 1A and Pioneer Reservoir during the storm events to respond to questions by the sampling team. City staff assistance will not be required for the River sampling team. The City's personnel will collect all of the street floodwater samples, and will also collect the CWTP effluent samples. The exact field time required for the individual events will depend on the storm.

The constituents analyzed are listed in Table 1. These may be modified depending on the results of the first storm event.

- 303) The laboratory results will be reviewed and a draft technical memorandum will be prepared. The technical memorandum will focus on the content of pathogens in street floodwaters, the general impacts on the Sacramento River from CSO and CWTP discharges, and on quality changes at Sump 1A, Pioneer Reservoir and Sump 2 during the sampling events. The analysis will focus on a comparison between published surface water standards and report, and the results of the sample analysis.
- 304) Prepare a final version of 303).

TABLE 1. CONSTITUENTS TO BE ANALYZED

Constituents	EPA Method Number	Detection Limit	Container Type	Sample Size
<b>Bacteria</b>				
Total Coliform	SM 908A	N.A.	Bacteria	250 ml
Fecal Coliform	SM 908C	N.A.		
Streptococci	SM 908C	N.A.		
<b>Nonmetals</b>				
pH	150.0	N.A.	Plastic	500 ml
Temperature	Field	-		
Turbidity	180.1	N.A.	Plastic	500 ml
Dissolved Oxygen (DO)	Field	-		
Total Kjeldahl Nitrogen	351.3	0.5 mg/l	Plastic	1 liter <sup>a</sup>
Phosphorus (total)	365.2	0.5 mg/l	Plastic	1 liter <sup>a</sup>
Phosphorus (dissolved)	365.2 + filter	0.5 mg/l	Plastic	2 liters <sup>b</sup>
Nitrate	300.0	0.5 mg/l	Plastic	1 liter <sup>a</sup>
Chemical Oxygen Demand (COD)	410.1	5.0 mg/l	Plastic w/ H <sub>2</sub> SO <sub>4</sub>	250 ml
Biochemical Oxygen Demand (BOD)	405.1	2.0 mg/l	Plastic	2 liters <sup>b</sup>
Total Suspended Solids (TSS)	160.2	5 mg/l	Plastic	1 liter <sup>d</sup>
Total Dissolved Solids (TDS)	160.1	10 mg/l	Plastic	1 liter <sup>d</sup>
<b>Organics</b>				
Volatile Organics	624	1-20 µg/l	Glass w/HCL	80 ml
Base/Neutral and Acid Extractable Organics	625	2-200 µg/l	Glass	2 liters

Constituents	EPA Method Number	Detection Limit	Container Type	Sample Size
Metals (Total and Dissolved)				-- <sup>c</sup>
Arsenic	206.2	0.002 mg/l	Plastic	--
Antimony	204.2	0.01 mg/l	Plastic	--
Beryllium	200.7 (ICP)	0.002 mg/l	Plastic	--
Cadmium	213.2	0.0005 mg/l	Plastic	--
Chromium	218.2	0.001 mg/l	Plastic	--
Cobalt	200.7 (ICP)	0.01 mg/l	Plastic	--
Copper	220.2 (ICP)	0.001 mg/l	Plastic	--
Lead	239.2	0.005 mg/l	Plastic	--
Selenium	270.2	0.005 mg/l	Plastic	--
Silver	272.2 (ICP)	0.0005 mg/l	Plastic	--
Thallium	271.2	0.005 mg/l	Plastic	--
Mercury	245.1	0.0002 mg/l	Plastic	--
Zinc	200.7 (ICP)	0.01 mg/l	Plastic all w/HNO <sub>3</sub>	--
<p><sup>a</sup> Analyses for total Kjeldahl nitrogen, nitrate, and total phosphorus, can be taken from one sample bottle.</p> <p><sup>b</sup> Analyses for dissolved phosphorus, and biochemical oxygen demand, can be taken from one sample bottle.</p> <p><sup>c</sup> One liter for total, 1 liter filtered for dissolved. Laboratory will filter samples.</p> <p><sup>d</sup> TDS and TSS should be in separate bottles (each test) due to the nature of the test.</p>				

22

WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2  
TASK NO.: 4  
DESCRIPTION: AutoCADD Base Maps  
TASK MANAGER: Peter Van Meurs  
SCHEDULE: Start - January 16, 1991.  
Maps Complete - March 1, 1991.  
WORK PRODUCTS: Combined Sewer System Maps in AutoCADD Format.

SCOPE:

The City's sewer system, including the combined sewer system, is currently mapped on 18 maps at a 1:500 scale. The City also has a Sewer Book, which provides detailed information at a scale of 1:200. This task consists of digitizing 10 of the 1:500 scale maps for the purpose of generating figures for the Detailed Technical Report (specific projects and alternative plan layouts) and for the City's future use in cataloging its sewer system and conveniently updating drawings.

401) Collect and review the City's existing set of 10 1:500 scale maps. These maps cover the eastern portion of the City sewer system, including the separated and combined sewer areas. These maps will serve as the base layer for the AutoCADD maps.

402) Scan the drawings using an automated digitizing system. The original mylar drawings will be scanned and digitized at 600 dots per square inch, in order to generate a rough draft set of maps.

Refine/edit the rough draft maps. This will consist of removing extraneous marks, filling in missing lines, and clarifying text.

403) Add two layers to the base maps: basin boundaries/numbers and computer model network set-up (interceptors, node numbers, conduit numbers). The digitizing of these features will be based on the maps developed as part of the Sacramento Combined Sewer Study, dated 1988, except where modified by Task 2 work.

404) Produce a set of draft mylars for the City's review.

405) Finalize the maps based on the City's comments.

WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2

TASK NO.: 5

DESCRIPTION: Pumping Station Evaluation

TASK MANAGER: David Reardon

SCHEDULE: Start - January 16, 1991.  
Draft Technical Memorandum - February 27, 1991.  
Final Technical Memorandum - July 1, 1991.

WORK PRODUCTS: Technical Memorandum presenting the assessment of reliability and remaining life of the station structures, main piping systems and mechanical equipment (pumps, motors) at Sump 1, Sump 1A, Sump 2 and the gates in the Flow Control Structure, including descriptions of field test procedures and results, evaluation criteria, and recommendations.

SCOPE:

The key facilities in controlling flow within the City's combined sewer system are the pumping stations. A comprehensive assessment of these facilities is a necessary element of developing the improvement and implementation plan.

501) Conduct field reconnaissance surveys, and obtain and review design drawings and operational data. This effort was initiated during Phase 1.

Collect information from and interview City personnel relevant to assessing the condition and performance of the pumping stations and flow control structure. Coordinate with City personnel in the development of improvement alternatives, including replacement options.

The City will provide, if available, drawings and schematics of the pumping stations and Flow Control Structure; summary of maintenance records, summary of improvements made to the stations, and other pertinent information.

samples) on Sumps 1 and 2, and thickness measurements of pump casings and main station piping (key, large-diameter sections). It is assumed that a maximum of 10 concrete samples will be taken and analyzed. (See cost estimate sheets of maximum expenditure on thickness testing and hot taps of main piping.) Inspect the valves, if possible, in the stations. Inspect the gates in the Flow Control Structure. Inspect the electrical feeds at Sump 2, if necessary to developing improvement alternatives. Inspect the motors in the station, as necessary to determining remaining life and maintenance requirements.

- 503) Assess the current condition of the mechanical facilities and estimate remaining life with and without rehabilitation.

Evaluate the structures and estimate remaining life. Assess structures with regard to seismic loadings. Develop improvement options and costs for extending the life of the station structures.

Evaluate the gates in the Flow Control Structure.

- 504) Develop improvements to station reliability, including: examining electrical power feeds, transformers and control schemes, developing emergency backup power alternatives, and developing backup mechanical pumping alternatives. Prioritize the recommended improvements.

Develop recommendations for life extension and pump maintenance at the three stations. Develop improvement schemes and cost estimates for extending the life of the facilities on a short-term and long-term basis.

- 505) Summarize the analysis and results in a draft technical memorandum. The preliminary format for the memorandum is:

Existing Facilities and Background  
Field Testing  
Condition and Performance of Pumping Stations  
Evaluation of Remaining Life of Facilities and Structures  
Alternatives for Improving Stations  
Recommended Improvements and Useful Life of Facilities  
    Improvements  
    Useful Life  
    Maintenance Recommendations  
Cost Estimates

The technical memorandum will focus on estimates of remaining life of the facilities based on present design capacity and conditions, and future conditions assuming that the recommended reliability improvements are implemented.

- 506) Prepare a final version of 505):

WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2

TASK NO.: 6

DESCRIPTION: Collection System Evaluation

TASK MANAGER: Paula Arsenault

SCHEDULE: Start - January 16, 1991.  
Draft Technical Memorandum - March 26, 1991.  
Final Technical Memorandum - July 1, 1991.

WORK PRODUCTS: Technical Memorandum presenting the assessment of current conditions (hydraulic, structural) and needs for improvement within the combined sewer system, focusing on the laterals and mains, and including the evaluation of representative areas in the collection system.

SCOPE:

A complete improvement plan for the combined sewer system must include an assessment of the pipelines from a structural and hydraulic standpoint. Specifically, this task will undertake an assessment of structural integrity (potential for failure, remaining life), presence of obstructions (roots, debris), and hydraulic design problems. The area included by this analysis will encompass the combined sewer area served by Sump 1A and Sump 2, including the separated sewer areas in eastern Sacramento which flow into the combined sewers. The objective is to build upon the results of the Sacramento Central City Sewer System Study (Brown and Caldwell, March 1982), which focused primarily on the central City area. The results of this previously-completed work will be adopted for use in this task. In addition, the current evaluation will utilize an approach similar to that employed in the 1982 study.

Because of the lack of existing information (inspection, TV data) on the condition of the laterals and mains, selected representative segments of the system will be videotaped and/or inspected. The results of this assessment will then be applied to the evaluation of the other parts of the system. This approach will be used for both the assessment of the mains and laterals and the small-diameter collection system.

In order to develop an accurate assessment, at least 10 percent of the system should be assessed. The compressed time-frame of this study will require that the videotaping work be divided between City and a subcontractor.

For the purposes of this scope of work, the collection system is defined as the pipelines which collect local flows from residential/commercial/industrial connections and are 10 inches or less in diameter. Laterals and mains are larger than 10 inches in diameter.

#### Data Collection

- 601) Collect and review background information. This would include the base data which was used to develop the 1982 study. Other information relating to historical condition or problems, such as trouble call logs will also be collected and reviewed.

Collect information and interview City personnel regarding current procedures for determining needs for rehabilitation and replacement within the small-diameter collection system.

#### Lateral/Main Evaluation

- 602) Develop a plan for additional TV surveying. The City will provide a catalog of TV surveys previously conducted, organized by pipeline location in tabular and map format, including those used for the 1982 study. From this information, and data on sewer age, size and material where readily available, we will develop a prioritized plan for performing additional TV work for the purpose of developing the Detailed Technical Report.
- 603) Perform the TV work defined in 602). (See cost estimate sheets for maximum subcontractor expenditure.) Inspect the condition of selected representative large-diameter (42 inches and larger) pipeline.
- 604) Establish evaluation criteria and review it with the City. Obtain the City's approval of the final criteria. Target hydraulic capacity criteria (e.g. the 5- or 10-year design event) will need to be established at the initiation of this task, in order to proceed efficiently.

Investigate and define sewer rehabilitation methods and unit costs. Summarize these for review by and discussion with the City.

- 605) Assess sewer condition and obstructions using the field (TV and inspections) data. Convert field information into matrix format, including pipe material type, where available. Determine structural condition and consequences of failure from the available information.

Assess hydraulic design problems, such as locations of significant head loss, inverse sewer grades, and other problems.

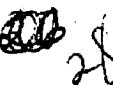
Combine information into matrices, including the baseline SWMM90 model run results which will provide the basis of the capacity assessment.

## Collection System Evaluation

- 606) Evaluate representative areas (3 subbasins) of the collection system relative to structural condition, consequences of failure, and hydraulic adequacy. These areas correspond to the representative areas evaluated in Task 2.
- 607) Develop estimates for improvements needed for the representative areas, including costs for typical rehabilitation methods and replacement. Use the results to extrapolate to the remainder of the collection system.
- 608) Estimate approximate costs for improving the combined sewer service area collection system, based on the results of the representative areas.

## Conclusions

- 609) Develop a long-term plan for maintenance and inspection, and implementing collection system improvements. Investigate the potential for enhancing the computerized reporting system (Hansen) that the City currently uses, as a means for planning and tracking improvements.
- 610) Using the above analyses, establish a priority list for improvements.
- 611) Prepare a draft technical memorandum.
- 612) Prepare a final version of 611).

 28

WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2  
TASK NO.: 7  
DESCRIPTION: Specific Alternative Projects  
TASK MANAGER: Robert Williams  
SCHEDULE: Start - January 22, 1991.  
Draft Technical Memorandum - April 23, 1991.  
Final Technical Memorandum - July 1, 1991.  
WORK PRODUCTS: Technical memorandum summarizing the assessment and results for the specific improvement projects.

SCOPE:

This task consists of developing specific alternatives for improving the present flooding and overflow conditions in the combined sewer system. Alternative projects will consist of tank storage, tunnels (for storage and conveyance), pipeline replacement/upsizing/diversion, treatment at City or Regional facilities, and non-structural treatment (for primary effluent or separated stormwater).

701) Evaluate alternative projects on a preliminary basis. Due to the accelerated schedule of this project, alternative projects identified in the Technical Overview Report, dated October 1, 1990, will be assessed on a preliminary basis, prior to establishing baseline conditions. This effort will focus on site reconnaissance and feasibility assessment for factors other than cost.

702) Develop design and evaluation criteria. Initial design goals (e.g. to what level of drainage/flood protection should improvements be designed) will be established to direct the alternative project development activities. As the alternatives analysis proceeds, the target design criteria may be revised in order to achieve a cost-effective set of improvements to the system.

The proposed evaluation and sizing goals will be summarized in the combined sewer survey report developed during Phase 1 and refined as a part of Task 1 of Phase 2. A meeting with the Regional Board on these goals is anticipated.

Develop cost estimating assumptions, such as cost level (i.e. present worth) for comparing alternative improvements. Summarize these and discuss with City staff. Obtain approval of the assumptions.

- 703) Evaluate the baseline conditions relative to needs for flood and CSO control. Using an improved Sacramento SWMM model, and the results of data collection and evaluation, the existing and future capacity and flooding conditions within the system will be validated. Structural condition will also be included in the baseline assessment. The baseline conditions will guide the location and size of the specific improvement projects.
- 704) Collect additional field information. This will include soils testing for the purpose of developing tunnel, pipeline and storage project alternatives. Field reconnaissance of specific, preliminary project sites may be required.
- 705) Develop and evaluate alternative projects. Determine feasibility based on factors other than cost, and prepare recommendations for potentially feasible projects. Estimate costs for those projects. Use the Sacramento SWMM to aid in sizing and estimating the effectiveness of those projects.

Storage. Identify specific sites, sizes and limitations (access, soils, easements, permits, odors, utilities) associated with 8 storage projects and supporting facilities. Determine which sites are feasible, considering construction limitations, and estimate costs. Facilities could be located within the City or near the Regional Wastewater Treatment Plant.

Tunnels. Develop and recommend feasible tunnel projects for the purpose of conveying/storing excess combined wastewater or stormwater (where sewer separation is proposed). Determine construction methods, sizes, alignments and costs for each project, including supporting facilities (odor control, washdown mechanisms, pumping stations). Estimate feasibility by considering construction limitations such as size, soils, permits, odor, utility conflicts, groundwater level, traffic impacts, and support facility location.

Conveyance system enhancement. Develop feasible conveyance system enhancement, such as upsizing and paralleling pipelines, and redirecting flow to laterals with higher design capacity. These alternatives will be directed towards problem areas defined in Task 4, and will be coordinated with the need for rehabilitation. Relative to flood control, sewer renovation (lining techniques, etc.) in itself may not achieve capacity increases sufficient to meet the target design storm goals. The best rehabilitation/flood control benefits will be realized in locations where there exists both a pipeline deterioration and flooding problem.

Sewer separation. Sewer separation will be evaluated in specific areas which drain to the Sacramento River. No additional stormwater discharges to the American River will be considered. Proposed storm drain systems will incorporate low flow diversions back into the sewer system.

Treatment. Develop feasible treatment projects, considering construction limitations and regulatory requirements. This would include adding treatment processes to storage facilities, constructing new treatment facilities, expanding the City's Combined Wastewater Treatment Plant, and expanding the use of existing and future capacity. The feasibility of these alternative improvements will depend greatly on effluent limitations required by the regulatory agencies.

Wetlands Treatment. Identify locations, constraints (construction, environmental, odor), removal levels, and process requirements for potential wetlands treatment projects. Estimate feasibility of specific projects and determine costs for those projects which are feasible.

- 706) Evaluate the specific projects based on criteria other than cost. This will provide additional criteria for screening the list of projects feasible for developing alternative plans.
- 707) Based on the specific project analysis, compare the cost-effectiveness (cost versus benefit) of various alternative projects. For instance, a storage/conveyance tunnel project might be compared to a reservoir/pipeline combination for relieving flooding in a given area to comparable levels of control. The objective of the comparison is to derive a set of feasible projects which provide flood relief throughout the system and control overflows to the Sacramento River.
- 708) Prepare a draft technical memorandum summarizing the results of the analysis. Include for each alternative project: description, feasibility, cost and site sketch. The technical memorandum will describe assumptions used in the analysis.
- 709) Prepare a final version of 708).



WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2

TASK NO.: 8

DESCRIPTION: Improvement Plans and Screening

TASK MANAGER: Gordon Culp

SCHEDULE: Start - March 25, 1991.  
Preliminary Alternative Plan Report - May 15, 1991.  
Draft Technical Memorandum - May 23, 1991.  
Final Technical Memorandum - July 1, 1991.

WORK PRODUCTS: Technical memorandum describing the development and screening of alternative project combinations.  
A brief Preliminary Alternative Plan Report will be developed for presentation to the City Council, identifying the approximate cost of the recommended plan and an overview of the projects included in the plan.

SCOPE:

Using the specific alternatives developed and updated version of the Sacramento SWMM, projects combinations will be developed and screened. The objective is to select a combination of projects, i.e. a plan, which will achieve the City's flood and overflow control goals in a cost-effective manner.

801) Establish plan evaluation and screening criteria. These may include:

- Reduction in CSO and Flood Volume
- Reduction in CSO and Flood Frequency
- Reduction in CSO and Flood Duration
- Total Cost
- Unit Cost (relative to CSO, flooding or remaining life)
- Pollutant Loading Reduction to the Sacramento River
- Aesthetic Improvement
- Potential for Cost Sharing
- Ease of Operation Criteria
- Surface Water Quality Criteria
- Implementability
- Coincident Benefits
- Known "Hot Spot" Improvement
- Pipe/Facility Life Extension
- O & M Cost Reduction

Summarize the evaluation criteria for discussion with the City staff, and obtain approval of the criteria.

33

- 802) Based on the analysis performed in Task 7, develop alternative plans by combining various specific projects. It is anticipated that a maximum of four plans can be developed from the feasible specific projects.

Included in the alternative plan development should be the analysis of operating the system in separate segments. For instance, the central City area could be routed entirely through a separate conveyance system which does not interface with other parts of the combined sewer system.

- 803) Screen the alternative plans, using a matrix approach, based on the criteria established at the initiation of the task.

Select the recommended project based on the results of the screening analysis.

- 804) Prepare a preliminary, brief report on the alternative plan selected for presentation to the City Council.

- 805) Refine the plan development analysis, including the benefits analyses and cost estimates.

- 806) Prepare a draft technical memorandum describing the analysis and results.

- 807) Prepare a final version of 806).

WORK ELEMENT DESCRIPTION  
SACRAMENTO COMBINED SEWER SYSTEM  
IMPROVEMENT AND IMPLEMENTATION PLAN

PHASE NO.: 2  
TASK NO.: 9  
DESCRIPTION: Detailed Technical Report and Analysis of Mitigation  
TASK MANAGER: Paula Arsenault  
SCHEDULE: Start - March 17, 1991.  
Detailed Outline - April 17, 1991.  
Rough Draft Report - June 6, 1991.  
HDR Receive Comments - June 10, 1991.  
Final Draft Report - June 20, 1991.  
HDR Receive Comments - June 24, 1991.  
Final Report - July 1, 1991.

WORK PRODUCTS: Detailed Technical Report to be presented to the Regional Water Quality Control Board, which describes the recommended solution for flooding and overflow problems in the combined sewer system.

SCOPE:

The primary objective of this task is to develop the Detailed Technical Evaluation and Analysis of Mitigation Alternatives Report for the City's combined sewer system, for submittal to the Central Valley Regional Water Quality Control Board.

- 901) Mechanisms for funding project construction will be described. This would include a description of funding sources and estimated amounts that could be secured through loan sources. Background information on current financing methods and other information will be provided by the Rate Study being prepared by CH2M-Hill.
- 902) Prepare a detailed outline for the report. Review the outline with City staff and obtain agreement on the contents and format of the report.
- 903) Prepare the draft report. The report will contain planning level cost estimates and project layouts for the selected plan, and will describe the procedures used in screening and evaluating the alternatives.

Preliminary construction phasing will be estimated in 1-year increments, and prioritized based on cost-effectiveness for flood and CSO control. (Final phasing would depend on the development of a complete and detailed financing plan, which is not part of this scope.)

904) Prepare a final version of 903).

905) Prepare the report appendix, which will contain the final versions of the technical memoranda developed throughout the planning process.

ATTACHMENT 2  
AMENDMENT #2

EXHIBIT B

CONSULTANT AND PROFESSIONAL SERVICES AGREEMENT

WITH HDR ENGINEERS, INCORPORATED

FEE SCHEDULE/MANNER OF PAYMENT

1. Payment under this contract for all services will not exceed \$787,284.
2. Services will be invoiced as performed, and all invoices will reference this agreement number and the City purchase order number.
3. This agreement will be charged to Flood Control and Sewer Administration:  

414-500-XD41-4802
4. Time-related charges shall be the total hours worked on the project by each employee, multiplied by the employee's direct hourly salary rate, multiplied by a fringe benefit, overhead, and profit factor of 3.10.
5. Expenses incurred by the consultant which are not included in the hourly rates (such as mileage, word processing, computer, telephone, facsimile, and printing), and all costs of subconsultant services, shall be billed at the actual cost plus ten (10) percent.
6. Each (monthly) invoice shall detail:
  - a. The current month's charges, including hours charged by each employee.
  - b. The total amount invoiced to date, including the current invoice amount.
  - c. The total of all invoices paid as of the date of submittal.

Request for payment shall be sent to:

Department of Public Works  
Flood Control and Sewers Division  
1391 35th Avenue  
Sacramento, CA 95822  
ATTN: Gary Reents  
Ref. Job #XD41