April 25, 1991

Mr. Tommy Thomson  
General Manager  
Southeastern Colorado Water Conservancy District  
P. O. Box 440  
Pueblo, CO 81002  

In accordance with our earlier discussions, the City has contracted with Black & Veatch to provide engineering services for the feasibility study to enlarge Pueblo Reservoir. Enclosed for your information is a copy of the Scope of Services for this contract.

If you have any questions about the proposed agreement or any other aspect of the project, please contact us. The City and Black & Veatch look forward to working with the District on this interesting and challenging project.

Sincerely,

Phillip H. Tollefson, P.E.  
Water Resources & Planning Manager  
Water Department  

jkw  

Enclosure
ATTACHMENT A
TO
AGREEMENT FOR ENGINEERING SERVICES

City: City of Colorado Springs, Colorado
Project: Pueblo Reservoir Enlargement Study

SCOPE OF SERVICES

The services which the Engineer agrees to furnish under this Agreement are defined in this Attachment A. A brief description of the project approach is as follows:

The initial activities associated with this study include collection of data from the United States Bureau of Reclamation (USBR) and other Federal and State agencies and the routing of the inflow design flood (IDF) hydrograph information, provided by the USBR, through Pueblo Reservoir. Based upon the results of this effort, the requirements for the enlargement of Pueblo Dam and Reservoir will be identified. A detailed predesign level geotechnical and structural evaluation will be performed to confirm feasibility and provide sufficient information to estimate costs. A report will be prepared to summarize the findings of the study.

The scope of services for this project is as follows:

I. INVESTIGATION AND REPORT

A. Collect Pertinent Data for the Study

1. Provide a list of information required for the study to the USBR and other involved agencies.

2. Obtain and review maps of Pueblo Reservoir for use in identification of alternative methods to enlarge the reservoir.

3. Obtain and review information from the USBR which would be used in conjunction with inflow design flood routing, such as stage-discharge (outlet works and spillway) information, stilling basin hydraulic information, etc.

4. Obtain and review construction documents from the USBR for the dam and reservoir including as-built drawings, specifications, and any modification or additions to the dam or area recreational facilities.

5. Obtain and review drawings for facilities constructed at Pueblo Reservoir by organizations other than the USBR including the fish hatchery, pumping stations, and ditches.

6. Obtain and review applicable geotechnical information from original dam design; obtain periodic piezometric and inclinometer readings.
7. Obtain and review geotechnical and structural design calculations for the dam.

8. Obtain and review historical and current reports and studies pertaining to Pueblo dam or reservoir.

B. Route Inflow Design Flood Through Reservoir

1. Review Inflow Design Flood Determined by USBR

Review flood hydrograph information determined by USBR for Pueblo Reservoir. Correspond with USBR regarding any questions or clarifications regarding the hydrograph. This information is scheduled to be available by June 1, 1991.

2. Spillway Sizing and Reservoir Routing Studies

Using the HEC-1 computer model, route the flood hydrograph through the reservoir and determine required spillway crest lengths, configurations, and embankment heights to pass the design flows. Consider routing at one alternative spillway crest elevation in addition to the existing spillway crest elevation.

C. Determine Reservoir Enlargement Parameters

1. Based upon the results of the hydrologic and routing analysis, identify and evaluate on a preliminary basis the design parameters for the enlargement of Pueblo Reservoir by 65,000 AF. An enlargement which requires interrupting reservoir operations will not be considered. As part of this task, several methods of accomplishing the enlargement will be considered. A partial list of modifications to the dam and spillway which will be considered is as follows:

   Potential Modifications to Dam and Spillway *

   Dam                        Spillway
   Retaining wall             Mass concrete
   Mass fly ash or cellular concrete
   Geogrid stabilized embankment
   Roller Compacted Concrete or Soil cement construction
   Enlarge main embankment

* Modifications considered will depend upon the increase in height being considered.

2. Develop an enlargement plan in terms of the actual detailed modifications considered for the dam and spillway.

3. Prepare tables, charts and graphs indicating proposed reservoir storage allocations (flood pool, joint use, active conservation).
D. Perform Geotechnical Evaluation of Enlargement Plan

1. Review existing geologic, geotechnical, and project information obtained from USBR, City of Colorado Springs, and the State of Colorado.

2. Assemble design information from previous analyses and investigations performed at the site. It is anticipated that additional geotechnical field and laboratory investigations will not be required. Material properties and shear strength parameters for use in stability analyses will be based upon existing information.

3. Pore pressures are currently being monitored at the Pueblo Dam. Monitoring data will be reviewed and compiled, reduced for the existing conditions, and projected to obtain pore pressures for the stability analyses of the dam for each pool level to be analyzed.

4. Review the stability criteria currently accepted for the Pueblo Dam, and evaluate and recommend stability criteria for dam enlargement. Discuss the stability criteria with the governing agencies and the City of Colorado Springs as necessary for approval.

5. Evaluate enlargement alternatives which will meet the stability and storage requirements of the governing agencies and the City of Colorado Springs. It is anticipated that alternatives will include the following components: parapet wall construction, geogrid stabilized embankment, earth embankment modification, and roller compacted concrete or soil cement construction.

6. Perform embankment stability analyses for selected critical sections for all credible loading conditions including steady seepage normal pool, steady seepage with earthquake conditions, flood pool, and rapid drawdown. In addition, an end of construction analysis will be performed for any earth embankment modification alternative considered. The computer program PCSTABL5 will be used to evaluate stability of embankments.

7. Two concrete spillway alternatives will be evaluated including raising the non-overflow section and raising the overflow section. Detailed stability analyses will be performed on the non-overflow section. The non-overflow section will be analyzed for stability against sliding and overturning for normal, flood, and earthquake loadings.

E. Perform Structural Evaluation of Enlargement Plan

1. Review all pertinent information pertaining to the geometry of the existing concrete gravity dam section.
2. Evaluate alternatives for raising the concrete overflow and non-overflow sections. Alternatives may consist of adding buttressed or parapet walls to the non-overflow section and mass concrete to the ogee shaped overflow section. A parapet wall will also be considered for the earth embankment portion. Preliminary design will be performed to determine member thickness and reinforcement for the purpose of making conceptual design level cost estimates.

F. Determine Feasible Alternative and Prepare Budgetary Cost Estimate

1. Combine information from geotechnical and structural evaluations and site considerations to verify the feasibility of enlarging Pueblo Reservoir.

2. Evaluate the effect on existing facilities at the reservoir such as the fish hatchery, wildlife sanctuary, pumping stations, and ditches.

3. Identify and evaluate the location, type and arrangement of intake structures and pumping stations.

4. Identify revised locations for utilities and recreational or transportation facilities which would be affected. Particular attention will be given to the potential for further settlement of the railroad tracks north of Pueblo Reservoir.

5. Prepare a budgetary level opinion of project cost.

6. Develop an annual expenditure schedule for use in future budget planning.

7. Based upon the cost of enlarging Pueblo Reservoir, estimate the cost ($/AF) to deliver water to City based upon the "southern delivery" alternatives (B-1, B-2, etc.) identified in the Raw Water Delivery Study prepared by Black & Veatch in 1989.

Update the capital costs and present worth analyses for the southern and western alternatives (A-1, A-2) to current construction cost indices.

G. Prepare Report

1. Prepare a draft engineering report summarizing the findings and recommendations developed during the study. Included in the report will be figures, charts, graphs, and tables supporting the study effort and illustrating the enlargement plan which was evaluated. Submit the draft report to the City, USBR, Southeast Colorado Water Conservancy District (SECWCD), and other agencies staff's for review and comment.

2. Upon receiving comments, prepare the final version of the report and submit 100 copies to the City.
H. Meetings

1. Meet with the staff of the City, USBR, SECWCD, and other agencies to share information and to review the direction and findings of the study at the following milestones:
   - Upon receiving notice to proceed for this project, in order to set direction for the study and to meet with the USBR to discuss and collect data.
   - Upon identifying the most feasible alternative for enlarging the reservoir for further evaluation.
   - Upon completing the geotechnical and structural analysis.
   - Upon completing the cost estimates.
   - Upon providing the City staff an opportunity to review the draft report.

2. Meet with the City staff at other times as requested by the City; the cost of which will be considered a supplemental service in accordance with Attachment B.

II. SUPPLEMENTAL SERVICES

A. Any work requested by the City that is not included in one of the items listed under any other phase will be classified as supplemental services.

B. Supplemental services shall include but are not limited to:
   1. Additional meetings with local, State, or Federal agencies not identified in Section I.
   2. Supplemental engineering work performed to meet the requirements of jurisdictional agencies which become effective subsequent to the date of this agreement.
   3. The investigation and evaluation of alternatives in addition to that defined in Section I.
   4. Preparation of permit applications, or environmental impact statements and assessments required for any of the alternatives investigated.
   5. Preparation of right-of-way or property descriptions required for any of the facilities recommended in the study.
6. Assistance to the City staff and legal counsel in the preparation of water rights filings for storage facilities which may result from the investigations conducted under this study.

7. Appearance at public hearings or at special boards.

8. Geotechnical field investigations.

9. Aerial mapping and ground surveys of dam and reservoir.

10. Evaluation of the addition of spillway gates.

11. Use of the USBR flood hydrology and routing computer program to complete the analysis.

12. Special consultants or independent professional associates requested or authorized by City.