

- **Board of Directors**
Engineering and Operations Committee

September 12, 2000 Board Meeting

8-2

Subject

Amend a Professional Services Contract for the Inspection and Analysis of Metropolitan's Prestressed Concrete Cylinder Pipelines (PCCP) in the amount of \$340,000.

Description

A number of large diameter Prestressed Concrete Cylinder Pipeline (PCCP) failures in the water industry has prompted Metropolitan to review its pipelines and develop the PCCP Inspection Plan under its Infrastructure Reliability Protection Program. The approach to ensure pipeline reliability includes assessing the pipelines that are most at risk while developing schedules and estimates for the remainder of the system over time. These assessments usually require coordination with the shutdown of the pipeline in periods of low demand (usually in winter time frames). Once inspections and assessments of the pipe sections are completed, it will then be determined whether repairs are necessary. As a result, in December 1996, the Board authorized a new capital program to assess the condition of Metropolitan's PCCP and to evaluate and develop alternative pipe monitoring techniques and instrumentation. After conducting soil-resistivity measurements, collecting soil samples, considering geographical location (nearby land uses, etc.), and analyzing other data, staff has categorized and ranked Metropolitan's PCCP in priority requiring attention.

As a result of these rankings, staff is initially recommending an internal pipeline investigation of a 16-mile reach of the Sepulveda Feeder, and a 5.4-mile reach of the Second Lower Feeder (SLF) utilizing the Remote Field Eddy Current/Transformer Coupling (RFEC/TC) technology. The Pressure Pipe Inspection Company (PPIC) holds an exclusive license for this technology and is the sole provider of that service. PPIC uses this technology to locate and quantify breaks in the prestressing wires along the length and/or around the circumference of PCCPs, and it is recommended that an existing sole source agreement with PPIC be amended to authorize this work. Some of Metropolitan's and other agencies' pipes have been excavated to verify the results of the RFEC/TC, and the new technology has proved to be reliable, expeditious and cost efficient.

In addition, staff is recommending that a detailed analysis of a previously inspected portion of the SLF be performed. An inspection of the SLF was performed in January 2000 by PPIC, and the final report was submitted in June 2000. The report was only intended to provide Metropolitan with an overview analysis for a 25-mile reach of the SLF. The overview identified the location of distressed pipes, and broadly grouped them into three categories from most distressed to least distressed. Having discovered the existence and location of distressed pipe reaches, additional analysis is now necessary to identify the specific pipe sections and the number of wire breaks. This information would allow staff to plan repairs, if necessary. Following the inspection included within this action, a total of 45 miles of PCCP will have been inspected. Metropolitan owns and operates approximately 170 miles of PCCP (See [Attachment 1](#) for a detailed description, [Attachment 2](#) for site map).

This program was evaluated by the Capital Investment Plan (CIP) Evaluation Team and is fully budgeted in the Fiscal Year 2000/2001 CIP.

Policy

Pursuant to Section 8115 (a) of the Metropolitan Water District Administrative Code, if the amount payable or expected to be paid under the terms of the contract is \$250,000 or more, the contract shall be executed only upon prior approval of the Board, provided that the Board may designate an officer of the District to negotiate and execute classes of contracts without prior approval of the Board.

Board Options/Fiscal Impacts

Option #1

Amend Agreement No. 30402 with PPIC to increase the contracted amount by \$340,000, for a total contract amount of \$560,000 for a detailed analysis of the previously inspected 25-mile reach of the Second Lower Feeder as well as inspection and analysis of an additional 5.4-mile reach; and the inspection and analysis of a 16-mile reach of the Sepulveda Feeder.

Fiscal Impact: \$340,000 of Appropriated Funds

Option #2

Amend Agreement No. 30402 with PPIC to increase the contracted amount by \$80,000, for a total contract amount of \$300,000 for a detailed analysis of only the previously inspected 25-mile reach of the SLF; defer the inspection and analysis of a 16-mile reach of the Sepulveda Feeder and a 5.4-mile reach of the Second Lower Feeder for Fiscal Year 2001/2002. This would reduce expenditures this fiscal year, but would delay the inspection of 21.4 miles of PCCP requiring attention.

Fiscal Impact: \$80,000 of Appropriated Funds

Staff Recommendation

Option #1

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|  | 8/17/2000 |
| Roy L. Wolfe Acting Manager, Corporate Resources | Date |

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|--|-----------|
|  | 8/28/2000 |
| Ronald R. Jester General Manager | Date |

[Attachment 1 – \(Detailed Description\)](#)

[Attachment 2 – \(Site Map\)](#)

BLA # 366

Detailed Report

Purpose/Background. Metropolitan owns and operates approximately 170 miles of PCCP, which was installed between 1965 and 1985. PCCP was commonly specified at that time because it was economical and it had the ability to contain high pressures. Metropolitan's PCCP diameters range from 54 to 201 inches, and the pipelines are located both in remote rights-of-way and dense urban areas. PCCP is fabricated with reinforcing wire that is prestressed to 196,500 psi, and operating pressures on some of these pipes can reach in excess of 280 psi. Degradation of the reinforcing wire is a concern because it is wrapped under high tension and is vulnerable to damage and corrosion.

To ensure pipeline reliability throughout the distribution system, Metropolitan has initiated a PCCP Inspection Plan (Plan) under its Infrastructure Reliability Protection Program. The Plan involves inspection using various techniques, which include visual and "sounding" methods, corrosion monitoring, and non-destructive testing and analysis. The Plan reassesses the PCCP over a 5-year cycle because of on-going corrosion. The Plan has evaluated and prioritized the levels of risk of PCCP in Metropolitan's distribution system. The pipelines have been categorized and ranked in order to facilitate the implementation of an inspection program. The rankings were determined after considering each pipeline's environment (soil corrosivity), design pressure, geographic location (nearby land uses, etc.), past corrosion data, type of prestressing wire used, and the criticality of the pipeline to Metropolitan's system.

Although Metropolitan maintains an aggressive corrosion monitoring program for PCCP, conventional monitoring techniques are not always reliable for locating defects of small severely corroded areas. These defects can lead to a catastrophic failure of the pipe. In December 1996, your Board appropriated \$1.9 million and authorized activities to categorize the condition of Metropolitan's PCCP, and to evaluate and develop alternate pipe monitoring techniques and instrumentation.

Previous Inspections. One promising new technology evaluated by staff was developed by The Pressure Pipe Inspection Company (PPIC). PPIC performs internal inspections with a Remote Field Eddy Current/Transformer Coupling (RFEC/TC) technology. Metropolitan staff was present when PPIC used this technology to locate and quantify breaks in the prestressing wires along the length and/or around the circumference of several water agencies' PCCPs. Some of these pipes were later excavated to verify the results of the RFEC/TC, and the new technology proved to be reliable, expeditious and cost efficient. PPIC holds an exclusive license for this technology and is the sole provider of that service.

The SLF was high on the priority list of PCCP requiring attention. In January 2000 Metropolitan contracted with PPIC in the amount of \$220,000, for an overview inspection of a 25-mile reach of the SLF in order to determine if any portions of the pipeline were distressed, as well as their approximate locations. The internal inspection of the pipeline was performed and a final report was submitted in June 2000.

Subsequent to the SLF inspection, PPIC was retained to perform RFEC/TC emergency testing along nine miles of the Allen McColloch Pipeline (AMP). Of the 2,478 PCCP pipes inspected, 280 sections, or 11.3 percent, showed evidence of broken reinforcing wires. Eighteen pipes were later excavated and 12 pipe sections are undergoing additional tests. To date, six pipe sections have had their mortar coating removed and the actual number of broken wires have verified the results of the RFEC/TC tests.

These results have proven that the RFEC/TC is very accurate in detecting defects within individual pipe sections.

Additional Inspections and Second Lower Feeder Analysis.

The SLF inspection report submitted by PPIC in June 2000 was only intended to provide an overview of the 25-mile reach. Metropolitan staff contracted for the overview inspection in order to determine the existence and approximate degree of pipe distress before spending the additional funds necessary for a detailed report. The overview analysis presented was qualitative and ranked the “distressed” pipe depending on the severity of distress. Of the 6,482 PCCP pipes inspected, 237 pipes were identified as being distressed. Of these 237 pipes, 104 are categorized as “Most Distressed”, 72 as “Medium Distressed”, and 57 as “Least Distressed”. While these results provide some indication of the severity of distress, they do not provide sufficient detailed information to proceed with repairs.

The field information necessary to develop the detailed report was compiled by PPIC during their internal inspection. Due to the amount of distressed pipe, evidenced in the overview analysis, it is recommended that PPIC perform the detailed analysis to specifically locate and quantify breaks in the prestressing wires. This information is needed in order to plan any necessary pipeline repairs. The estimated cost for the detailed evaluation is \$80,000.

The staff recommendation is to amend the existing sole source agreement with PPIC to perform all of the additional analysis and inspection work for the SLF and Sepulveda Feeder.

Funding. The proposed services were planned and budgeted as part of Metropolitan’s PCCP monitoring program. To date, (July 2000) \$898,222 of the appropriated \$1.9 million has been spent.

Future Work. To maintain pipeline reliability, the current scope of the program to Assess the Condition of Metropolitan’s PCCP is to conduct soils studies to identify areas of high corrosion susceptibility on all 170 miles of PCCP. The results, along with other criteria, help established a prioritized list of pipelines. In addition, the program scope includes investigating and verifying non-destructive inspection techniques. Acoustic emissions, echo impulse, and remote field eddy current techniques were identified as being most promising to determine the conditions of PCCP. To verify the technology, two pipelines were identified to be tested: SLF and the Sepulveda Feeder. An overview using the three techniques has been performed on the SLF, and more detailed test verification still remains to be performed. The Sepulveda Feeder is planned to be tested during its shutdown, scheduled for this winter. A third pipeline, the Allen McColloch Pipeline, was also tested, verified, and repaired following its rupture in December 1999.

Based on the results to-date on the testing and verification of the SLF and AMP, and the testing of the Sepulveda Feeder, Metropolitan will plan and coordinate the inspection and testing of the rest of the PCCP in its system over a 3-year period. The scope to perform complete testing on all of Metropolitan’s PCCP will be brought to the board for approval. Also any recommended repairs of the PCCP will be justified as new capital program(s) for board approval

