

## **Appendix D**

### **Sewer Separation Cost Memorandum**

# CDM / C&S

Camp Dresser & McKee/C&S Engineers, Inc.

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## A Joint Venture

**MEMO TO:** Susan Miller

**FROM:** Bob Albright

**RE:** Review of Sewer Separation Costs

**SUBJECT:** Recommended Unit Costs for Planning Estimates

**DATE:** April 30, 2001 (Issued September 10, 2001)

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### Introduction

A review of the draft facilities plans for the Harbor Brook and Clinton projects indicated that the methods used for preparing preliminary cost estimates for evaluating the feasibility of sewer separation as an abatement alternative varied for each project. In an effort to streamline the planning process and minimize review comments, development of a consistent method for preparing sewer separation cost estimates should be considered. The following recommendations for estimating sewer separation costs were developed in a collaborative effort with representatives of the design firms performing the respective planning studies, Environmental Engineering Associates and Moffa/Brown and Caldwell.

### Sources of Cost Data

Cost data from other municipalities was originally considered in developing the unit costs to be used in the planning stages of these projects, but was found to vary considerably by city or region. Differences in sewer construction methods, plumbing configurations, soil conditions, underground utilities, traffic and other issues can have significant impacts on the costs of constructing sewers. These issues, as well as the size, age and condition of the existing combined sewer system can create the significant variations observed in the costs incurred by each city. Based on the foregoing, it is believed that site specific cost data, where available, is the best source for developing unit costs to be used in evaluating the feasibility of separating sewers.

Two sources of sewer separation cost data are currently available for the City of Syracuse. These sources consist of the as-built costs for the West Street Sewer Separation Project and the design cost estimates provided in the design memorandum entitled "Contract #DACW 49-99-C0002 Design of Sewer System to Separate Combined/Storm Sewers, Syracuse, Onondaga County, New York" by O'Brien and Gere (OBG Design Memo). The West Street Project provides as-built cost data for a sewer service area that consists of primarily commercial development, while the OBG Design Memo provides design costs based on field investigations performed for separation of sewer service areas that consist of primarily residential use.

## **Unit Costs for Commercial Areas**

The West Street Project, completed in August 2000, separated the sewers within a combined sewer service area that is made up of primarily commercial properties and has a relatively high density of utilities. This project provides the construction costs incurred for the separation of the sewers within a commercial area of the city that is similar to those within the limits of the Harbor Brook and Clinton planning areas. The as-built costs take into consideration various construction issues such as traffic control, soils, utility conflicts, plumbing configurations and other site characteristics indicative of performing sewer separation work within the City of Syracuse. As these issues can have significant impacts on sewer construction methods and the resultant project costs, the as-built data for the West Street Project provides a valuable source of data for developing cost estimates for planning of future projects within the City.

The as-built cost, as indicated on the final payment application for the West Street Project, was \$2,311,125.85. The project required the installation of 3418 feet of sanitary sewer and 394 feet of storm sewer to complete the separation of the sewers in this service area. The total length of 3812 feet of new sewer is comparable to the length of combined sewer that existed prior to construction. Using this data, the resultant per foot cost was calculated to be \$606 per foot of sewer. Using the Engineering News Record Construction Cost Index (ENRCCI) to adjust the unit cost to current conditions (ENRCCI 6286), the unit cost was determined to be \$611 per foot of sewer.

In an effort to identify the costs of the plumbing modifications required for the buildings within the service area, the costs for these modifications were isolated from the balance of the project costs. Upon review of the payment items and change orders, the cost associated with the plumbing modifications for the 22 commercial buildings was found to be \$225,134. This equates to a cost of approximately \$10,200 per building. Upon excluding the costs of the plumbing modifications, the unit cost to separate the City sewers was found to be \$547 per foot. Adjusting these costs to current conditions (ENRCCI 6286), results in an estimated cost of \$10,320 per building and \$552 per foot of sewer.

Based upon a review of the costs and descriptions of the modifications addressed in the change orders for this project, as well as discussions with construction representatives from C&S, the level of work related to the plumbing modifications was found to vary considerably due to site specific conditions. In consideration of these observations and in the interests of simplifying the preliminary estimating procedures, it is recommended that a unit price of \$610 per foot of sewer be utilized to develop the construction cost estimates for separating commercial areas.

## **Unit Costs for Residential Areas**

The sewer separation project under design by O'Brien and Gere covers the combined sewer service areas for thirteen (13) outfalls to Onondaga Creek. Although this project is in the design stages, intensive field investigations have been performed to evaluate sewage flows, soil conditions, utility conflicts, building connections, as well as the structural integrity of the existing sewer system. Detailed construction cost estimates were prepared and summarized in the OBG Design Memo utilizing the field

information. These estimates include a 25% contingency for mobilization, demobilization, bonds, permits, survey, stakeout, field office and record drawings, but do not include costs for modifications to internal building plumbing.

A review of the OBG Design Memo indicates that 10 of the 13 sewer service areas to be separated consist of primarily residential use. The report data for the 10 residential areas has been summarized in the attached table and was used to develop an average cost per foot for sewer separation. The unit cost estimates ranged from \$272 to \$581 per foot of existing combined sewer with an average cost of \$457 per foot. Upon adjusting the cost to current conditions (ENRCCI 6286), the unit cost was determined to be \$466 per foot of existing combined sewer.

The OBG Design Memo does not include costs for plumbing modifications, but a separate report entitled 95% Inspection/Design Report, Modification P00001 to Contract #DACW 49-99-C0002 Design of Sewer System to Separate Combined Sanitary/Storm Sewers dated February 2000 (95% I/D Report) contains information relating to external inspections of residences within the service areas to be separated. The 95% I/D Report indicates that external inspections of 654 residential properties were performed to locate yard and roof drain connections to the existing combined sewer. These inspections revealed only 5 properties (less than 1%) with roof leaders tied to their plumbing connections. No yard drain connections were identified. Based upon this information, it would appear that the work required to modify existing plumbing connections would be minimal.

While external inspections can be used to effectively detect potentially large inflow sources such as roof drains, yard drains and broken cleanouts, they do not reveal such inflow sources as sump pumps and foundation drains. These types of connections can be common in older homes and areas where the water table is high. Foundation drains can be difficult to detect, even upon entry to the home.

As limited information is available relating to residential plumbing connections, these costs may be best addressed by assuming a percentage of the construction costs. In consideration of the small number of roof and yard drain connections detected in the residential areas currently under design, it would appear that increasing the unit cost for sewer separation by approximately 5% would be a reasonable preliminary estimate of the plumbing modifications to private residences. This adjustment to the unit cost would result in the use of \$490 per foot of existing combined sewer for developing the sewer separation costs to be provided in the facilities planning documents for the Harbor Brook and Clinton projects.

### **Contingencies, Engineering, Legal and Administrative Costs**

The unit costs discussed above do not include contingencies, engineering (design and construction inspection), legal and administrative costs. In order to account for these project costs, a factor should be applied to the estimated construction cost. A factor of 15% is recommended for contingencies, while a factor of 25% is recommended for engineering, legal and administrative costs. These same cost ratios should be applied in the development of the project costs for each of the CSO abatement alternatives considered in the respective planning studies.

## Recommendations

The preliminary construction cost estimates to be prepared for the Harbor Brook and Clinton Facilities Plans should use \$610 per foot of proposed sewer for commercial areas and \$490 per foot for residential areas. These recommended unit costs were developed using as-built costs and design estimates that were prepared based upon actual field conditions within the City of Syracuse, thereby providing an accurate reflection of the work required for separation of residential and commercial sewer service areas.

While some unanticipated issues may arise during construction, the 15% contingency factor should be sufficient to account for any associated costs. A factor of 25% is recommended in order to account for the engineering, legal and administrative costs of the project. All costs provided in these reports should reference the Engineering News Record Construction Cost Index, upon which they are based, in order to allow their accurate update in the future.

Should you have any questions or wish to schedule a meeting to discuss our recommendations further, please do not hesitate to call me.

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