FACILITY PLAN
FOR RESTORATION AND IMPROVEMENTS TO ON-SITE SEWER LINE SERVING ROCK CREEK REGIONAL PARK - LAKE NEEDWOOD

THE MARYLAND-NATIONAL CAPITAL
PARK AND PLANNING
COMMISSION

9500 Brunett Avenue
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Task Order No. MC 2005-03

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The Park Development Division (PDD) of the Montgomery County Department of Park and Planning of the Maryland-National Capital Park and Planning Commission (M-NCPPC) has retained URS Corporation (URS) of Gaithersburg, Maryland under Task Order No. MC 2005-03 for the preparation of a Facility Plan for restoration and improvements to the on-site sewer line serving Lake Needwood within the Rock Creek Regional Park system.

Rock Creek Regional Park consists of 1,810 acres in Montgomery County, developed in the 1960s for lake-oriented recreation and flood control. Lake Needwood is a 75-acre man-made impoundment lake located along Needwood Drive near Rockville, and according to M-NCPPC, "is one of the crown jewels of Rock Creek Regional Park." In addition to the picturesque lake on which visitors can boat and fish, the park features a golf course, hiking trails, playgrounds, picnic areas, an archery range, a visitors center, and snack bar.

The existing on-site sewer system, which was built in the 1960s, serves the visitors center, three bathhouses, and the Maintenance Yard. The system consists of approximately 6,750 feet of gravity sewer, approximately 1,000 feet of force main, 34 manholes, and two ejector-pump stations. The Maintenance Yard is not connected to the sewer line and has its own septic system and drain field.

The goal for this Facility Plan is to generate innovative, economical, and environmentally sensitive options for the restoration or re-design of the existing sewer lines. Ultimately, the Facility Plan will include 30 percent complete construction documents consisting of a design, cost estimate, and determination of regulatory feasibility. Based on detailed site investigations and review of existing data, URS will investigate three alternatives for restoration or replacement of the sewer line, and recommend the most viable alternative to M-NCPPC for more detailed design.

The scope of this project has been delineated into three tasks that will accomplish these goals:

- Task One – Project Initiation Phase
- Task Two – Facility Planning Phase
- Task Three – Facility Plan Approval Phase

This Facility Plan summarizes the results of Task One and the design alternatives phase, and permit and approval phase of Task Two. This Plan will be submitted to the PDD Committee for review and selection of the preferred alternative. This Plan will be prepared as a Draft Final and submitted for review by all pertinent M-NCPPC stakeholders. Once reviewed by all M-NCPPC stakeholders, a Final Facility Plan will be prepared and presented to the Planning Board.

2.1 RESULTS OF SITE RECONNAISSANCE

URS engineers conducted a thorough reconnaissance of the sewer system on two visits to Lake Needwood. The visits were conducted on August 10 and September 19, 2005. During these visits, URS engineers used the most current information and hard-copy drawings provided by M-NCPPC to attempt to correlate the various sewer system components and structures shown on the drawings with those structures found in the field.

URS reviewed each of the documents to determine its applicability and relevance to the assessment of the sewer line system. Based on the review of the drawings, discussions with Lake Needwood personnel, and the site reconnaissance, the following sections describe the major components and structures associated with the sewer system. Photographs taken during the site reconnaissance are referenced to the various system components described below. The photographs are presented in Appendix A.

2.1.1 Primary 6- and 8-Inch Sewer Lines

The primary 8-inch sewer line comprises two gravity sections with a pump station and force main section located between these two gravity sections. Beginning at the downstream terminus of the Lake Needwood park system where the 8-inch sewer line joins the Washington Suburban Sanitary Commission's (WSSC) 24-inch sewer main, the first gravity section runs upstream approximately 2,700 feet to Picnic Area 1. Along this section, the 8-inch terra cotta clay sewer line has 14 manholes and drops approximately 89 feet from the invert elevation of 367.7 feet mean sea level (ft msl) at Manhole 14 located in Picnic Area 1 to the invert elevation of 278.6 ft msl at Manhole 1, which is a WSSC manhole and the junction point with the WSSC system. Based on the results of the closed circuit television (CCTV) inspection, which URS conducted from Manhole 1 to Manhole 14, this pipe segment is in fair to very good condition. All of the manholes were opened and found to be in fair to good condition.

Based upon the CCTV inspection, manholes and pipelines were judged to be in poor, fair, or good condition. Pipelines were judged to be in poor condition if there was severe root growth, pipe joint separation, and debris within the pipeline. Pipelines were judged to be in fair condition if there was some root intrusion, debris or pipe separation at joints, and the pipe had some flow capacity. Pipelines were judged to be in good condition when there was minimal root intrusion, joint separation, or groundwater infiltration in the pipeline and ample flow capacity.

Manhole 14 is the junction point for sewage discharges from the Visitors Center and Boathouse, Bathhouse No. 1, and the main sewage pump station manhole located 560 feet upstream of Manhole 14. Sewage from the Visitors Center and Boathouse is collected in a holding pit and pumped to Manhole 14 through a 2-inch PVC line inside of a 6-inch pipe. Sewage from Bathhouse No. 1 flows into a septic tank where the liquids are allowed to drain to Manhole 14 via a 4-inch ductile iron pipe (DIP). These structures are discussed further in Section 2.1.2. From the main sewage pump station, a 6-inch DIP force main conveys sewage 560 feet downstream to Manhole 14, and overcomes 41.5 feet of elevation change from Manhole 15A to Manhole 14. The main sewage pump station contains two approximately 10-horsepower pumps that are activated by liquid level switches located in the pump station wet well. The pump station is discussed further in Section 2.1.2. Based on the CCTV inspection, it was determined that the 6-inch DIP force main was in fair to good condition for the first 170 feet upstream of Manhole 14.

As discussed in Section 2.3.2, due to a severe bend in the line, the CCTV camera could not be advanced any further.

From the main sewer pump station, the 8-inch terra cotta clay sewer line travels approximately 600 feet upstream to Manhole 17, where a septic tank collecting solids from Bathhouse No. 2 drains liquids into the system, and then another 240 feet upstream to Manhole 19, where the sewer line upstream of that manhole reduces to a 6-inch line. From Manhole 19, the 6-inch terra cotta clay pipeline winds another 2,300 feet upstream to a buried drop manhole, at which point it reduces to a 4-inch line terminating at Manhole 33, the farthest point north along the main sewer line. The buried manhole was located during the CCTV inspection and cleaning work. From Manhole 33 downstream to Manhole 15A, the sewer line drops a total of 91.6 feet.

Between Manholes 29 and 30, it was determined that the 6-inch pipeline acts as a "siphon" system; the 6-inch DIP line drops 15 feet down from Manhole 30 under Beach Drive and then rises 12 feet back up to enter Manhole 29. The field reconnaissance also revealed that a 4-inch clay or DIP line runs parallel to the 6-inch line and connects Manhole 30 with Manhole 29. Both of these lines were deemed to be in poor to very poor condition.

In the past, sewage from two small bathhouses located in Picnic Area No. 3 drained by gravity to Manhole 33, and then to Manhole 30 through 4- and 6-inch terra cotta clay sewer lines. From Manhole 30 to Manhole 29, the 4-inch and 6-inch DIP siphon sewer line carried flow to the gravity portion of the system from Manhole 29 to Manhole 15A. In 1999, the two older bathhouses were torn down and a new bathhouse (Bathhouse No. 3) was constructed. At that time, the sewer line was abandoned from Manhole 33 downstream to Manhole 17, and the line was plugged at several locations, according to Lake Needwood personnel. Sewage from Bathhouse No. 3 drains to a self-contained septic holding tank system and not to the main sewer line.

The condition of the 4-/6-inch pipeline from Manhole 33 to Manhole 30 is poor because the buried manhole, located by the CCTV inspection, was filled with a substantial amount of gravel when the pipeline was abandoned. The pipeline is in very poor condition in the siphon section between Manholes 30 and 29. From Manhole 29 to Manhole 17, the pipeline is in extremely poor condition, as it is filled with heavy roots, root balls, and debris. This portion of the pipeline was cleaned prior to the CCTV work. From Manhole 17 to Manhole 15A, the pipe is in poor to fair condition, and is subject to infiltration of groundwater that routinely overtaxes the system.

2.1.2 Park Structures

Lake Needwood has five structures associated with the primary sewer line system:

- Visitors Center and Boathouse
- Bathhouse No. 1
- Bathhouse No. 2
- Bathhouse No. 3
- Main Pump Station

In addition, the park's Maintenance Yard, which is located 1,200 feet north of Picnic Area 3, has its own septic system which consists of a holding tank and drain field that is not connected to the

primary sewer line. Park personnel reported that this tank is pumped out approximately every two years.

Visitors Center and Boathouse. Sewage from the Visitors Center and Boathouse drains to an antiquated septic tank and sump equipped with a grinder pump. The sump was built in the 1960s and is in disrepair, constantly filling with groundwater infiltrating through cracks in its walls. It often overflows onto the surrounding ground during the summer months, when the park demand is high, according to Lake Needwood personnel. Sewage is pumped from the sump via a 2-inch PVC line to Manhole 14, where it then flows by gravity downstream through the system. Contractors use vacuum trucks to pump the solids out of the sump on a routine basis.

Bathhouse No. 1. Sewage from Bathhouse No. 1 drains to a septic tank, which stores the solids and drains liquids via a 4-inch pipe to Manhole 14. This tank is pumped out by a contractor on a biennial basis according to Park personnel. From Manhole 14, the liquids flow by gravity downstream through the system to the junction with the WSSC sewer line. This portion of the sewage system is considered to be in fair to good condition.

Bathhouse No. 2. Sewage from Bathhouse No. 2 drains to a 1,500-gallon septic tank, which is used to store solids. The tank is only approximately 3 or 4 years old, and is pumped out annually by a contractor according to Park personnel. Liquids from this tank drain down a steep slope via a 4-inch pipe to Manhole 17. According to the CCTV inspection, the condition of this pipe is very poor. From Manhole 17, the liquids flow by gravity downstream to Manhole 15A and into the main pump station. This pipe segment is in poor to fair condition.

Bathhouse No. 3. Bathhouse No. 3 was built in 1999 to replace the two small bathhouses at Picnic Area 3 that were torn down. It was at that time the primary sewer line was abandoned from Manhole 33 to Manhole 17. Sewage from Bathhouse No. 3 drains to a pair of septic holding tanks near the parking lot for Picnic Area 3. The tanks are not connected to the primary sewer line, so they must store all of the solids and liquids from Bathhouse No. 3 until they are pumped out by a park contractor. Two 3-inch PVC pump-out pipes rising above the ground surface are located next to the tanks' entrance manholes. Park personnel indicated that these two tanks are sometimes pumped out as frequently as every two weeks during busy summer months.

Main Pump Station. The pump station located between Manholes 15A and Manhole 14 was built in the 1960s and is in poor operating condition. Specifics about the pump station were provided to URS by Park personnel during an on-site meeting in October 2005:

- The main pump station contains two large, old grinder pumps that are controlled by level floats. One of these pumps was likely installed when the pump station was constructed. The pumps are 3-phase with 4-inch diameter outlets.
- The depth of the concrete sump is approximately 18 feet from ground elevation. The pumps are located at the bottom of the sump, and a platform is located 8 feet below the pump station lid at grade.
- Reportedly the pumps routinely cease operating for no apparent reason, causing maintenance problems for Park personnel.
- The pump station floods when the lake level rises above the elevation of the manhole lid (reportedly approximately two times a year), and when this occurs, the pump station runs for extended periods of time.

- When the main pump station has clogged in the past, several manholes upstream from it have overflowed onto the surrounding ground surface. Park personnel indicated that the pump requires resetting several times each month.

2.2 ON-SITE MEETING

URS engineers met with M-NCPPC personnel stationed at Lake Needwood on October 21, 2005 at the Needwood Mansion. The purpose of the meeting was to discuss the status of the Park's sewer system, any specific operational issues that the Park personnel had intimate knowledge of, and ideas for future upgrades to the system. A summary of the meeting notes is presented in Appendix B.

Representing M-NCPPC and Lake Needwood were Mr. Jim Humerick, Mr. Rob Triplet, and by telephone, Mr. Joe Loveless. The meeting yielded a significant amount of new and specific information about many elements of the existing condition of the sewer system, and what future upgrades to the system would be desirable to Park personnel. A summary of the important issues is presented below:

- The septic holding tank (concrete sump) associated with the Visitors Center and Boathouse was field constructed circa 1965 and is in disrepair; it should be repaired or replaced. Because of cracks in the sump walls, groundwater infiltrates the sump and it routinely fills completely. When the sump fills, it overflows at the ground surface, especially during the busy summer season, creating substantial maintenance problems for Park personnel.
- There are no overflow problems associated with Bathhouses No. 1 and No. 2. The septic holding tanks retain the solids and the liquids are allowed to drain into the primary sewer line via connecting pipes. The connecting pipe from Bathhouse 2 to Manhole 17 is in poor condition, with much root growth inside the pipe. These two holding tanks are pumped out by contractors every two years and one year, respectively.
- Bathhouse No. 3 is connected to two 1,200 to 1,500 septic holding tanks that are not connected to the primary sewer system. There are no overflowing issues. These tanks are pumped out as frequently as every two weeks during the busy summer months by a park contractor.
- The pump station pumps routinely cease operating for no apparent reason, causing maintenance problems for Park personnel. The pump station floods when the lake level rises above the elevation of the manhole lid (reportedly two times a year) and the pump station runs for extended periods of time.
- When this pump station has clogged in the past, several manholes upstream of it have overflowed on the ground surface, and the pump has needed to be reset a couple of times a month.
- The Maintenance Yard has no issues associated with its septic system, but the maintenance shops are scheduled to be expanded in the next five years, which will overtax the current septic system. Before the Maintenance Shops are expanded in the future, M-NCPPC personnel would like to abandon the existing septic system and construct a new sewer line that would connect the Maintenance Yard, along with

Bathhouses No. 2 and No. 3, to the existing system downstream of the current Bathhouse No. 1 connection.

- To reduce pumping maintenance at Bathhouse No. 3, M-NCPPC personnel recommended that a liquid outlet drain be installed from the two holding tanks to a new sewer line; it would be designed to follow Beach Drive and connect to the existing system at Bathhouse No. 1.

2.3 STRUCTURAL SURVEY AND INSPECTION

2.3.1 Location and Elevation Survey

URS and its surveying subcontractor, KCE Engineering, Inc., completed a location and elevation survey of all relevant structures associated with the sewer system, including all of the manhole and the septic and holding tank lids. The survey data and layout of the sewer system was overlaid on the M-NCPPC topographic map. These survey plan drawings are presented in Appendix C (figures C-1 and S-1 thru S-8). For each of these sewage system structures, the specific horizontal location of the structure is referenced to the North American Datum of 1983 and 1991 (NAD 83/91) coordinate system. For manholes, the lid elevation and invert elevations of entering and exiting pipes were obtained using the National Geodetic Vertical Datum of 1929 (NGVD 29). The data is presented in the structure table shown on each sheet of the survey plan drawings (figures S-1 thru S-8) in Appendix C.

2.3.2 Closed Circuit Television Inspection (CCTV)

URS began a CCTV inspection of the primary sewer line during the week of November 11, 2005 from Manhole 1 to Manhole 33. The CCTV inspection consisted of maneuvering a 6-foot long, self-propelled camera upstream and/or downstream from a specific manhole through straight, unclogged pipe sections. When a clog (due mainly to heavy root intrusion or a manhole bend) was encountered, the camera was extracted from the pipe and filming continued from the opposite direction in the same section of pipe. The camera was equipped with an internal measuring device, so that the distance the camera traveled upstream or downstream from one structure to another could be accurately measured and recorded. The images recorded by the camera were televised simultaneously as they were filmed and were later copied onto a DVD as a permanent record of the CCTV survey. A complete summary of the CCTV inspection, including the Manhole Inspection Report, is presented in Appendix D.

From Manhole 1 upstream to Manhole 14, the pipe was filmed and the condition deemed to be fairly good. For the 6-inch force main between the pump station and Manhole 14, only 170 feet of pipe could be televised upstream of Manhole 14 before a bend greater than 22 degrees prevented the camera from advancing any farther. The camera could not be inserted in the pump station due to the permanent pump connections, and thus the 6-inch pipeline was not televised from the pump station downstream. The sections of pipe between the main pump station and Manhole 17 upstream were filmed and deemed to be in poor to fair condition. Due to roots and severe clogs in the sewer pipeline between Manhole 17 and Manhole 30, only partial segments of pipe could be televised between those two manholes during the initial attempt in November 2005.

During the week of April 24, 2006, URS completed the CCTV work of the sanitary sewer line for those segments that were clogged and could not be televised during the earlier effort. Prior to undertaking the CCTV work, URS' subcontractor, Video Pipe Services, cleaned approximately 3,860 linear feet of 6- and 8-inch sewer pipe that was clogged with heavy roots, root balls, and debris. Subsequent to the pipe cleaning, URS televised the remaining segments of sewer pipe, with the following exceptions:

- The 6-inch DIP force main from Manhole 14 upstream to the main pump station has a significant bend (greater than 22 degrees) 170 feet upstream of Manhole 14. The pipe is clean to that point, but the camera could not navigate through the bend, and filming terminated there. The upstream end of the force main is permanently attached to the pumps in the pump station, so CCTV work was not possible downstream of the pump station.
- The 4-inch line from Bathhouse No. 2 to Manhole 17 was televised approximately 70 feet upstream from Manhole 17. At that point, the pipe makes a sharp bend that the camera could not negotiate. No entry point for the camera was available at the septic tank.
- The siphon sewer line running upstream from Manhole 29 to Manhole 30 consisted of a 6-inch line and a parallel 4-inch line. The camera was able to enter the 6-inch line in Manhole 30 and televised approximately 29 feet downstream, where it encountered a sharp bend that the camera could not negotiate. The sharp channel bend in the base of Manhole 29 did not allow the camera to enter the 6-inch line in that manhole. The camera could not enter the 4-inch pipe opening.
- The 6-inch sewer line running from Manhole 30 upstream toward Manhole 33 was cleaned approximately 174 feet upstream from Manhole 30 when the cleaning equipment encountered a buried manhole (No. 31) which was filled entirely with gravel. The gravel cold not be penetrated, and thus the 6-inch line was only televised upstream to the buried manhole. From Manhole 33 downstream to the buried manhole, the sewer line is a 4-inch pipe. The line was televised downstream with a push camera for 100 feet, the limit of the cable.

All other segments from Manhole 29 to Manhole 17 were cleaned and televised. The pipe is deemed to be in poor condition with many penetrations of the pipeline by heavy roots and several pipe joint separations noted.

Based on the information that URS obtained during the site investigation and CCTV inspection related to the existing conditions of the Park's sewer system, the following is a summary of the deficiencies of the sewer system:

1. The sewage holding sump and pump station located at the Visitors Center and Boathouse are in disrepair; the sump floods routinely, creating substantial maintenance problems for Park personnel.
2. The main pump station often fills with groundwater or lake water when the lake level rises during flood stage.
3. The two pumps and liquid level switches in the main pump station are unreliable.
4. The discharge pipeline from the Bathhouse 2 septic holding tank is in poor condition.
5. The primary sewer pipeline from Manhole 29 to Manhole 17 is in poor condition.
6. The "siphon" line from Manhole 30 to Manhole 29 is in extremely poor condition and will always be subject to acute maintenance issues.
7. The two septic holding tanks associated with Bathhouse No. 3 do not have a liquid outlet drain, and thus a significant amount of maintenance is required to sustain the capacity of the tanks.
8. The Maintenance Yard at the far north end of the park has its own septic system separate from the rest of the main sewer line, which is not sufficiently sized to accommodate expansion of the Maintenance Yard.
9. The 8-inch sewer pipeline downstream from Manhole 14 to the junction with the WSSC system is in fair to good condition having approximately 10 locations, within the terra cotta clay pipeline, that have cracks or joint offsets. Additionally, there are approximately 18 locations where medium to large roots penetrate the pipeline at pipe joints or infiltration can be observed entering the pipeline at joints.

Each of these deficiencies is discussed and addressed in Section 4, Assessment of Design Alternatives.

Based on URS' investigation of the existing conditions of the Lake Needwood Park sewer system, and the resulting deficiencies presented in Section 3, the following three design alternatives are proposed. The alternatives address the system deficiencies and provide the necessary upgrades to the system to meet present and future demands. The three alternatives URS proposes are (1) replacing the existing system with a new pipe alignment upstream of Manhole 14, (2) replacing the existing system along its original alignment upstream of Manhole 14 to Manhole 28, and (3) rehabilitating the existing sewer system along the original alignment upstream of Manhole 14 to Manhole 28. Based on the site investigation, URS believes that the 8-inch sewer pipeline downstream from Manhole 14 to the junction with the WSSC system is in fair to good condition, requiring repairs at approximately 28 specific locations.

The following system upgrades are common to all three alternatives, and thus, URS recommends that they be incorporated into each of the three design alternatives:

- The Maintenance Yard north of the existing sewer system is currently being serviced by a separate septic system. It is recommended that it be connected to the main park system sewer line.
- The section of the sewer line between Manhole 30 and Manhole 29 was originally intended to function as a siphon line, but has since been abandoned and has subsequently filled with sediment, gravel, and root debris. URS recommends that this section of the existing line, along with the section running upstream to Manhole 33, be totally abandoned and filled with fly ash and concrete.
- It is recommended that the septic tanks currently collecting and holding all waste from Bathhouse No. 3 be retrofitted to drain into the proposed sewer line replacement system extending upstream to the Maintenance Yard.
- Due to its extreme deficiencies, URS recommends replacing the pump station serving the Boathouse and Visitors Center, and 375 feet of 2-inch PVC pressure sewer that connects the pump station with Manhole 14.
- It is recommended that new pump stations and lift stations be powered by 3-phase direct burial cable running from two existing Pepco vaults, one near the Maintenance Yard and one adjacent to the Boathouse and existing main pump station.
- It is recommended that the 28 locations in the pipeline downstream of Manhole 14, which have cracks, joint offsets, severe root penetration, or infiltration at pipe joints, should be repaired by excavating to and around the pipeline at those particular locations and externally sealing the pipeline with galvanized steel collars and stainless steel bands.

4.1 ALTERNATIVE 1: REPLACE EXISTING SYSTEM WITH NEW ALIGNMENT

Design Alternative 1 consists of relocating the existing sanitary sewer system alignment upstream of Manhole 14, as shown in Drawing D-1 in Appendix E, and extending the system to the Maintenance Yard. Alternative 1 consists of a new mainly pressurized PVC sewer line, with a few sections of gravity sewer, which connects to Manhole 14, and runs upstream along Beach Drive north to the Maintenance Yard. As shown in Drawing D-1, Alternative 1 consists of four new 4-foot diameter manholes along the downstream end of the new alignment, including two WSSC approved transition manholes (one of these replacing existing Manhole 14), and two

standard manholes. Alternative 1 also includes new duplex pump stations adjacent to the Maintenance Yard and at Bathhouses No. 2 and No. 3, which will pump liquids leaving the septic tanks at these locations into the new pressurized main sewer line. New water-tight septic tanks will be installed to replace existing septic tanks at the Maintenance Yard, Bathhouse No. 1 and the Visitors Center and Boathouse. As discussed earlier, the pump station at the Boathouse and Visitors Center will also be replaced. Along the new pressurized 2-inch PVC sewer line, three air/vacuum and air release valves (at all high points) and eleven in-line flushing connections (approximately every 400 feet) will be required. These fourteen structures will be installed along the pressure sewer line in standard 4-foot manholes. Alternative 1 consists of approximately 790 feet of 4-inch PVC gravity sewer line and 5,400 feet of 2-inch PVC pressure sewer line. This includes the connections from the two septic tanks and new pump station for Bathhouse No. 3, the septic tank and new pump station for Bathhouse No. 2, and the new septic tank and new pump station for the Visitors Center and Boathouse.

The new alignment proposed in Alternative 1 crosses Beach Drive in two places, Needwood Lake Drive in two places, and runs directly through the parking lot for the Picnic Area and Bathhouse No. 3. Approximately 400 linear feet of asphalt pavement will need to be replaced in kind along the new alignment, which includes road crossings and sections of pavement between the Visitors Center and Boathouse and the junction point of the old and new alignment at Manhole 14 and pavement between Bathhouse No. 2 and the new alignment. In constructing the new alignment, URS proposes that the contractor avoid removing any trees in wooded areas larger than 4-inches in diameter. The proposed new alignment travels as closely to the road and as far away from forested areas as possible.

Alternative 1 includes abandoning all sections of the existing sanitary sewer main line from Manhole 14 upstream to Manhole 33. This involves filling approximately 4,010 feet with fly ash and concrete. Along this section of the line, at least 19 manholes and the main pump station must also be abandoned and filled with fly ash and concrete.

The preliminary conceptual cost for implementing this alternative is discussed in Section 4.4.

4.2 ALTERNATIVE 2: REPLACE EXISTING SYSTEM ALONG ORIGINAL ALIGNMENT

Design Alternative 2 consists of replacing the existing sanitary sewer system from Manhole 14 to Manhole 28, as shown in Drawing D-2 in Appendix E. Alternative 2 consists of pipe bursting the existing pipeline between these manholes, which is made up of mostly 6- and 8-inch clay pipe. The alternative also consists of replacing many of the existing manholes along this section of the original alignment.

Pipe bursting is a trenchless technique used to replace deteriorating pipes, such as sanitary sewer lines. A Pipe bursting tool forces its way through the pipeline, bursting and expanding the existing sewer while it pulls a new pipe as it progresses upstream. Simultaneously the new pipe is pulled by the bursting head and pushed into place from downstream. More information about this technique can be found in Appendix F. One significant benefit of using this technique is that the old existing line is replaced by a pipe of the same or greater diameter, which does not jeopardize the capacity of the pipeline. A major drawback of this technique is that it can be very costly because of the equipment, labor, and materials involved in putting the new pipe in place.

Pipe bursting would be undertaken in sections between the existing manholes, and would consist of bursting and replacing approximately 120 feet of 4-inch pipe, 2,200 feet of 6-inch pipe, and 840 feet of 8-inch pipe. The 4-inch pipe from Bathhouse No. 2 to Manhole 17 would also require pipe bursting. The main pump station downstream of Manhole 15A would need to be rehabilitated.

Alternative 2 also consists of constructing a new sewer line from Manhole 28 upstream to the Maintenance Yard. This new sewer line would consist of eight new manholes along the new alignment, including two lift station manholes, one transition manhole, and five standard manholes. Manhole 28 would be replaced with an approved WSSC transition manhole. The new sewer main line would include approximately 1,140 feet of 6- and 4-inch PVC gravity sewer line, and 1,380 feet of 4- and 2-inch PVC pressure sewer line (this would include the connections from the two septic tanks for Bathhouse No. 3 and the septic tank for the Visitors Center and Boathouse). No pump station manhole is required at the septic tanks holding solids for Bathhouse No. 3. Alternative 2 also consists of replacing the pump station at the Visitors Center and Boathouse.

The new section of the sewer system proposed in Alternative 2, from the Maintenance Yard downstream to the septic tanks for Bathhouse No. 3 and Manhole 28, crosses Beach Drive several times and runs directly through the parking lot for the Picnic Area and Bathhouse No. 3. Approximately 630 linear feet of asphalt pavement will need to be replaced in kind along the new alignment, also including sections of pavement between the Visitors Center and Manhole 14. Similar to design Alternative 1, URS proposes that the contractor avoid removing any trees in wooded areas larger than 4-inches in diameter. The proposed new alignment travels as closely to the road and as far away from forested areas as possible.

All sections of the existing sanitary sewer main line from Manhole 28 upstream to Manhole 33 (totaling approximately 990 feet) would be abandoned and filled with fly ash and concrete. Along this section of the line, at least three manholes would be abandoned and filled.

The preliminary conceptual cost for implementing this alternative is discussed in Section 4.4.

4.3 ALTERNATIVE 3: REHABILITATE EXISTING SYSTEM ALONG ORIGINAL ALIGNMENT

Design Alternative 3 consists of lining the existing sanitary sewer system from Manhole 14 to Manhole 28, as shown in Drawing D-3 in Appendix E. Alternative 3 consists of inversion lining the existing pipeline between these manholes, which is made up of mostly 6- and 8-inch clay pipe. The alternative also consists of repair or replacement of many of the existing manholes along this section of the original alignment. The main pump station downstream of Manhole 15A needs to be rehabilitated or replaced.

Inversion lining is a trenchless technique used to rehabilitate deteriorating pipes, such as sanitary sewer lines. A cured-in-place pipe liner is formed within the existing sewer pipe for pipes with diameters of 6 inches or more. More information about this technique can be found in Appendix G. One significant benefit of using this technique is avoiding costs and negative environmental impacts associated with excavating and backfilling required for laying new pipelines. A major drawback is that the liner takes up some of the cross sectional area of the existing pipe, reducing the capacity of the pipeline (possibly significantly). Alternative 3 consists of lining

approximately 2,200 feet of 6-inch pipe and 840 feet of 8-inch pipe using this procedure. The 4-inch pipe from Bathhouse No. 2 to Manhole 17 will require replacement with 120 feet of new 4-inch PVC sewer.

The existing manholes will need to be repaired and rehabilitated. Common techniques for rehabilitation of deteriorating manholes and/or manholes suffering problems with infiltration of groundwater and stormwater are as follows:

- Raising the frame and lid,
- Lining the manhole using a poured-in-place or a cured-in-place method,
- Installing mechanical seals or lid inserts, and/or
- Grouting using cementitious or polymer coatings either sprayed, pumped, or troweled onto the inside of the manhole's walls

Similar to Alternative 2, Alternative 3 consists of constructing a new sewer line from Manhole 28 upstream to the Maintenance Yard. This new sewer line would consist of eight new manholes along the new alignment, including two lift station manholes, one transition manhole, and five standard manholes. Manhole 28 would be replaced with an approved WSSC transition manhole. The new sewer main line would include approximately 1,140 feet of 6- and 4-inch PVC gravity sewer line, and 1,380 feet of 4- and 2-inch PVC pressure sewer line (this would include the connections from the two septic tanks for Bathhouse No. 3 and the septic tank for the Visitors Center and Boathouse). No pump station manhole is required at the septic tanks holding solids for Bathhouse No. 3. Alternative 3 also consists of replacing the pump station at the Boathouse and Visitors Center.

The new section of the sewer system proposed in Alternative 3, from the Maintenance Yard downstream to the septic tanks for Bathhouse No. 3 and Manhole 28, crosses Beach Drive several times and runs directly through the parking lot for the Picnic Area and Bathhouse No. 3. Approximately 630 linear feet of asphalt pavement will need to be replaced in kind along the new alignment, also including sections of pavement between the Visitors Center and Manhole 14. Similar to design Alternatives 1 and 2, URS proposes that the contractor avoid removing any trees in wooded areas larger than 4-inches in diameter. The proposed new alignment travels as closely to the road and as far away from forested areas as possible.

All sections of the existing sanitary sewer main line from Manhole 28 upstream to Manhole 33 (totaling approximately 990 feet) would be abandoned and filled with fly ash and concrete. Along this section of the line, at least three manholes would be abandoned and filled.

The preliminary conceptual cost for implementing this alternative is discussed in Section 4.4.

4.4 PRELIMINARY COST ESTIMATES

The preliminary conceptual cost for each of the three alternatives has been estimated from a number of industry sources and discussions with specialty contractors. These costs are based on the amount of new construction and rehabilitation work to be undertaken for each alternative as discussed in Sections 4.1 to 4.3 above. The costs presented below and in Tables 4-1 through 4-4 include the costs for labor, equipment, materials, supplies, tools, vehicles, supervision, and contractor administration and profit. The costs for new construction include excavation,

trenching, bedding, backfill, repaving where necessary, installation of new PVC pipelines, new manholes and lift stations, new pump stations, and new pipe cleanouts. The costs for rehabilitation include the costs of inversion lining existing pipelines and pipe bursting and replacing existing pipes. The costs also include the abandonment of existing pipelines as discussed for each alternative.

The cost estimates presented in this analysis are based on preliminary concepts of the alternatives considered, and not on engineered designs. A design contingency is incorporated into and becomes an integral part of the estimated construction cost to accommodate those features of the work that cannot be adequately assessed due to the partially developed design. The amount of contingency reflects the degree of risk associated with uncertainties, particularly with respect to subsurface conditions, and the completeness of the design detail for the major elements of work. The design contingency is based on, and is added to, the subtotal of construction costs because it represents an unknown portion of the total estimated construction cost. The contingency will decrease as the project moves forward into final design and more information becomes available, project requirements become better defined, and more of the design detail is captured in the subtotal of construction costs.

A construction growth contingency should be planned to pay for the costs of owner-directed changes after the project is under contract, changed conditions that occur or are encountered during construction, and other unforeseen conditions or changes. Construction growth costs are often associated with unexpected, or variations in expected, subsurface conditions. A minimum overall construction contingency allowance equal to 30 percent of the construction contract cost is recommended.

It is assumed that because this is only a conceptual cost estimate, escalation should be considered by M-NCPPC. Pricing is considered current as of June 2006. The cost estimate is based on the construction industry at the time the estimate was prepared and therefore does not include an escalation factor. Potential issues that could affect future estimates include the bid climate of the construction industry when the work is actually bid, actual increases in prevailing wage rates, and unpredictable fluctuations in material and equipment prices.

Recent trends have shown dramatic increases in the cost of construction materials and fuel spurred in part by unforeseeable national and international events. In particular, the effects of the Hurricane Katrina disaster in the Gulf Coast on future construction costs are uncertain. Construction cost trends should be monitored during final design and taken into consideration when making the final design construction cost estimate.

The costs for each alternative are summarized below, with details for each alternative presented in Tables 4-1 to 4-4.

SUMMARY OF PRELIMINARY COST ESTIMATES

LAKE NEEDWOOD SANITARY SEWER SYSTEM

Sewer Design Alternative	Preliminary Conceptual Cost
Alternative 1 – Replace Existing System	$ 1,~~055~~140,000
Alternative 2 – Pipe Burst Existing System	$ 1,~~270~~370,000
Alternative 3 – Inversion Line Existing System	~~—~~$ ~~930~~1,005,000

4.5 DESIGN AND CONSTRUCTION PERMITTING

In order to construct a retrofitted or new sewer line in the Lake Needwood Park under any of the three alternatives, M-NCPPC will need to contact WSSC to obtain permits for the sewer line work. WSSC is the controlling authority for this project, and no other governmental agencies are required to be contacted for permits or authorizations (including the Montgomery County Department of Environmental Protection). Because all of the alternatives involve the construction of various new segments of sewer pipeline, M-NCPPC must submit design plans to WSSC as part of the "Onsite Plan Review" process. This is a streamlined review and approval process for simple, uncomplicated sewer replacement projects, and WSSC estimates that it can take from 3 to 4 months to obtain permits through this process. In addition, M-NCPPC must make a separate submittal of the design plans, which must contain erosion and sediment control plans, to the WSSC Environmental Group. This group will issue a separate "Sediment and Erosion Control Permit" to M-NCPPC at the pre-construction site meeting. It is not anticipated that any additional permits will be required for disturbance of wetland areas.

At the time that the selected alternative progresses to a detailed design program within M-NCPPC, the selected alternative would be subject to a simplified Natural Resources Inventory Forest Stand Delineation (NRIFSD) Plan. It is anticipated that the selected alternative would receive a Forest Conservation exemption as this project is a modification to an existing facility.

Based on the information presented in Section 4 for the three design alternatives, URS believes that Alternative 1 provides the best long-term solution for Lake Needwood Park. The costs for Alternative 1 and 3 are fairly comparable, but Alternative 1 offers a new, streamlined sewer system from the Maintenance Yard downstream to Manhole 14. The new sewer system would be constructed close to Beach Drive, and would therefore provide M-NCPPC the most convenient access to the system for future maintenance. Because the only flows upstream of Manhole 14 emanate from the Maintenance Yard and from Bathhouse No. 2 and No. 3, installation of a new pressurized sewer line adjacent to Beach Drive with new duplex grinder pumps at a few specific locations would be more cost effective than overhauling and maintaining the existing main pump station downstream of Manhole 15A. The new sewer alignment would also move the sewer conveyance system much farther away from the lake, thus minimizing potential environmental impacts to the lake.

Under this design alternative, connection of the Bathhouse No. 3 holding tanks to the new main sewer line and replacement of the pump station at the Visitors Center will also substantially reduce the future maintenance requirements for the Park.