



August 23, 2001

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Mr. David Riggs, P.E.  
Assistant City Engineer  
City of Mason  
214 West Main Street  
Mason, Ohio 45040

RE: Proposed Scope of Work and Fee Proposal  
Pine Hill Lake Dam  
Mason, Warren County, Ohio

Dear Mr. Riggs:

Fuller, Mossbarger, Scott and May Engineers, Inc. (FMSM) is pleased to submit its scope of work and fee proposal for engineering services related to Pine Hill Lake Dam in Mason. The 50-year old, 25.5-foot tall earth dam is classified as a Class I (high hazard) structure by the Ohio Department of Natural Resources (ODNR). During the heavy rainfall experienced on July 17, 2001, the dam embankment, principal spillway and emergency spillway experienced damage. The City of Mason has requested assistance including the preparation of construction plans for repairing the damaged areas, and other engineering studies and analyses. The following sections outline the proposed scope of work.

### **Task 1 – Construction Plans for Repair of Storm Damage**

Engineers from FMSM will perform an inspection of the damage at the site. We will use a subconsultant (Bayer Becker) to perform a topographic survey of the dam areas damaged by the July 17 storm. This information will be merged with previous topographic mapping to develop a complete site plan. Grab samples of soil will be obtained from the upstream slope and the emergency spillway exit channel. Borings will be advanced along the eroded area next to the road downstream from the dam.

Existing hydrologic and hydraulic models will be reviewed to determine the proper design velocity and depth for the emergency spillway channel. Construction plans will be prepared for the repair of the damage. Other items cited in the last inspection report by the Division of Water will also be addressed. The plans will also include repair of the eroded area along the road downstream from the dam. The construction drawings will

include plan views, cross sections, profiles and details. An erosion and sediment control plan will be prepared, as well as construction specifications and a cost estimate. The plans will be submitted to ODNR for approval. FMSM will address review comments received from ODNR and will submit mylar drawings and electronic copies of all files to the City.

FMSM will assist the City of Mason in evaluating bids. We will provide construction inspection services and will assist the City staff in construction administration matters.

### **Task 2 – Hydrologic and Hydraulic Study**

FMSM will evaluate the effects of the July 17<sup>th</sup> storm event and the 100-year design storm event on the Pine Hill Lake watershed and make recommendations to improve the watershed through regional stormwater detention, sediment and erosion control, stream maintenance and other measures. Dredging and shoreline protection issues will also be addressed under this task. We will perform a hydrographic survey of the lake and compare to previous studies to determine rate of sedimentation.

FMSM will use the existing hydrologic and hydraulic model developed by city staff as a starting point. We will use existing aerial photographs to evaluate land use within a GIS framework. Rainfall data for the July 17 storm will be obtained from surrounding communities. High water marks will be used to calibrate the HEC-HMS model. We will also analyze the 100-year event and will compare the results with the data in the city's Flood Insurance Study. This scope of work does not include revising the FEMA floodplain.

### **Task 3 – Dam Classification Study**

FMSM will perform analyses to determine if the hazard rating for the dam can be lowered. This will require performing dam breach analyses and the preparation of inundation maps for the area downstream from the dam. If the analyses indicate that it is feasible to lower the hazard ranking, FMSM will prepare a formal request for the City to submit to ODNR containing the necessary documentation. We will address ODNR's review comments.

### **Task 4 – Downstream Channel and Culvert**

The hydrologic and hydraulic model developed under Task 2 will be expanded and used to analyze the downstream channel and the culvert under Kings Mill Road. Construction drawings will be prepared for the replacement of the culvert. FMSM will perform the necessary geotechnical exploration and will assist the City in the bidding process. We will also provide construction inspection services and assist the City staff with construction administration services.

### **Deliverables**

As a result of this work the City of Mason will receive:

1. Construction drawings and specifications for repairs to the emergency spillway, principal spillway, dam and downstream channel.
2. Hydrologic and Hydraulic study of watershed with recommendations for watershed improvements including such items as regional stormwater detention, erosion and sediment control, dredging, stream restoration and shoreline protection.
3. Engineering study with analyses for lowering classification of dam.
4. Construction drawings and specifications for culvert under Kings Mill Road.
5. Construction cost estimates.
6. Monthly progress reports and meetings.
7. Construction inspection for dam repairs and culvert under Kings Mill Road.

### **Schedule**

The anticipated completion dates for Tasks 1 through 4 are as follows:

- Task 1 – December 31, 2001 (Design complete by September 30, 2001)
- Task 2 – June 30, 2002
- Task 3 – June 30, 2002
- Task 4 – December 31, 2002 (Design complete by June 30, 2002)

The schedule outlined above assumes that we receive approval to proceed by August 31, 2001.

### **Fees**

Our fees for performing the tasks are as follows:

Task 1 .....	\$ 51,970.00
Task 2 .....	\$ 58,210.00
Task 3 .....	\$ 13,700.00
Task 4 .....	\$ <u>38,900.00</u>
<b>TOTAL PROJECT COST .....</b>	<b>\$ 162,780.00</b>

# Proposed Scope of Services

## Pine Hill Lake Watershed Study and Design

### Task 1 – Pine Run Watershed Evaluation

Task 1 involves the development of a model to simulate the open and closed-conduit stormwater conveyance system in the Pine Run watershed. Using the model, CDM will simulate the July 17-18, 2001 storm that triggered the emergency overflow of the Pine Hill Lake Dam. CDM will also evaluate alternatives and make recommendations to reduce peak flows entering Pine Hill Lake.

#### Task 1.1 – Obtain and Review Existing Information

CDM will obtain and review pertinent reports, construction plans, and other existing data that will be needed to adequately perform the modeling and alternatives evaluation for the Pine Run watershed. This may include, but is not limited to, the following sources of information:

- City of Mason as-built construction plans and storm sewer maps;
- City of Mason's one-foot contour interval topographic mapping of the Pine Hill Lake area;
- Warren County Auditor's GIS;
- Federal Emergency Management Agency (FEMA) flood insurance study (FIS) and rate map;
- FIS hydraulic model of Pine Run (if available);
- Draft Pine Hill Lake Dam Hydrologic and Hydraulic Analysis prepared by the City of Mason Engineering and Building Department dated October 2000;
- SCS Soils Map for Warren County;
- land use coverages;
- hydrologic data including typical rainfall frequency, distributions, and amounts (Bulletin 71, Rainfall Frequency Atlas of the Midwest); and
- rain gage data.

To simulate the July 17-18, 2001 storm event, CDM proposes to use rain gage data from the State of Ohio Rain/Snow Monitoring System (STORMS) Network or other nearby rain gage data, if available. CDM's cost estimate assumes that rain gage data will be available for this event; if data is not available, additional costs may be

necessary to obtain gage-adjusted radar rainfall data for the storm event if the City should desire to pursue the information.

### **Task 1.2 - Model Setup and Calibration**

For this study, CDM proposes to use the EPA StormWater Management Model (SWMM) and HEC-RAS. SWMM version 4.3 and HEC-RAS are both accepted models by the Federal Emergency Management Agency (FEMA). The SWMM RUNOFF block will be used to simulate the dynamic rate of runoff generated from the subwatersheds. The resulting hydrographs will be saved for input to the EXTRAN block of SWMM. The EXTRAN model will be used to perform dynamic routing of stormwater flows through the major storm drainage system, including the Pine Run open channel, the Pine Hill Lake Dam, stormwater detention facilities, and the main trunk sewers that are necessary to accurately simulate stormwater detention and routing in the Pine Run watershed. The resulting peak flows from EXTRAN will be input into the HEC-RAS model to determine the floodplain extents.

CDM has found that watershed-wide evaluations can be performed more accurately and for less cost if SWMM is used with HEC-RAS versus using HEC-1 with HEC-RAS. First, SWMM allows continuous simulation for evaluation of periods of multiple small storms that affect water quality and erosion. Second, SWMM is more accurately calibrated and verified because of its ability to evaluate rainfall-runoff based on actual rainfall intensities, infiltration rates, and runoff/routing response times. Third, SWMM does not need a separate hydrologic routing that requires the assumption of uniform flow and/or the development of rating curves for channel reaches that must be recalculated for each alternative. Fourth, SWMM allows for direct input of runoff hydrographs into the dynamic routing network and automatically considers runoff inflow and headwater/tailwater variations throughout a given storm event in the routing. This gives more direct solutions, eliminates guesswork on system tributary timing, and can save analysis time and costs. This approach will result in proposed facility improvements that are sized more accurately and not over or under designed. This approach will also enable CDM to evaluate the stage-area relationships of detention basins and their outlet structures in the Pine Run watershed more directly and recommend modifications, if necessary, to optimize their performance.

In summary, dynamic simulation of watershed-wide responses (versus steady-state analyses) allow more accurate simulation of regional facilities, development criteria, surcharge, varying tailwater, and hydrograph timing. This will save analysis and capital costs and can also help to ensure that problems are not simply “moved downstream to someone else’s door step” as solutions are developed.

#### ***Task 1.2.1 - Open Channel Cross-section and Culvert Data Collection***

Per the FIS, a detailed analysis was previously performed for a portion of Pine Run. CDM will attempt to obtain a digital copy of this model, or hard copy if digital is unavailable. If a copy is available, CDM will use cross-sections, culverts, and other

data from the model, where appropriate, to develop the EXTRAN and HEC-RAS models.

CDM will also utilize the City's as-built drawings to the maximum extent practicable to obtain culvert and bridge data for the models.

To update the previous model's cross-sections and extend the model further upstream, CDM will obtain additional cross-sections and culvert inventory information through surveying by Bayer Becker Engineers (BBE). BBE will obtain twelve cross-sections between Mason Montgomery Road and Pine Hill Lake, four cross-sections between the Pine Hill Lake Dam and the confluence with Muddy Creek, and will inventory the Stitt Road culvert. The surveyed information will be referenced to state plane coordinates and to NAV88 datum. The surveyed cross-sections will include the main channel only; CDM will develop the flood plain cross-sections from the Warren County Auditor's GIS topographic mapping or the City's topographic mapping of the Pine Hill Lake area.

#### ***Task 1.2.2 – Model Input Development and Calibration***

CDM will develop the SWMM and HEC-RAS models using the Warren County Auditor's GIS; the City's as-built construction plans, storm sewer maps, and topographic mapping of the Pine Hill Lake area; the SCS Soils Map for Warren County; available land use coverages; and the cross-section and culvert data developed under Task 1.2.1.

The graphic pre- and post-processor interface that CDM will use to create and view the SWMM input and output files will be MIKE SWMM, which is Microsoft Windows compatible. MIKE SWMM is a versatile modeling package that CDM developed in conjunction with the Danish Hydraulic Institute (DHI) and uses the public domain version of SWMM.

To calibrate the models, CDM will use high water marks obtained from City staff. CDM will attempt to calibrate the models using the July 17-18, 2001 storm event. As previously mentioned under task 1.1, CDM proposes to use rain gage data from the State of Ohio Rain/Snow Monitoring System (STORMS) Network or other nearby rain gage data if available for this storm event.

Using the calibrated models, CDM will simulate the hydrologic and hydraulic response within the study area for the 100-year design storm.

At the completion of this sub-task, the City will have a calibrated stormwater model for the study area for the infrequent storm events (e.g., 25-, 50-, and 100-year). Additional data, such as in-stream flow monitoring, would be necessary to have a stormwater model calibrated for a wide array of storm events (i.e., smaller events such as the 1- and 2-year design storm where minimal to zero runoff is generated from pervious areas during normal dry antecedent moisture conditions). Accompanying the model will be tabular and graphic data that will facilitate the

City's review of model output and results. At the completion of the study, CDM will provide the City with a disk copy of model input and output.

#### **Task 1.2.3 - Comparison to FIS**

CDM will model the 100-year recurrence interval SCS design storm, and will compare the profile results with the FEMA Flood Insurance Study (FIS) for the City of Mason, Ohio. The SWMM model results for this project will likely differ from the FIS flood elevation due to differences in the model computations and because the model will extend upstream of the FIS. The model likely used for the FIS study, HEC-2, computes steady-state hydraulics in the open channel, while the SWMM model computes dynamic, gradually-varied unsteady-state flow. CDM will document the differences in the results of the two models.

#### **Task 1.3 - Alternatives Evaluation**

CDM will develop up to three (3) alternatives for the study area to reduce peak flows to Pine Hill Lake and control erosion and sedimentation. CDM will meet with the City of Mason to establish watershed goals and determine suitable performance standards and criteria for the Pine Hill Lake watershed stormwater management system in achieving these goals. CDM will review the City's existing design standards and performance criteria and summarize criteria from other cities that CDM has performed similar stormwater evaluations for in Ohio. Using this information, CDM will determine if more stringent performance standards and criteria are necessary to achieve the watershed goals and objectives.

After determining the design capacity for which to analyze the stormwater management system, CDM will use the calibrated model to analyze each alternative. For the preferred alternatives, model output will verify that no structural flooding will result from a 100-year storm event. In addition, for each alternative, CDM will determine the following: need for a U.S. Army Corps of Engineers 404 permit, need for an OEPA 401 permit, need for any other relevant permit, land/easement acquisitions, environmental impacts, potential utility constraints, and public preferences.

As part of the three (3) alternatives, CDM will consider structural (facility) - such as regional detention -- and non-structural (ordinance, regulations, or maintenance) controls, often referred to as best management practices or BMPs, in balance to provide the needed level of service and cost affordability for the City. To a certain extent, these alternatives will provide a preliminary design level of detail to give guidance in the final design of structural improvements. In undeveloped areas where development is planned to occur, CDM can evaluate what the post-development release rates would need to be in order to achieve a reduced flow scenario into Pine Hill Lake.

In addition to the three alternatives, CDM will also address the sediment issues in Pine Hill Lake from a water quality and dam structural integrity perspective and

make recommendations as to how the City should proceed in dealing with sediment deposition in Pine Hill Lake.

#### **Task 1.4 - Cost Estimates**

CDM will develop conceptual designs and provide an opinion of probable construction and implementation costs for performing the improvements associated with each alternative identified as part of Task 1.3. These cost estimates will include construction, engineering, easement/land acquisition and contingencies. CDM will base all easement/land acquisition costs on information provided by the City Auditor's office.

#### **Task 1.5 - Report Preparation**

CDM will prepare and submit to the City three copies of a draft project report that discusses the results obtained during the completion of all previous tasks. CDM will meet with the City to obtain comments to the draft report. CDM will then submit seven copies of the final report and one copy of the technical appendices, including a disk copy of model input and output.

#### **Task 1.6 - Monthly Progress Meetings**

CDM will prepare for and attend monthly progress meetings with the City. The meetings will focus on progress made during the course of this study, as well as Tasks 2 through 4, and will identify any constraints which may be encountered that affect the project's schedule and budget. For this task, CDM will provide minutes of the monthly meetings to the City.

### **Task 2 - Pine Hill Lake Dam Repair**

Task 2 involves the preparation of final design documents for the repair of the Pine Hill Lake Dam. The dam was damaged during a recent storm event that caused erosion to the primary and emergency spillways, upstream slopes of the dam and along the downstream channel. Rip rap placed along the downstream channel was also displaced during the storm. The purpose of this task is to provide detailed design drawings for repair of the spillways and shore protection as required around the reservoir. This includes repairing the erosion on the upstream face of the dam and tapering these improvements beyond the face of the dam and along the shoreline of Pine Hill Lake. It also includes repairing the erosion at the emergency spillway, the principal spillway, and directly downstream of the primary spillway where prior erosion protection has been washed downstream, a plunge pool has been created, and where the erosion is encroaching upon a park road.

The Ohio Department of Natural Resources (ODNR) conducted an inspection in November 1999, prior to the recent storm event that caused the damage. As part of that inspection, they noted trees on the dam that should be removed, bare areas and



erosion on the upstream face and in the emergency spillway channel. In addition to repairing the recent damage, the proposed repairs to the spillways and additional shore protection are anticipated to comply with these requirements.

Based on our understanding of the Dam Safety Administrative Rules, a permit from ODNR will be required for this work. The permit must be applied for with two submittals: a preliminary design report that outlines the existing dam, subsurface conditions and intended construction and then the detailed design drawings with a final report which includes a detailed cost estimate, calculations, investigations and other analysis. It is CDM's experience that ODNR will require their active involvement throughout the design of the repairs. This permit is required for any substantial repairs to any dam, no matter what classification.

The services for Task 2 which CDM will provide are presented below.

### **Task 2.1 - Field Investigation**

CDM will visit the site with the City to discuss the repairs to be undertaken and conceptual alternatives to completing the repairs, inspect the dam and confirm critical dimensions, observe critical features and residences upstream and downstream of the dam, identify any additional repairs, assess the damage, determine construction access and other limitations and review previous construction records. We assume that the existing borings taken for the recent modifications are available and will be adequate for this work.

### **Task 2.2 - Surveying**

CDM will coordinate with Bayer Becker Engineers (BBE) to obtain surveyed elevations of the erosion damage to the emergency overflow for use in preparing the final construction plans for repair.

### **Task 2.3 - Preliminary Design**

CDM will prepare a preliminary engineering report on the condition of the dam and proposed remediation. The report will include details and criteria to be used in repair of the dam, proposed materials, limits and methods of construction to be used and other details related to the design of the remedial measures. The report is required as a submission to ODNR as part of the application process for a permit for repairs to the dam. The report will also serve as the basis to develop a preliminary cost estimate for the work.

### **Task 2.4 - Prepare Plans and Specifications**

Following review and comments by ODNR, CDM will develop detailed plans, specifications and final design report for the repair of the dam. Currently it is believed that two sheets of plans and two sheets of details as well as an abbreviated version of technical specifications related to earthwork, temporary dewatering, materials, erosion control placement and seeding will be required.

### **Task 2.5 - Application for Permit**

CDM will prepare the application for the ODNR permit to conduct the repairs to the dam to be submitted with the final design documents. CDM will meet with ODNR at their offices or at the site to discuss the nature of the repairs and respond to their questions.

### **Task 2.6 - Incorporate Comments**

CDM will incorporate ODNR comments into the final design documents.

The ODNR also recommended that removal of the steel plate that was installed to raise the reservoir level or an engineer be retained to modify the dam to safely pass the design storm and that an engineer be retained to prepare an operation, maintenance and inspection manual and an emergency action plan for the dam. Our scope does not include this work, however, these services can be provided as part of additional work, if required.

### **Task 2.7 - Assistance with Bidding**

CDM will assist with bidding by distributing contract documents to requesting contractors, respond to bidders' questions and issue addenda, participate in a pre-bid meeting, open and tabulate bids, and recommend award of contract. CDM will also prepare the contract documents for execution by the City and selected contractor.

### **Task 2.8 - Services During Construction**

CDM will provide consultation and review services during construction including reviewing and approving shop drawings, making interpretations and clarifications of the contract documents, make up to three site visits to the site to review conditions in the field that may be different than anticipated or to confirm suitable subgrade conditions prior to placement of fill or erosion control materials, and assisting with the review of construction claims during the work.

## **Task 3 - Pine Hill Lake Dam Analysis**

Task 3 will evaluate and identify the downstream development that would be impacted in the event of failure of the dam and release of high flows from the lake. CDM proposes to construct a computer model to represent the lake, dam, and downstream creek channel, and then use the model to simulate the affect of several dam failure modes that have been established by dam safety officials throughout the United States. The model computes the resulting flows out of the lake and through the downstream channel along with the corresponding maximum water levels throughout the downstream channel. These high water levels can than be plotted on the Warren County Auditor's GIS topographic mapping to determine the extent and depth of flooding as well as the flow velocities of the flood wave. This will provide

the City with a far more complete understanding of the dam failure risk to lives and property and what might be done to reduce that risk.

In order to accomplish the objectives of Task 3, CDM proposes the following scope of work:

### **Task 3.1 - Data Collection**

CDM will visit the site to observe the dam, outlet works, downstream channel, and adjacent development to decide on the downstream limit of the analysis. CDM will obtain all relevant data for use in the investigation, including dam design drawings, the City's topographic mapping along the downstream channel, the ODNR inspection report, available Flood Insurance Mapping, and all related supporting documentation and calculations. Downstream survey data will be collected under Task 1 to supplement the available data.

### **Task 3.2 - Dam Failure Modeling**

This task involves translating the physical data representing the dam and downstream channel system into the computer model input files. It is anticipated that the National Weather Service (NWS) Floodwave (FLDWAV) Model will be used for the analysis. FLDWAV is a replacement and refinement of the well-known Dam Break (DAMBRK) model that CDM has used successfully to conduct a variety of similar analyses. This model will be developed, tested, and then used to simulate the affect of various dam failure modes and identify the extent of downstream flooding that would result.

### **Task 3.3 - Dam Failure Analysis Report**

CDM will prepare and submit a report to document the data and assumptions used and the results obtained. The resulting maximum flood levels will be plotted on the available Warren County Auditor's GIS 4-foot contour interval topographic mapping and orthophotos to illustrate the estimated inundation area. The report will include the identification and characterization of the downstream development that would be at risk as a result of this flooding, as well as, recommendations on what might be done to reduce this risk, now and into the future.

### **Task 3.4 - Coordination and Meetings**

CDM will discuss the dam failure analysis and results with the city regarding the current potential for loss of human life that results in the dam being rated by ODNR as a Class I structure. CDM will discuss options for reducing this risk and the likelihood that it can be eliminated so that the dam classification might be reduced. CDM will meet with ODNR at their offices to discuss the dam, the dam failure analysis, and the appropriate safety classification for this dam.

## Task 4 - Kings Mill Road Culvert Design

Using the results of Task 1 and Task 3, CDM will determine the appropriate sizing of the Kings Mill Road culvert such that no backwater effects are seen for the 100-year design storm. CDM will produce a complete set of engineering plans, specifications, and related construction documents for resizing the culvert and addressing the eroded plunge pool directly downstream of the existing culvert. The services for Task 4, which CDM will provide, are presented below.

### Task 4.1 - Preliminary Design

CDM's proposed services for the preliminary design of the Kings Mill Road culvert reconstruction will provide the City of Mason with a concise preliminary design report which clearly presents a definitive course for the City to implement the final design of the culvert's reconstruction and repair the erosion directly downstream. To produce the preliminary design report the CDM project team will perform the following tasks.

#### *Task 4.1.1 - Review Existing Available Data*

CDM will review existing available data which pertains to reconstructing the Kings Mill Road culvert. Available information that will be reviewed includes, but may not be limited to:

- Plans, specifications and available engineering calculations for the existing Kings Mill Road culvert,
- Warren County GIS and County Engineer's data,
- Existing reports related to the structural integrity of the culvert and possible reconstruction methods to be used,
- Existing city documents which show rights-of-way and easements for the area of concern, and
- The results of the Task 1 study to determine the culvert size required under Kings Mill Road.

This information will be reviewed to determine if and what additional information may be required to adequately complete the preliminary and final design for reconstructing the Kings Mill Road culvert and solving the downstream erosion problem.

#### *Task 4.1.2 - Coordinate and Obtain Additional Information*

CDM will coordinate with Bayer Becker Engineers (BBE) to locate existing utilities along Kings Mill Road, including but not limited to gas, water, telephone, power, and cable utilities. BBE will also obtain channel cross sections upstream of the culvert, inverts of the existing pipes, manholes, catch basins and culvert in the potential

effected area, dimensions of the existing pipes and culvert, location and elevations of the Kings Mill Road roadway, vertical and horizontal project controls, and location of existing walls and other observable items which may affect the reconstruction of the culvert. All elevations will be in reference to USGS datum. BBE will also verify the rights-of-way and easements that exist within the study area. The results of this task, coupled with Task 4.1.1 results will be compiled to identify potential constraints in reconstructing the Kings Mill Road culvert.

***Task 4.1.3 - Alternative Layouts and Reviews***

CDM will utilize the data gathered in Tasks 4.1.1 and 4.1.2 and the Task 1 results for sizing the culvert and to determine potential alternative layouts of proposed improvements for reconstructing the Kings Mills Road culvert and solve the downstream erosion problem. Up to three potential layouts (culvert sizings) will be drawn such that the existing constraints related to the project (i.e., existing utilities and structures, easements and rights-of-way, traffic control, aesthetics, traffic and residential safety, residential impacts, etc.), and potential methods to minimize the constraints, are readily discernable. The alternative layouts will be reviewed and discussed with the City, including the advantages and disadvantages, to determine which potential layout would be the best to implement.

***Task 4.1.4 - Prepare Preliminary Construction and Project Cost Estimates***

Based on the preferred alternative, CDM will determine preliminary quantities of the items that will be needed to implement the proposed improvements, and determine the probable unit construction costs for the items. Based on the proposed quantities and unit costs, CDM will provide an opinion of probable construction and project costs for reconstructing the Kings Mill Road culvert.

***Task 4.1.5 - Letter Report***

Based on the results of Tasks 4.1.1 through 4.1.4, CDM will prepare a draft letter report which summarizes the findings and analyses performed above. The report will include text and drawings/figures which clearly depict the pertinent items related to the preliminary design of reconstructing the Kings Mill Road culvert, as well the advantages, disadvantages, and constraints related to the proposed design. Three draft copies of the draft report will be submitted to the City for review. CDM will meet with the City to discuss and review the report. The draft letter report will be revised to include agreed upon revisions, and ten copies of the final letter report will be submitted to the City.

**Task 4.2 - Final Design**

Based on the results of Task 4.1, CDM will proceed with the final design of the Kings Mills Road culvert reconstruction. CDM will provide the following services for this final design portion of the project.

***Task 4.2.1 - Coordinate Geotechnical Services***

CDM will coordinate, monitor, and schedule activities of a geotechnical firm specializing geotechnical engineering.

***Task 4.2.4 - Prepare Plans and Specifications***

Based on the facilities recommended for improvements in the Preliminary Design, CDM will prepare detailed construction drawings, specifications, and contract documents suitable for inviting construction bids of the Kings Mill Road reconstruction project, and to allow construction of the facilities designed. The contract document drawings will be on 24" x 36" sheets and all elevations shall be based on USGS datum.

***Task 4.2.3 - Technical Reviews***

At approximately the 50 percent and 90 percent completion level of the construction drawings and specifications, CDM will submit two sets of progress drafts of construction drawings and specifications to the City for review and conduct technical reviews of the project. At the 50 percent completion review, the location of all major structures will be determined.

***Task 4.2.4 - Monthly Progress Meetings***

CDM will prepare for and attend monthly progress meetings with the City. The meetings will focus on progress made during the course of the design, as well as Task 1 through 4 activities, and will identify any constraints which may be encountered that affect the project's schedule and budget. For this task, CDM will provide minutes of the monthly meetings to the City.

***Task 4.2.5 - Agency Approvals***

CDM will obtain required Ohio Environmental Protection Agency, Ohio Department of Natural Resources, and Army Corps of Engineers permits for the project. CDM will submit plans and specifications to the City's Engineering Division and private utilities as necessary, and coordinate their review and approval with these entities.

***Task 4.2.6 - Probable Construction Costs***

CDM will prepare an opinion of the probable construction costs for the project using the final construction drawings, specifications, and contract documents and submit to the City.

***Task 4.2.7 - Bid Package Approval***

CDM will prepare a final bid package, submit to the City for review, and incorporate appropriate City review comments into the bid package.

## **Proposed Schedule and Estimated Project Cost**

Based upon the scope of services described in Tasks 1 through 4, CDM estimates expending approximately 1,978 hours at a total labor cost of \$153,500. In addition to

the labor costs, CDM estimates expending approximately \$13,750 in Other Direct Costs (ODCs) and \$19,000 on subconsultant fees (surveying and geotechnical), for a total project cost of \$186,250. The table attached at the end of the proposal shows the hours and costs allocated for each task and the attached figure shows our proposed schedule.



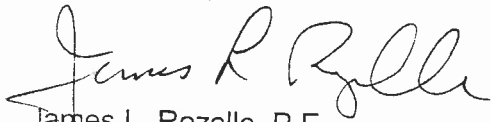


Invoices will be submitted monthly based upon percentage of work completed.

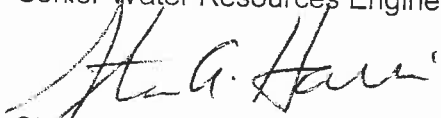
Thank you for the opportunity to submit this proposal. Please call if you have any questions.

Respectfully submitted,

FULLER, MOSSBARGER, SCOTT AND MAY  
ENGINEERS, INC.



James L. Rozelle, P.E.  
Senior Water Resources Engineer



Stan A. Harris, P.E.  
Associate

JLR/SAH/Ifb