

**YADKIN COUNTY**

**NORTH CAROLINA**

**AGREEMENT FOR SERVICES**

(Munis Contract Number) \_\_\_\_\_

This Agreement is made and entered into this 8th day of January, 20 16  
("Effective Date") between Yadkin County, North Carolina ("County") and  
Schnabel Engineering South, P.C. ("Provider").

WHEREAS, the County and the Provider wish to enter into a contract under which the Provider will provide certain specified services and/or materials to the County in exchange for payment. NOW, THEREFORE, in consideration of the mutual covenants, promises, terms, conditions, and agreements herein, the County and the Provider agree as follows:

1. **Services To Be Performed.** The Provider agrees to perform the services and to provide the materials (all collectively called the "Services") for the County as authorized by the County Manager. Provider acknowledges that this Agreement does not guarantee that the County will assign the Provider any work; however, that the County from time to time may request the Provider to perform services for Yadkin County.

The Provider represents that all materials it provides shall be of good quality and shall meet industry standards and the County's expectations and approval, and the Provider represents that it shall perform all Services in a good and workmanlike manner, in accordance with industry standards and the County's reasonable expectations, and to the County's full satisfaction.

See "Exhibit A" attached hereto and incorporated as if fully setout herein. "Exhibit A" lists in detail the scope of services to be provided under this Agreement. Any changes to "Exhibit A" must be approved by the County Manager and Provider, in writing, prior to the service being provided.

2. **Term of the Agreement.** (Check the one provision that applies.)

☐ This Agreement shall end on \_\_\_\_\_, 20\_\_\_\_.

☒ This Agreement shall continue until the Provider has completed the Services to the County's reasonable satisfaction.

☐ This Agreement shall continue until terminated in accordance with Section 8 of the Agreement.

3. **Payment to the Provider.**

☒ The County shall pay the Provider \$ \$ 20,000.00 every completed assessment- approved by NRCS.

☐ The County shall pay the Provider a total of \$ \_\_\_\_\_ for all Services performed under this Agreement. The Provider will invoice the County for Services as they are performed, but no more frequently than monthly.

In accordance with Item 3, Payment to the Provider, the County agrees to pay the Provider for Services satisfactorily performed in accordance with this Agreement. The County shall pay each properly submitted invoice within thirty (30) days of its submission. Each invoice shall document, to the County's satisfaction, the work performed and the basis for the amount of payment sought. If the Provider fails to perform in accordance with this Agreement, the County may, without penalty, withhold any payment(s) associated with Services not properly performed until and unless the Provider completes or corrects its performance, as applicable. The County's remedies under this Agreement are not exclusive and are in addition to all other rights and remedies provided by law.

4. **E-Verify.** North Carolina General Statutes prohibit counties from entering into contracts with contractors and subcontractors under the formal bid process and/or proposals who have not complied with the requirement of Article 2 of Chapter 64 of the NC General Statutes. Said Article 2 of Chapter 64 states *The prohibition applies to all contracts subject to G.S. 143-129, which are purchase contracts with an estimated cost of \$90,000 or more, and construction or repair contracts with an estimated cost of \$500,000 or more. GS 143-129 applies to virtually all public entities, including cities, counties, local school boards, water and sewer authorities, and other special purpose local government districts and authorities.* The Provider must submit the E-Verify Affidavit with bid proposals and/or contracts as required by NC General Statutes.

5. **Non-waiver.** If the County at any time does not require the Provider to satisfy any of the Provider's obligations under this Agreement, or if the County fails at any time to exercise any right or privilege granted to it by this Agreement, that shall not waive or limit the County's ability to require the Provider to satisfy those obligations in the future or the County's ability to enforce its rights or privileges in the future. Failure of either party to enforce any provision of this Agreement shall not constitute or be construed as a waiver of such provision nor of the right to enforce such provision. If either party waives any breach of this Agreement by the other party, that shall not be deemed a waiver of any later breach by the other party, nor shall it be deemed a waiver of this section of the Agreement.

6. **Independent Contractor.** For purposes of this Agreement, the Provider at all times shall be considered an independent contractor, and the County shall not be deemed the employer of the Provider or of any of the Provider's agents or employees, nor shall the County be responsible for the actions or omissions of the Provider or its agents and employees. For purposes of this Agreement, the Provider and its agents and employees shall not be deemed an employee of the County for any purpose, including (by example only and not for purposes of limitation) federal or state income taxation, unemployment benefits, or worker's compensation benefits.

7. **Insurance.** During this Agreement's term, the Provider shall maintain at its sole expense all insurances as set out in this section. All insurance policies shall be issued by a company authorized to issue insurance in the State of North Carolina. Before beginning to perform under this Agreement, the Provider shall provide the County with a certificate of insurance showing that all insurance required by this Agreement is in effect, and the Provider shall keep that certificate current by submitting to the County updated certificates as the Provider's insurance policies are renewed or otherwise modified. The Provider shall notify the County immediately if any insurance required by this Agreement will be or has been cancelled or not renewed or if the amount of coverage of any such insurance will be or has been reduced.

The Provider shall maintain worker's compensation insurance as required by North Carolina law to cover all of the Provider's employees engaged in any work under the Agreement.

The Provider shall also maintain the following insurance to cover its performance under this Agreement during the Agreement's term:

- General commercial liability in the amount of \$1,000,000 per occurrence/\$2,000,000 aggregate.
- Workers' Compensation in the amount of \$500,000 employer's liability.
- Automobile liability covering all owned, hired, and non-owned vehicles used in connection with this Agreement. The minimum combined single limit shall be \$1,000,000 for bodily injury and property damage; and \$1,000,000 uninsured/underinsured motorist coverage.

8. **Indemnity.** The Provider agrees that it shall defend, indemnify, and hold harmless the County and its officials, employees, and agents from and against any and all losses, liabilities, claims, demands, suits, costs, damages, or expenses (including reasonable attorneys' fees) arising from or related to this Agreement and/or the Services, including (by example only and not for purposes of limitation) those for bodily injury, death, or property damage, but only to the extent caused by the negligent acts, errors or omissions of the Provider, its employees or subcontractors. The Provider's obligations under this section shall survive termination of this Agreement.

9. **Termination.** Notwithstanding any other provision of this Agreement, this Agreement may be terminated at any time by mutual written agreement of the County and the Provider, or it may be terminated by the County upon ten (10) days' written notice to the Provider. Ten days' written notice for termination by the County is not required if the County is terminating because the Provider has breached the Agreement.

10. **Entire Agreement.** This Agreement (including any attached Exhibits) constitute the complete and entire Agreement between the County and the Provider concerning the subject matter of the Agreement and supersedes any and all prior agreements, discussions, understandings, promises, or representations concerning that subject matter. This Agreement may be modified only by a writing signed by both the County and the Provider.

11. **Governing Law and Forum for Disputes.** This Agreement shall be governed by the laws of the State of North Carolina without regard to North Carolina's choice of law provisions. Any lawsuit or other legal proceeding concerning this Agreement and/or the Services must be filed in Yadkin County, North Carolina, unless it is properly filed in Federal Court, in which case it must be filed in the Federal District Court for the Middle District of North Carolina.

12. **Severance Clause.** If any part of this Agreement is deemed unenforceable by a court of competent jurisdiction, then that part shall be enforced to the greatest extent legally possible, and the rest of this Agreement will remain in full force and effect.

13. **Compliance With Laws.** The Provider acknowledges and agrees that it will perform all Services and will satisfy all of its obligations under this Agreement in full compliance with all applicable federal, state, and local laws and regulations.

14. **Repair of Damages.** The Provider shall promptly and fully repair any damages that it or its employees or agents cause to the County's property. Alternatively, the County may choose in its discretion to require the Provider to fully compensate the County for any such damages rather than have the Provider repair them.

15. **Titles and Headings.** Titles and headings used in this Agreement are for convenience only and do not limit or modify the language within each section of this Agreement.

16. **Non-Assignment.** The Provider may not assign its rights or obligations under this Agreement, nor may it sub-contract any part of this Agreement, without written approval from the County.

17. **Notices.** Any notice or communication to the County or the Provider for purposes of this Agreement shall be delivered or shall be deposited in the United States Mail, first class, addressed to the addressee below:

**THE COUNTY**

Lisa Hughes  
PO Box 220  
Yadkinville, NC 27055

**THE PROVIDER**

Schnabel Engineering South, P.C.  
Thomas Fitzgerald, Senior Vice President  
11A Oak Branch Drive  
Greensboro, NC 27407

18. **Number and gender.** This Agreement's use of singular, plural, masculine, feminine, and neuter pronouns shall include the others as the context may require.

19. **Exhibits.** To the extent of a conflict between the above language of this Agreement and any attachments, the above language of this Agreement will control.

IN WITNESS WHEREOF, the County and the Provider have caused this Agreement to be executed as of the Effective Date.

THE COUNTY

BY: 

Name: Lisa Hughes

Title: County Manager


THE PROVIDER

BY: 

Name: Thomas Fitzgerald

Title: Senior Vice President

This instrument has been pre-audited in the manner required by the Local Government Budget and Fiscal Control Act.



Yadkin County Finance Officer

EXHIBIT A

TO AGREEMENT FOR SERVICES

Below is a detailed listing of the scope of services to be provided under this Agreement. Any changes to "Exhibit A" must be approved by the County Manager, in writing, prior to the service being provided. (The detailed listing of the scope of services may also be described on one or more sheets attached hereto and incorporated herein, but each must be signed by the Provider and the County.)

Please see the attached scope of services. All eight dam assessments shall be completed and approved by NRCS no later than September 15, 2016

Provider shall invoice monthly. The maximum amount invoiced per assessment shall not exceed \$20,000.00. The total amount of this agreement shall not exceed \$160,000.00. The county shall retain 20% of each invoice until the entire project has been completed and approved by NRCS.

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**Schnabel**  
ENGINEERING

SCHNABEL ENGINEERING SOUTH, P.C.

January 7, 2016

Mr. Jason Walker  
Soil and Water Director  
Yadkin County, NC  
PO Box 220  
Yadkinville, NC 27055

**Subject: P5821090.00, Professional Engineering Services for the Deep Creek Watershed Dam Assessments, Yadkin County, North Carolina**

Dear Mr. Walker:

**SCHNABEL ENGINEERING SOUTH, P.C.** (Schnabel) is pleased to submit this proposal for professional engineering services for the assessment of eight flood control structures located in the Deep Creek Watershed in Yadkin County, NC. This proposal has been prepared in response to your email request on December 22, 2015.

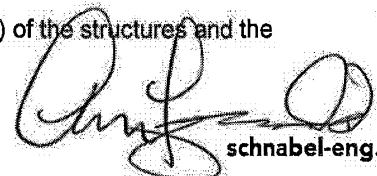
#### **PROJECT BACKGROUND**

In 1957, a Watershed Agreement was signed between the Yadkin County Commissioners, the Yadkin County Soil and Water Conservation District, and the United States Soil Conservation Service (now known as the National Resources Conservation Service or NRCS). As a result of this agreement, 14 flood control dams were constructed under the Watershed Protection and Flood Prevention Program (PL-566) between the late 1960s and early 1970s. Seven of the 14 dams are located within the North Deep Creek Watershed while the remaining seven dams are located in the South Deep Creek Watershed. We understand Yadkin County (County) would like to assess the condition of eight of these 14 dams since they have been in service for nearly 50 years.

#### **PROJECT OBJECTIVES**

The objective of these services is to complete assessments of Deep Creek Watershed Dam Nos. 6B, 10, 12, 15B, 21, 22A, 23, and 24 in accordance with NRCS requirements. As described in the RFQ prepared by Yadkin County, each assessment will include the following:

- Review the status concerning the operation and maintenance (O&M) of the structures and the original design criteria.



schnabel-eng.com

T/ 336-274-9456 F/ 336-274-9486  
11A Oak Branch Drive / Greensboro, NC / 27407

**Yadkin County, NC**  
**Deep Creek Watershed Dam Assessments**

- Perform a visual inspection of the structures.
- Perform updated hydrologic analyses using the current drainage area and land use.
- Perform hydraulic analyses to evaluate spillway capacity and auxiliary spillway stability and integrity.
- Perform dam breach analyses and determine the appropriate hazard classification of the dams.
- Determine the Population at Risk (PAR) and the NRCS Failure and Risk Indices for each dam.
- Identify potential rehabilitation alternatives, if necessary, and develop preliminary cost estimates for each alternative.
- Provide an assessment report summarizing the results of the visual inspection, engineering analyses, and rehabilitation alternatives.

**SCOPE OF SERVICES**

Our proposed scope of services has been divided into six major tasks in order to achieve the previously stated objectives. The services to be provided under each task are outlined in the following sections of this proposal. These services will be performed under the supervision of a Professional Engineer registered in North Carolina.

- Task 1 – Review of Available Information
- Task 2 – Site Reconnaissance and Dam Inspections
- Task 2 – Evaluation of Existing Conditions
- Task 4 – Hazard Classification Determination
- Task 5 – Rehabilitation Alternatives Analysis
- Task 6 – Assessment Report

**Task 1 – Review of Available Information**

Prior to initiating investigation, analysis, and design activities, Schnabel will review available information from Yadkin County such as previous inspection reports, operation and maintenance reports, the original design reports, record drawings, and engineering analyses performed since the original construction. This information will be used to familiarize the team with the project setting, obtain applicable baseline data, and finalize a site reconnaissance program to supplement and/or validate existing information.

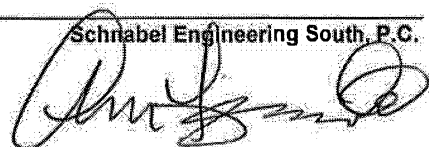
**Task 2 – Site Reconnaissance and Dam Inspections**

Two of Schnabel's engineers will inspect the dams to observe and document the layout and condition of the embankments and spillways. We will confirm key measurements of the embankments and spillways so that the hydraulic analyses can be performed appropriately. We will also observe the upstream and downstream areas to evaluate the current watershed characteristics and structures that could be affected in the event of upstream or downstream flooding. Key measurements of downstream structures needed to support the downstream impacts analysis will also be obtained.

**Task 3 – Evaluation of Existing Conditions**

***Geotechnical Analysis***

This task includes research and review of available geologic and geotechnical data for each dam. An understanding of the subsurface conditions and regional and site geology is essential to evaluating the



**Yadkin County, NC**  
**Deep Creek Watershed Dam Assessments**

condition of the dams and developing appropriate and cost effective rehabilitation alternatives. We will review the construction record drawings, the geologic design reports prepared by NRCS, the USACE Phase 1 inspection reports (if available), available geologic maps, and other applicable reports and data prepared since the construction of the dams. This review will be a collaborative effort between our geotechnical engineers and geologists.

We will analyze the stability of the maximum section of the dam under steady-state seepage conditions, rapid drawdown conditions, flood loading, and earthquake loading. We will also evaluate the filter compatibility between adjacent embankment zones and drain fill layers, and provide the subsurface profile and material erodibility indices required to perform or update the auxiliary spillway integrity analyses.

The results of our geotechnical analyses will be summarized and incorporated into the applicable sections of the assessment report. These results will also be used to develop the potential rehabilitation alternatives for each dam.

***Hydrologic and Hydraulic Analyses***

Hydrologic and hydraulic analyses will follow NRCS policies and procedures contained in Technical Release 60 (TR-60), the National Engineering Handbook, and related documents.

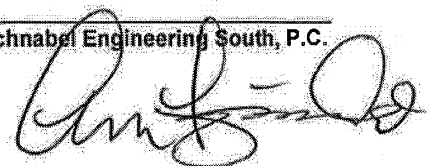
The watershed will be delineated for each dam using 2005 NCFMP LiDAR Topography. The land use/land cover for each watershed will be delineated using data from the Multi-Resolution Land Characteristics (MRLC) Consortium. The delineation and characteristics of the watershed will then be compared to those developed for the original design and any significant differences will be field-verified in order to obtain a new curve number (CN).

Hydrologic analyses will be performed using the USDA SITES Integrated Development Environment software (SITES). The hydrologic analyses will include the evaluation of the principal spillway hydrograph (PSH), the stability design hydrograph (SDH) and the freeboard hydrograph (FBH), as specified in TR-60. SITES will also be used to evaluate the frequency of operation, capacity, stability, and integrity of the auxiliary spillway at each dam. The results of these analyses will be incorporated into the assessment report and will also be used to support the development of potential rehabilitation alternatives.

***Downstream Impact Analysis***

Schnabel will determine the peak discharge for each dam breach scenario using the criteria stated in TR-60. The following dam breach scenarios will be analyzed:

- Hydrologic Failure (minimum requirement), which occurs when the dam breaches with the reservoir elevation at the crest of the dam or at the maximum elevation during the FBH, whichever is lower.
- Static Failure, which occurs when the dam breaches with the reservoir elevation at the auxiliary spillway crest.
- Seismic Failure, which occurs when the dam breaches with the reservoir at the normal pool elevation.



**Yadkin County, NC**  
**Deep Creek Watershed Dam Assessments**

Using the breach hydrographs, a HEC-RAS unsteady flow hydraulic model will be developed for each dam that accounts for changes in flow and flooding depth with respect to time to provide a more accurate depiction of potential flooding downstream for each dam breach scenario analyzed. The model will be developed from the HEC-RAS model obtained from NC Floodplain Mapping Program (NCFMP) and supplemented with 2005 NCFMP LiDAR topography. The unsteady flow analysis will demonstrate the timing and duration of storm events and the associated flood wave through the downstream valley.

***Inundation Mapping***

Based on the results of the downstream impact analysis, we will prepare breach inundation maps for each of the dams. The inundation maps will be developed for the hydrologic failure scenario only. The inundation maps will document the following:

- Extent of Inundation
- Peak Flood Water Elevations
- Flood Wave Time To Peak
- Roads
- Impacted Addresses

In order to perform the dam assessments on schedule and within budget, we do not plan to perform any land surveys. We will use LiDAR data in conjunction with the Yadkin County Address Point GIS shapefile to develop the depth of flooding at each impacted structure. For the structures included in the NCFMP HEC-RAS model, we will use HEC-RAS outputs to determine depth of flooding and flow.

***NRCS Failure and Risk Indices***

We will develop Population at Risk (PAR) indices for the potential modes of failure – static, hydraulic, and seismic. The PAR indices will be based on the number of affected structures within the breach inundation area for each potential failure mode.

We will complete the NRCS Failure and Risk Indices form for each dam using the information obtained from the downstream impact analysis, inundation maps, and PAR evaluation.

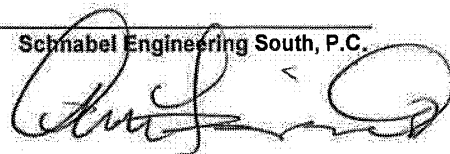
**Task 4 – Hazard Classification Determination**

NRCS defines high hazard dams as "dams located where failure may cause loss of human life or major damage to dwellings, commercial or industrial buildings, main railroads, important public utilities, or where a high risk highway may be affected or damaged". This definition is similar to the NC Dam Safety's definition of high hazard dams.

Schnabel will use the results of the downstream impact analysis and PAR evaluation to recommend an appropriate hazard classification for each dam in accordance with NRCS requirements.

**Task 5 – Rehabilitation Alternatives Analysis**

If a dam does not meet current NRCS and NC Dam Safety criteria, an alternatives analysis will be performed in order to recommend an appropriate and economical dam rehabilitation design that meets regulatory criteria for hydraulic capacity, stability, and integrity, along with achieving other project



**Yadkin County, NC**  
**Deep Creek Watershed Dam Assessments**

objectives that may include additional or continued flood protection, recreation, etc. Design alternatives may include modifications to the auxiliary spillway geometry (e.g., lowering, raising, and/or widening), armoring the auxiliary spillway with Roller Compacted Concrete (RCC) or articulated concrete blocks (ACBs), cutoff walls, reinforced concrete spillways, raising of the embankment, closure of the existing auxiliary spillway, or a combination of these methods.

The technical merits of each of the alternatives will be evaluated in combination with the project objectives, environmental considerations, constructability considerations, property ownership constraints, operation and maintenance issues, and cost to allow selection of the most appropriate option for each site. The site-specific information gathered during Task 1 – Review of Available Data will be carefully considered in the development of potential alternatives. Hydraulic analyses will be performed using SITES in order to develop preliminary sizing and layout of potential rehabilitation alternatives. Once the rehabilitation alternatives have been defined, plan sketches and preliminary construction cost estimates will be developed for each of the defined alternatives.

**Task 6 – Assessment Report**

As a result of our past experience, Schnabel has a proven template and process for developing the dam assessment reports. The assessment report for each dam will include a summary of the results of our investigations, evaluations, and analyses performed in Tasks 1 through 5. The report will include a discussion of the dam's potential deficiencies, the rehabilitation alternatives considered, and conceptual drawings and preliminary construction cost estimates for the rehabilitation alternatives. The report will also include the hazard classification of the dams, the NRCS Failure and Risk Indices, and the impacted structures downstream of the dam due to the dam breach scenarios. A summary and conclusions section will provide recommendations for any additional investigations or analyses that are warranted.

A draft of the first assessment report will be submitted to the County and NRCS for review as soon as it is complete. Once the County and NRCS review this report, Schnabel will address the County's comments, submit a final version of the first report for the County and NRCS approval, and incorporate the comments from the first report into the remaining drafts as applicable. It is our opinion that this review procedure will allow us to be more efficient and will result in a higher quality product for the County.

**ASSUMPTIONS**

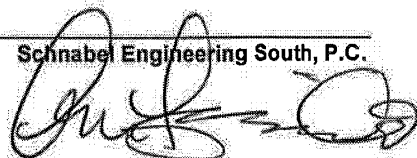
In developing our scope we have assumed the following:

- The County will provide Schnabel with available information for each dam, including any engineering analyses (e.g., SITES models) performed since the original construction.
- The inundation map will end at the confluence between Deep Creek and the Yadkin River unless the flood wave is within the normal channel banks before this point.

**EXCLUSIONS**

Services not specifically identified above are not included in the scope of services under this agreement. The following services are not included in our proposed scope, but can be provided upon request:

- Video inspection of the principal spillway system and internal drainage system.



**Yadkin County, NC**  
**Deep Creek Watershed Dam Assessments**

- Topographic survey of the dam, spillways, and impacted downstream structures.
- Bathymetric survey of the reservoir area, estimates of sediment volume, sampling of sediment for consistency or contamination.
- Geotechnical investigation.
- Attendance at meetings.

**PROJECT FEES**

Our lump sum fee for the proposed services is **\$160,000 (\$20,000 per dam)**. A breakdown of our fees by task for each dam is included in the table below. The fee for work requested beyond the scope of services included herein will be based on our current unit prices at the time the work is authorized or a negotiated lump sum. Our current Schedule of Personnel Fees is included as Enclosure (1). Our Standard Contract Terms and Conditions of Enclosure (2) will apply to services to be provided under this proposed agreement.

**Table 1: Breakdown of Fees Per Dam**

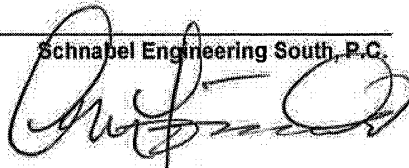
<b>Task</b>	<b>Fee</b>
Project Management	\$750
Task 1 – Review of Available Information	\$1,040
Task 2 – Site Reconnaissance and Dam Inspections	\$2,650
Task 3 – Evaluation of Existing Conditions	\$4,980
Task 4 – Hazard Classification Determination	\$4,980
Task 5 – Rehabilitation Alternatives Analysis	\$1,880
Task 6 – Assessment Report	\$3,720
<b>Total Lump Sum Fee Per Dam:</b>	<b>\$20,000</b>

**SCHEDULE**

We will begin to evaluate potential downstream impacts immediately upon receipt of a signed agreement. We will perform the dam inspections and reconnaissance within four weeks of receipt of a signed agreement. We anticipate the dam inspections and reconnaissance will take two to three days to complete. We will issue a draft of the first assessment report to you by the end of May 2016. We will continue to issue drafts of each report to you for review as they are complete and anticipate submitting all draft reports to you by the end of August 2016. We will issue final copies of the reports within two weeks of receipt of review comments.

**PAYMENTS**

Services will be billed monthly as a percentage of completion of the lump sum fee. Payment will be due on receipt of our invoices and will be considered past due 30 days after the invoice date. Interest will be charged at 1.5 percent per month on all overdue accounts. Payments will not be contingent upon receipt



**Yadkin County, NC  
Deep Creek Watershed Dam Assessments**

of funds from third parties. Twenty percent of the fee for each assessment will be held until approval is obtained from NRCS.

We appreciate the opportunity to submit our proposal for these services and are looking forward to working with you on this project. Please contact us if you have any questions regarding this proposal.

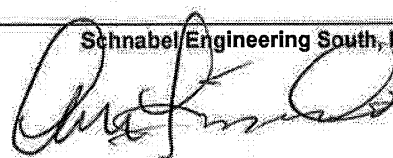
Sincerely,

**SCHNABEL ENGINEERING SOUTH, P.C.**

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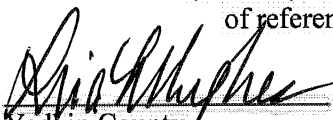
Thomas J. Fitzgerald, PE  
Senior Vice President

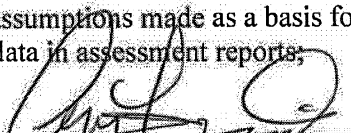
MRG:JMP:TJF

A large, stylized handwritten signature in black ink, likely belonging to a representative of Schnabel Engineering South, P.C., written over a horizontal line.

## Scope of Services- Watershed Dam Assessments

1. The scope of work is to complete the eight dam assessments in accordance with standard engineering principles that comply with all Natural Resources and Conservation Resources (NRCS) programmatic requirements.
2. All work will conform to all NRCS policy documents, technical guidelines, and references. NRC policy documents include the General Manual, National Engineering Manual, Nation Operations and Maintenance Manual, and the National Watershed Program Manual. NRCS technical materials include all sections in, but not limited to, the National Engineering Handbook, National Handbook of Conservation Practices, Technical Releases, and Technical Notes.
3. Assessments shall consist of the following activities:
  - a) Review the status concerning operation and maintenance (O&M) of the structure and the original design criteria;
  - b) Delineation of the current drainage area for each structure. Update other parameters used in hydrologic analysis as needed; i.e. time of concentration;
  - c) Review of the structure on site including completion of a dam inspection checklist; visual evaluation of the condition of the principal spillway pipe (does not require video inspection barrel), riser, and outlet; visual condition of foundation drainage; assessment of the condition of the embankment and auxiliary spillway; and photo documentation of existing site conditions.
  - d) Hydrologic analysis of the current drainage area with current land use and determination of the adequacy of the structure in meeting current NRCS design criteria;
  - e) Hazard classification evaluation including field surveys or reconnaissance to verify or locate potential hazards. This will include a map outlining the breach inundation limits;
  - f) Completion of the NRCS Failure Index and Risk Index for each dam;
  - g) Propose modifications or alternatives necessary to ensure that the structure meets current NRCS and State of North Carolina State Dam Safety agency's design criteria, including structural repairs or modifications. A cost analysis will be included for each proposed alternative;
  - h) Provide a comprehensive report with recommendations for each structure. The typical project will require knowledge and experience in all aspects of surveying, hydraulic and hydrologic modeling, and engineer design activities associated with design, operation, and maintenance of floodwater retarding structures;
4. General:
  - a) Use the criteria, methods, and procedures contained in applicable NRCS publications. The contractor shall certify that all assessments meet NRCS standards and the State of North Carolina State Dam Safety agency's hydrologic design criteria. The contractor shall maintain a prompt and continuous liaison with the County for approval of criteria and methods not covered by NRCS criteria and methods;
  - b) Clearly state assumptions made as a basis for assessments and list all sources of reference data in assessment reports;

  
Yadkin County

  
Schnabel Engineering


- c) The contractor shall promptly report to the County any omissions, discrepancies or inadequacies in data furnished as a basis for assessments. Should the need for supplementary data become apparent during the development of the assessments, the contractor shall promptly report such needs to the County. Such reports shall contain suggestions for supplementary investigations or corrective actions required to secure adequate data;

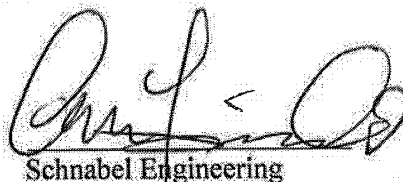
5. Hydrologic Analysis

- a) The current watershed delineations shall be compared to the original watershed delineations and any significant differences verified. Watershed boundaries may need to be field checked, such as through new developments and at roads.
- b) The hydrologic analysis shall include evaluation of the 6-hour and 24-hour PMP to determine adequacy of the existing structure in meeting current NRCS design criteria as defined in TR-60;
- c) The hydrologic analysis shall include evaluation of alternatives for the structure to meet current NRCS (as defined in TR-60) hydrologic design criteria. Note that all work must also meet the State of North Carolina State Dam Safety Agency's design criteria.
- d) The following alternatives will be evaluated:
  - 1.No Action. Dam will remain unchanged,
  - 2.Decommissioning. Dam will be removed,
  - 3.Upgrade Dam. Dam will be brought up to current design standards,
  - 4.Relocation of Downstream Structures. Remove or raise downstream structures and/or roads to reduce the dam hazard class. Note that zoning to keep all future development out of the breach inundation area would have to be part of this alternative.
  - 5.Contractor proposed alternatives.

6. Hazard Classification Evaluation

- a) The hazard classification evaluation shall consist of evaluating the downstream area for potential hazards. This shall consist of mapping the current land use, zoning, and identifying potential hazards. The dams shall be classified according to definition as and NRCS definitions in National Engineering Manual, Part 520, Subpart C-Dams (furnished with reference material. The breach peak discharge will be determined by a top-of-dam breach condition (minimum) and adhere to the criteria given in TR-60 (NRCS). The inundation area will be mapped downstream to a point that is within one vertical foot of the FEMA 100-year flood elevation. Documentation shall include location and description of the dam, configuration of the valley, description of existing development (houses, utilities, highways, railroads, farm and commercial buildings, and other improvements), potential for future development, and other pertinent information. A map of the area with the latest Digital Orth photo Quarter Quadrangle (DOQQ) shall be prepared showing the dam location and delineating the breach inundation area.

  
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7. Supporting Data

- a) All notes, surveys, computations, interpretations, design assumptions, drawings, sketches, maps, watershed delineations, and other data shall be checked and initialed by a competent person. This information shall be recorded neatly and organized a manner that will allow reproduction of copies and incorporation in reports with a minimum of editing and revisions. Preliminary design drawings, diagrams, graphs, sketches, or other pictorial representations shall be physically incorporated into the related computation file.

8. Drawing and Maps

- a) Drawings shall conform to the requirements of the NRCS National Engineering Manual, Title 210, Part 541 and shall be prepared and assembled in general conformance with previous dam assessments developed for NRCS. Drawings shall be in an electronic drawing fill in AutoCad\*.dwg format. GIS maps shall be saved to electronic files in ArcView shape file format and copies of the files provided to the County.

9. Reviews and Approvals

- a) Work submitted for review and approval, subject to any changes that may be required by NRCS, will be discussed at conferences arranged for that purpose. Work that, in the opinion of the Government Representative, does not require conference discussions may be reviewed and approved by correspondence. Where conferences are required, notify the County and the Government Representative at least five days in advance of the time of each conference and provide, at the time of such notification, an agenda of the questions to be considered.
- b) The contractor and County shall schedule reviews as needed on draft assessment reports for each site.
- c) A Final Assessment Report Review may be required for each site. The Final Assessment Report will be presented by the contractor.

10. Reports and Documentation

- a) Assessment Reports- AT a minimum, the assessment report shall consist of:

1.Introduction

- a. Background
- b. Scope of Study

2.Original Design Summary

3.Site Inspection Summary

4.Hydrology and Hydraulic Analyses

5.Hazard Classification Summary with breach inundation map

6.Failure and Risk Indexes

7.Design Criteria

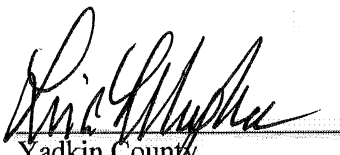
8.Environmental Considerations

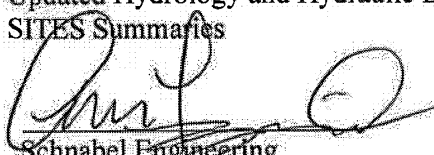
9.Cost Estimate for each proposed rehabilitation alternatives

10. Conclusions and Recommendations

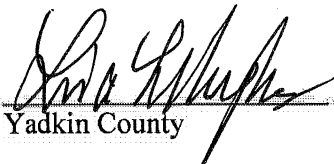
11. Appendices

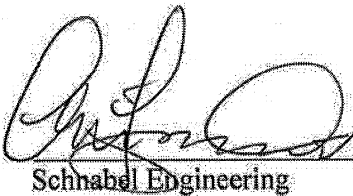
- a. Updated Hydrology and Hydraulic Data
- b. SITES Summaries

  
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- c. Site Inspections Checklist
  - d. Photos- One general photo of dam site and photos of any potential deficiencies needed to be addressed during rehabilitation.
- b) Supporting Data Folder- At a minimum, the supporting data folder shall contain:
- 1.All field survey data (electronic ASCII file format)
  - 2.Dam inspection notes
  - 3.All hydrology and hydraulic basic data
  - 4.GIS maps (electronic ArcView shape files)
  - 5.Printouts from computer models. Computer model input and output files shall be furnished on a CD or referenced to a website or vendor
  - 6.Correspondence, notes from meetings, etc.
  - 7.Computations
  - 8.All data furnished by the County to NRCS for use in performing the work.
- c) Final Assessment Report
- After draft Assessment Reports have been reviewed by NRCS, the contractor shall incorporate all comments and requirements and submit the deliverables to the County.

  
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