The scope of work is presented in the following elements:

I. Project Description
II. Scope of Services
III. Assumptions and Exclusions
IV. Deliverables
V. Compensation

I. Project Description

Barge Design Solutions, Inc. (Barge) proposes to provide the City of Kingsport with an assessment of the South Fork Holston River from the Fort Patrick Henry Dam downstream to approximately 0.75 river miles below the confluence of the South Fork Holston River and Reedy Creek. The assessment will occur at 13 sampling locations along the South Fork Holston River and various tributaries. The approximate sampling locations are provided in Attachment C. This proposal provides an estimated fee for the services described below.

II. Scope of Services

A. Sampling and Analysis Plan and Quality Assurance Project Plan

Prior to initiating sampling, Barge will develop pre-assessment planning documents:

- Sampling and analysis plan, which will detail the planned scope of work, as summarized in Sections B – E.
- Quality assurance project plan (QAPP) to ensure high data quality.
- Health and safety plan (HASP) to identify and mitigate potential risks.

These planning documents will be provided to the City of Kingsport for review and comment prior to coordination with the applicable regulatory agencies.

B. Macroinvertebrate Sampling

Barge will conduct the macroinvertebrate survey in accordance with the Environmental Protection Agency (EPA) Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition (RBP; Barbour et al., 1999), and the Tennessee Department of Environment and Conservation (TDEC) Quality System Standard Operating Procedures (QSSOP) for Macroinvertebrate Stream Surveys, Revised December 28, 2021. Qualified biologists will conduct the biological stream sampling, utilizing the SQSH Method described in Protocol G of the QSSOP. The samples will be collected using the Semi-quantitative Riffle Kick (SQKICK) or modified method. During sample collection, Barge will also measure water temperature, dissolved oxygen, pH, and conductivity. A Stream Survey Field Sheet will be completed for each sampling occasion at each sampling location.

The preserved composite samples will be sent to the Aquatic Resource Center (ARC) located in Nashville, Tennessee for sorting and identification. The lab will reduce the samples to a 200 +/- 20 percent organisms subsample by using a gridded pick subsampler and collecting the organisms from Macroinvertebrate Samples in EPA's RBP. ARC will identify all organisms to the lowest practicable level and provide numeric value organism biometrics and a Tennessee Macroinvertebrate (TMI) score.

A habitat assessment will be performed at each of the proposed biological sampling stations following Protocol D-1 of the TDEC QSSOP for Macroinvertebrate Stream Surveys. The High Gradient Habitat Assessment Field Sheet found in Appendix B of the TDEC QSSOP will be used in conjunction with the riffle kick collections.

Barge assumes macroinvertebrates will be collected at 13 sampling locations, twice per year for three years. It is possible macroinvertebrate sampling may be suspended at some or all locations following consistent TMI scores over multiple sampling occasions, but this determination must be made in consultation with TDEC prior to cessation of macroinvertebrate sampling. All data will be compiled and submitted to the Client prior to submitting to TDEC.

C. Water Quality Sampling

Surface water quality samples will be collected at each of the 13 proposed sampling locations to facilitate total maximum daily load (TMDL) modeling. Barge will conduct water quality sampling in accordance with the TDEC QSSOP for Chemical and Bacteriological Sampling of Surface Water. Qualified biologists will conduct the water quality sampling. Constituents to be tested include the following: total nitrogen, NH_3, NO_3, total phosphorus, PO_4, selenium, per- and polyfluoroalkyl substances (PFAS), total suspended solids, chlorophyll *a*, and *Escherichia coli*. During sample collection, Barge will also measure water temperature, dissolved oxygen, pH, and specific conductivity.

For *E. coli*, a Water Parameter Report will be completed for each sampling occasion at each sampling location. Additionally, *E.coli* sampling will be conducted as a stand alone event given the short hold time of six hours for samples collected.

All water quality constituents will be sampled monthly at 13 sampling locations for three years. Water quality samples will be delivered to Waypoint Analytical in Johnson City, TN, within the recommended holding times per sample. All data will be compiled and submitted to the Client prior to submitting to TDEC.

D. Sediment Sampling

Preliminary sediment samples will be collected at three locations during Year 1. These samples will help develop a detailed sampling approach for Year 2. During Year 2 a full suite of sediment parameters will be collected to facilitate TMDL modeling. Sediments will be collected with sterilized cores. Qualified biologists will conduct the sediment sampling. Constituents to be tested include the following: carbon, nitrogen, inorganic NH_4, NO_3, phosphorus, PO_4 flux, and sediment oxygen demand. During sample collection, Barge will also measure water temperature, dissolved oxygen, pH, and conductivity. Collection will be conducted by the Philadelphia Academy of Natural Sciences.

E. Water Quality Modeling

Barge has engaged Dynamic Solutions to model the water quality and sediment data to develop a water quality model for the South Fork Holston River over the course of the three-year study. This task includes watershed development and calibration based on available DEM data and HUC12 subbasins in the watershed. From this a hydrological and water quality model will be developed and tested. Once developed, the model will be calibrated using data provided by Barge. Additionally, up to four scenarios for nutrient and *E. coli* reduction will be analyzed with the model. A TMDL report will be developed based on the models and will document load allocation for each TMDL. Dynamic Solutions will also provide flow and stage gauge installation services. Flow data is needed for the model.

F. Meetings, Communication, Reporting, and Project Management

Barge will facilitate communication with TDEC and other regulatory agencies for approval of the proposed sampling plan. This task also includes monthly update meetings with the City. Barge will provide annual sampling reports to the Client. Annual reports will summarize all data collected during the previous year and will include all raw data received from subconsultants.

G. Bathymetry

Barge will conduct river soundings with a boat and Seafloor HydroLite system which will be attached to the boat. The intent of the bathymetry is to collect cross-sectional data at specific locations within the South Fork Holston River and the associated sluice. Transects will be conducted immediately upstream and downstream of any bridge crossings and at approximately 1,200 intervals from the Fort Patrick Henry Dam to the confluence with North Fork Holston River. In total, 94 cross sections will be surveyed, 60 on the mainstem South Fork Holston River and 30 on the sluice.

The topographic data collected with the HydroLite will be prepared at a scale of 1 inch = 50 feet and relative to State Plane coordinates and NAVD88 vertical elevations. Contours will be shown at 1-foot intervals, with spot shots at 50-foot intervals taken to 0.1 foot utilizing GNSS and Seafloor system.

III. Assumptions and Exclusions

A. Barge will provide the above-noted services based upon a given set of assumptions. These assumptions are as follows:

1. The above approach will generally be accepted by regulating authorities without significant changes requested. Significant changes may result in modification of the scope and associated fee.
2. Water quality modeling will be performed by Dynamic Solutions.
3. Barge will have access to the sampling locations, as required.
4. Sampling events will not be disrupted by conditions outside of Barge's control, such as unexpected/excessive dam releases, dangerous weather conditions, etc.

B. The following excluded services can be provided as an additional service with the fee and detailed scope to be negotiated at the time of request:

1. Jurisdictional water(s) verification by agency(ies).
2. 404 and 401 permitting applications.
3. Mitigation plan for permittee responsible mitigation.
4. Listed protected species presence/absence surveys.
5. Desktop and/or Phase 1 Cultural Resource Survey.
6. NEPA studies and/or NEPA documents.
7. Floodway modeling/studies.
8. Environmental sampling/testing other than that described within this Scope of Work.

IV. Deliverables

A. Sampling and Analysis Plan, Quality Assurance Project Plan, and Health and Safety Plan - PDF
B. All macroinvertebrate, water quality, and sediment data – Excel, PDF
C. Three annual sampling reports – PDF
D. TMDL Report – PDF

V. Compensation

The estimated maximum fees for the Scope of Work described above are included in the table below.

This scope of services will be performed on a Time & Materials basis. The fees and materials will be billed based on Barge's schedule of standard rates, is included in Attachment B. In the event additional work is requested by the Client, this work can be performed under a supplemental scope of work and on a time and materials basis, according to the same standard rate sheet (Attachment B). The hourly rates listed in Attachment B are valid until July 1, 2025, after which the rates will be adjusted three percent (3%) annually due to salary adjustment to Barge employees.

Year 1a Fee Summary Table

Items	Fee Type	Estimated Fee Amount
Project Management/Regulatory Meetings	T&M	$10,000
Macroinvertebrate Survey	T&M	$54,520
HASP/QAPP/SAP	T&M	$18,150
Macroinvertebrate Survey Direct Expenses	Direct	$7,860
Gage Installation Subconsultant	Direct	$60,000
Water Quality Modeling/Bathymetry	T&M	$134,050
Water Quality Modeling Direct Expenses	Direct	$15,390
TOTAL	Est. Max. Fee	$299,970

Year 1b Fee Summary Table

Items	Fee Type	Estimated Fee Amount
Macroinvertebrate Survey Laboratory Costs	Direct	$8,250
Gage Data Collection	T&M	$9,900
Water Quality Sampling	T&M	$66,310
Water Quality Sampling Direct Expenses	Direct	$15,700
Water Quality Sampling Laboratory Costs	Direct	$39,469
E. coli Sampling	T&M	$46,550
E. coli Sampling Direct Expenses	Direct	$15,700
E. coli Sampling Laboratory Costs	Direct	$10,300
Sediment Sampling	T&M	$1,400
Sediment Sampling Subconsultant	Direct	$77,000
Water Quality Modeling/Bathymetry	T&M	$28,540
Water Quality Modeling Subconsultant	Direct	$125,000
Annual Reports	T&M	$9,050
TOTAL	Est. Max. Fee	$453,169

Year 2 Fee Summary Table

Items	Fee Type	Estimated Fee Amount
Macroinvertebrate Survey Laboratory Costs	Direct	$8,245
Gage Data Collection	T&M	$14,900
Water Quality Sampling	T&M	$75,108
Water Quality Sampling Direct Expenses	Direct	$15,700
Water Quality Sampling Laboratory Costs	Direct	$39,468
E. coli Sampling	T&M	$55,350
E. coli Sampling Direct Expenses	Direct	$15,700
E. coli Sampling Laboratory Costs	Direct	$10,300
Sediment Sampling	T&M	$3,255
Sediment Sampling Subconsultant	Direct	$82,500
Water Quality Modeling Subconsultant	Direct	$121,950
Annual Reports	T&M	$9,050
TOTAL	Est. Max. Fee	$451,526

Year 3 Fee Summary Table

Items	Fee Type	Estimated Fee Amount
Macroinvertebrate Survey Laboratory Costs	Direct	$8,245
Gage Data Collection	T&M	$14,900
Water Quality Sampling	T&M	$75,107
Water Quality Sampling Direct Expenses	Direct	$15,700
Water Quality Sampling Laboratory Costs	Direct	$39,468
E. coli Sampling	T&M	$55,350
E. coli Sampling Direct Expenses	Direct	$15,700
E. coli Sampling Laboratory Costs	Direct	$10,300
Water Quality Modeling Subconsultant	Direct	$121,950
Annual Reports	T&M	$10,930
TOTAL	Est. Max. Fee	$367,650