SCOPE OF WORK

Jewell Engineering Consultants, PC (JEWELL) respectfully submits this Scope of Work (SOW) to the City of High Point for a stream stabilization and infrastructure improvement project for the neighborhood in the area of Dovershire Place and Kensington Drive. JEWELL's work is to be performed under the 2013 Master On-Call Services Agreement between the City and JEWELL. The City seeks to address erosion concerns along the open stream channel paralleling Dovershire and Kensington, and enlarge the culvert system spanning from upstream of Dovershire Place, and then converging with flows from other parts of the watershed for conveyance under Kensington Drive. The geographical location of the project site is depicted on the "Project Area Map" featured at the end of this SOW.

The City seeks to accomplish the following goals for this project:

- Enhance the existing stream channel to stabilize the stream banks such that increased flows from upstream can be discharged through the reach without exacerbating bank erosion.
- Reduce the flood risks for neighborhood residents and streets by improving conveyance capacity for flood runoff conveying from the open channel paralleling Kensington Drive and Dovershire Place through pipes and a short reach of open channel under and along properties at the Kensington and Dovershire intersection. Conveyance capacity for flows from the north, currently running overland and through a 42" RCP under yards along Kensington Drive, will also be improved. The City seeks to avoid or minimize increases in flood elevations downstream of the project area in the design storm event.
- Stabilize the discharge area on the property at 1218 Kensington Drive where there is extensive erosion downstream of a storm drain.

JEWELL has assembled a team (the Project Team) of professionals from its on-call services team to provide the requested services to address the project goals:

- Hydrologic/hydraulic modeling and analysis – JEWELL
- Drainage infrastructure design – JEWELL
- Natural channel design for stream stability – JEWELL
- Survey – Davis-Martin-Powell and Associates, Inc.
- Geotechnical assessment – Terracon Consultants, Inc.
- Structural design – Engineered Concepts

The SOW for this project is comprised of 8 tasks, as listed below and described in the following sections.

Task 1 – Project Coordination
Task 2 – Existing Conditions Survey and Assessment
Task 3 – Completion of Hydraulic Analysis and Sizing for Pipe Improvements

Task 4 – Preliminary Construction Plans for Stream Channel Improvements
Task 5 – Preliminary Construction Plans for Pipe Improvements
Task 6 – Permitting
Task 7 – Construction Documents for Stream Channel Improvements
Task 8 – Construction Documents for Pipe Improvements

Task 1 – Project Coordination

The Project Team understands the importance of coordination with City staff and the residents of the Kensington/Dovershire neighborhood to implement a successful project. The JEWELL project manager will coordinate with these parties throughout the duration of the project. We envision up to three coordination meetings with the residents whose properties will be affected by the channel improvements and pipe installations. Meeting minutes will be issued no later than 3 business days after each meeting. Time for miscellaneous communication such as phone calls and emails has been scoped. The total duration of the Project is assumed to be 8 months (240 days).

Task 2 – Existing Conditions Survey and Assessment

2.1 Site Survey – The Project Team will perform the existing conditions site and topographic survey which will include areas of the floodplain and channel depicted on the "Project Boundary Map". JEWELL will provide QA/QC services to assure deliverables meet requirements for the geomorphic assessment and stream restoration project components. The survey will include the following elements:

- Stream thalweg, top of bank, and toe of slope approximately every 15 feet along the stream channel where improvements are planned
- Topography,
- Planimetrics,
- Property lines,
- Sanitary and storm sewer,
- Underground utilities (where discernable from the surface and/or marked by locator service),
- Ownership references,
- Existing recorded easements and right-of-way,
- All trees (species) greater than 12 inches (DBH),

2.2 Geotechnical Assessment – The Project Team will perform 5 auger borings to a depth of about 5 feet below grade. Samples will be obtained for the following laboratory tests:

- Standard Penetration (SPT, ASTM D 1586),
- Natural moisture content,
- Atterberg Limits,

- Standard Proctor,
- In-situ soil compaction,
- Ground water elevation,
- pH, and
- Organic content.

Following completion of the field and laboratory work, a short memorandum describing the findings of the investigation and laboratory testing results will be prepared.

2.3 Site Visit/Meeting with Owner at 1218 Kensington Drive – JEWELL staff will visit the property at 1218 Kensington Drive to assess existing conditions and meet with the property owner to verbally describe recommendations and planned improvements.

2.4 Stream Assessment – The geotechnical assessment will be evaluated to recommend the appropriate type of stream bank enhancement. Specifically, bank grading with live stake planting will be implemented if the slope stability analysis will allow for an appropriate factor of safety. If not, vegetated geolifts will be recommended for implementation.

2.5 Bankfull Discharge Verification - Bankfull indicators identified in the field will be verified by utilizing a hydraulic model (developed from the previous project phase), USGS regression equations for the piedmont region, published regional curve information, and/or evaluating our reference reach database. This analysis is needed to determine the vertical height of bank protection structures (vanes), and cross section geometry which may affect post-construction sediment transport competency.

2.6 Hydraulic Modeling Refinement – The hydraulic model created in the previous phase of work for this project will be further refined based on additional and updated cross-section data. The purpose of the modeling is to estimate bank shear stresses and ensure that the planned improvements will provide adequate bank stability and protection against excessive erosion.

Task 3 –Completion of Hydraulic Analysis and Sizing for Pipe Improvements

3.1 Refine SWMM Model to Size Pipe Improvements – The SWMM model created in the previous phase of work will be used in planning for replacement of the existing 42" RCP with a pipe adequate to convey the 10% annual chance storm event. Based on the decision to remove and replace the existing 66" CMP, the SWMM model will also be modified to size a box culvert to replace that reach of pipe. JEWELL will develop an updated schematic of planned pipe improvements for review by City staff before proceeding with development of construction plans.

3.2 Extend modeling and analysis to assess downstream impacts - To further address potential concerns about possible impacts on downstream neighbors in the Westminster Drive and Wales Drive area (approximately 500 feet downstream of Westminster Drive), the project modeling and analysis will be extended to include the culvert crossing at

Westminster Drive and the home most at risk of flooding in the block of Wales Drive downstream of the Westminster crossing. The purpose of the analysis will be to assess the existing conditions in the 10-year design storm event and compare that to proposed conditions after the upstream improvements are constructed. Our expectation, based on limited analysis thus far, is that the flood storage upstream of Kensington Drive is very minimal relative to the 10-year design storm and does not provide enough flood detention to reduce the peak flow downstream. Improving the culverts at the Kensington/Dovershire intersection is expected to convey the peak flows underground instead of as a combination of pipe and overland flows, as is occurring now in major storm events. There are possibly some minimal impacts from the Rockford improvements and the elimination of flood storage behind Westchester Drive. If further analyses indicate an unacceptable increase of the peak flood elevations in the 10-year design storm event in the Westminster area, JEWELL will seek and analyze possible mitigation options (up to two) for providing detention in another area to reduce the design storm peak flow. If development of construction plans for a detention facility is warranted, this will necessitate an additional contract or could be billed as additional services on a time and expenses basis.

Task 4 –Preliminary Construction Plans for Stream Channel Improvements

4.1 Preliminary (60%) Construction Plans – Drawings will include a planimetric view of existing conditions and the proposed design. The plans will be prepared to approximately a 60% completion level. The plan view drawings will show structure locations, grading, and location of bioengineering structures, riparian vegetation, existing utilities, proposed construction staging areas, access corridors, and other relevant features. Preliminary details for stream structures, bioengineering techniques, and vegetation implementation will be provided. Draft technical specifications will not prepared until the 90% Construction Plans.

The 60% plans will be used for soliciting comments from the City and, if appropriate, affected residents. Comments will be incorporated in the 60% plans and, if needed, returned to the City for final approval. Subsequent changes to the approved 60% plans will be addressed as Additional Services.

4.2 Preliminary (90%) Construction Plans – Drawings will include plan and cross sections of the existing conditions and the proposed design. The plans will be prepared to approximately a 90% completion level. The drawings will show structure locations and elevations, grading, location of bioengineering structures, extents of the proposed stream bank, riparian vegetation, existing utilities, proposed limits of disturbance, proposed permanent and temporary easements, and other relevant features. Details for stream structures, bioengineering techniques, and vegetation implementation will also be provided. Technical specifications for non-standard construction items (e.g., cross vanes, geolifts, etc.) will be drafted.

The 90% plans will be used for permitting. These plans will also be submitted to City for comments. Addressed comments will be incorporated in the final construction drawings.

Task 5 –Preliminary Construction Plans for Pipe Improvements

5.1 Preliminary (60%) Construction Plans – Drawings will include a planimetric view of existing conditions and the proposed design. The plans will be prepared to approximately a 60% completion level. The plan view drawings will show pipe alignments, inverts and sizes, structure locations, elevations and sizes, existing utilities, proposed construction staging areas, access corridors, and other relevant features. Structural plans and draft technical specifications will not be prepared until the 90% Construction Plans.

The 60% plans will be used for soliciting comments from the City and, if appropriate, affected residents. Comments will be incorporated in the 60% plans and, if needed, returned to the City for final approval. Subsequent changes to the approved 60% plans will be addressed as Additional Services.

5.2 Preliminary (90%) Construction Plans – Drawings will include plan and longitudinal profile of existing and proposed pipes, with locations of potential utility conflicts noted and addressed. The plans will be prepared to approximately a 90% completion level. The drawings will show pipe alignments, sizes, materials, and profiles; structure locations, elevations and sizes with structural details provided; details for addressing conflicts with existing utilities; and proposed limits of disturbance, permanent easements, and temporary easements. Technical specifications for non-standard construction items will be drafted. Structural designs will be provided for two junction boxes and three headwall/endwall structures.

The 90% plans will be used for permitting. These plans will also be submitted to City staff for comments. Addressed comments will be incorporated in the final construction drawings.

Task 6 – Permitting

6.1 401/404 Permitting – The Project Team assumes the project will be permitted under a Clean Water Act Nationwide Permit 27 (NWP 27). The Project Team will prepare and submit the permit application package with appropriate supporting documentation to the USACE and NCDWR for approval. The Project Team will utilize the 90% restoration plans and data layers to prepare permits. A Pre Construction Notice (PCN) will be issued to the USACE within 30 days of City concurrence with the 90% construction plans.

6.1A Protected Species Clearance
This task is required for 401/404 permitting. The Project Team will conduct a protected species habitat review based upon available data from the US Fish and Wildlife (USFWS) database, and communication with regulatory agencies. Formal surveys for populations of protected species and Section 7 consultation services are not included under this SOW, but can be provided as Additional Services.

6.1B Cultural Resource Clearance
This task is required for 401/404 permitting. The Project Team will prepare and submit a Project Review Request to the North Carolina Department of Cultural Resources, State Historic Preservation Office (SHPO) for the site. Further coordination with SHPO, and formal surveys and/or excavations are not included in this SOW, but can be provided as Additional Services.

6.2 Erosion and Sediment Control Permitting – The Project Team will prepare and submit Erosion and Sediment Control Plans and the appropriate application documents to the NC Division of Energy, Mineral, and Land Resources (NCDEMLR). The Project Team will coordinate with NCDEMLR to ensure timely approval of erosion control plans.

NOTE: Permitting for the stream channel improvements and the pipe improvements will be done as a single task if these projects proceed concurrently. If the City opts to delay in proceeding on development of construction plans for the pipe improvements, the later permitting efforts would be done as an additional service. The effort required for both the 401/404 permitting and the erosion and sediment control permitting will be substantially less for the pipe improvements than for the stream channel improvements, particularly given that the protected species clearance and cultural resource clearance would have already been accomplished as part of the permitting for the stream improvements.

Task 7 – Construction Documents for Stream Channel (100% Plans)

Construction documents will include final design plans, an engineer's estimate of construction quantities and cost, and technical specifications certified by a professional engineer.

7.1 Final Design Plans – This task includes revising the 90% Construction Plans to incorporate comments from the permitting agencies and the City. The Project Team will then prepare Final Construction Plans certified by a Professional Engineer.

The final plan set will include:

- Title and symbol sheets with project location maps, symbology, and definitions;
- Plan and profile sheets;
- A landscape plan consisting of areas identified for floodplain and stream bank vegetation enhancement;
- Detail sheets for stream structures, bioengineering techniques, planting, and erosion control measures;
- Erosion control plans; and

- A written construction sequence to facilitate efficient construction progress, and compliance with permitting agencies.

7.2 Easement Documents – An easement map and legal descriptions will be provided for each property where a permanent and/or temporary easement will be required. The scope includes easement documents for up to nine (9) affected properties. If construction access requires easements on any additional properties, these will be provided as an Additional Service on a time and expenses basis.

7.3 Engineer's Estimate of Construction Quantities and Cost – Based on final design plans, quantities of all construction materials will be estimated. Based on recent construction bids, the Project Team will approximate unit costs to estimate the construction cost.

7.4 Technical Specifications – The Project Team will write project specific technical specifications for construction items that are not available in the City of High Point's Standard Drawings for City Construction or the 2012 NCDOT Standard Specifications Book. These specifications may include items such as cross vanes, rock vanes, and geolifts.

Task 8 – Construction Documents for Pipe Improvements (100% Plans)

Construction documents will include final design plans, an engineer's estimate of construction quantities and cost, and technical specifications certified by a professional engineer.

8.1 Final Design Plans – This task includes revising the 90% Construction Plans to incorporate comments from the permitting agencies, and the City. The Project Team will then prepare Final Construction Plans certified by a Professional Engineer.

The final plan set will include:

- Title and symbol sheets with project location maps, symbology, and definitions;
- Demolition plan;
- Erosion control plan;
- Plan and profile sheets (three expected);
- Structural plans for junction boxes and headwall/endwalls; and
- Detail sheets for pipes, miscellaneous drainage structures and erosion control measures;
- A written construction sequence to facilitate efficient construction progress, and compliance with permitting agencies.

8.2 Easement Documents – An easement map and legal descriptions will be provided for each property where a permanent and/or temporary easement will be required. The scope includes easement documents for up to six (6) affected properties. If construction

access and/or additional construction not anticipated at this point require easements on any additional properties, these will be provided as an Additional Service on a time and expenses basis.

8.3 Engineer's Estimate of Construction Quantities and Cost – Based on final design plans, quantities of all construction materials will be estimated. Based on recent construction bids, the Project Team will approximate unit costs to estimate the construction cost.

8.4 Technical Specifications – The Project Team will write project specific technical specifications for construction items that are not available in the City of High Point's Standard Drawings for City Construction or the 2012 NCDOT Standard Specifications Book.

Summary of Deliverables

- Existing conditions mapping
- Geotechnical laboratory report
- Schematic of proposed pipe improvements/replacements
- Preliminary (60%) construction drawings
- Preliminary (90%) construction drawings
- 401/404 (DWR/USACE) permit application/pre-construction notification (includes buffer authorization request)
- NCDEMLR (Erosion Control) permit application
- Construction Documents (plans and technical specification)

Assumption/Limitations

The following assumptions and limitations were used in developing the SOW and project fees for the tasks associated with this contract:

- Permit fees are not included in this scope of work and fee schedule.
- The Project Team assumes that the City will handle all easement acquisition (temporary or permanent) that will be needed for this project. Easement maps and legal descriptions will be provided to the City.
- The Project Team assumes that survey will not be required outside of the project area depicted in "Project Area Map". Existing survey information from the City will be used to supplement plans outside of this area.
- This SOW assumes the project will be completed within 240 days from NTP by the City. If the project is delayed for reasons outside of the Project Team's control, additional time to complete the project and compensation may be required.

- Up to three coordination meetings with neighborhood residents are included in the scope. Time and expenses for additional meetings requested by the City will be billed as additional services.
- Construction plans will include up to 25 sheets (24"x36").
- Bid and construction phase services are not included in this SOW.
- A Rosgen Level II assessment, which includes pebble counts and sediment sampling is not needed for stream enhancement projects, therefore is not included in this SOW.
- Post construction phase monitoring or success criteria documentation is not included in this SOW.
- The Project Team is not responsible for compensatory mitigation if required by the US Army Corps.
- The SOW does not require the Project Team to perform any cultural resource identification or resource delineation if discovered during construction.
- The SOW does not require the Project Team to perform hazardous materials remediation if hazardous materials are discovered during construction.
- Right of access to all properties will be provided to the Project Team prior to initiation of field work activities.
- The SOW assumes no engineering change orders by others that adversely affect the project limits up to the initiation of field work. All project limit or boundary changes that may require supplemental investigations is out-of-scope and is subject to separate change orders.
- Phase I, II, or III ESA tasks are not included in this scope of work.
- Environmental Data Reports (EDR) are not included in this scope of work.
- The Project Team will provide up to two (copies) of each deliverable, and will also supply an electronic copy via email, ftp link or cloud server.
- Ground Penetrating Radar (GPR) for geotechnical exploration is not included.
- The hydraulic model results will not be used for FEMA permitting.

PROJECT FEES

The Project Team will provide the services documented in the SOW for the following LUMP SUM fee;

$160,800 (One hundred sixty thousand, eight hundred dollars and zero cents)