FY 21 HMA – Grant Application Review Summary

Subapplication Number	EMA-2021-BR-005-0046		
Project Title	Fayetteville, NC - Wayland Drive Drainage Improvements - BRIC FY2021		
Applicant Name	North Carolina Department of Public Safety		
Subapplicant Name	City of Fayetteville		
Project Type	Stormwater Management		
Recommendation	Yes with Conditions		
Federal Cost (FEMA GO)	$2,612,602.78	**Phased Project**	Yes
BCR (subapplication)	1.97	**Duplicate Project**	No
BCR (reanalysis)	1.03	**Benefits (reanalysis)**	$3,687,489

Summary

This is a technical feasibility and cost-effectiveness review in support of the National Technical Review process. No contact was made with the applicant or subapplicant; this review is solely based on information provided in the subapplication. The project was found to be technically feasible and cost-effective; therefore, it is recommended for further consideration with the conditions listed in the conclusion.

This review only constitutes an evaluation of the technical feasibility and cost-effectiveness of the proposed project. Additional Environmental Planning and Historic Preservation (EHP), eligibility and completeness, and funding limitation considerations may affect the selection of this subapplication for further consideration and funding.

Scope of Work

The scope of work is well-defined and clearly explains the activities necessary to complete the work. City of Fayetteville (subapplicant) has submitted a subapplication for the Wayland Drive Drainage Improvement Project that involves redirecting stormwater away from a residential and industrial area, which is prone to repetitive flooding, to a proposed downstream basin. The project includes construction of a 6-foot-wide drainage ditch, a 3-foot-wide drainage ditch, 54- and 48-inch reinforced concrete pipelines, and a newly excavated and graded storage basin with 15,000 cubic feet of capacity covering 4.8 acres. The proposed project is intended to reduce risk to 23 structures and impact 18,738 people. This is a phased project with design occurring as part of Phase 1 and construction as part of Phase 2.

Technical Feasibility

Project Schedule

The schedule provided indicates the project would be completed in 36 months. The schedule does include all items in the scope of work and is reasonable. The project description includes possible impacts to emergent wetlands and the schedule provides 6 months for environmental assessment. The project also requires six easements and provides 17 months to complete the task. Note that these two tasks may take longer than the schedule permits.

Cost Estimate

The cost estimate includes sufficient line items. Line items included specific components of construction, design, easements, traffic control, erosion control, construction management, and management costs.

The cost estimate is consistent with the scope of work. The source of the cost estimate is not clear; however, it appears reasonable for the scope of work.

The total cost estimate provided in the subapplication is different than the detailed cost estimate included in the submitted design report completed on November 17, 2020, by an engineering firm. Comparing the cost in the engineering report to the subapplication itemized costs, it was found that, in many cases, the line-item costs were increased marginally. The subapplication states that the cost estimate included in the engineering report was adjusted for price fluctuations owing to COVID-19 and inflation.

Technical Design Information

To achieve flood mitigation, the following information and documentation were provided to support the project:

- Engineering analysis report, prepared by an engineering firm, included a hydrology & hydraulics (H&H) study that modeled before- and after-mitigation flooding during the 2-, 10-, 25-, and 50--year storm events. Three alternatives were evaluated, and one was selected. This report forms the basis for the project concept. It is stamped and signed by an engineer.
- Subapplication refers to local codes, regulations, and policies being evaluated. Additionally, the subapplication identifies applicable standards, including American Water Works Association (AWWA) C901, AWWA C906, ASTM International (ASTM) D2239, ASTM D2737, ASTM D3035, and American National Standards Institute (ANSI)/National Science Foundation (NSF) 14/61.
- Currently, a ditch adjacent to S Reilly Road floods during storm events. The H&H modeling, as well as documentation provided in the subapplication (e.g., news articles, photographs, and emails detailing work orders), support the assertion that the current level of protection is inadequate.
- Proposed level of protection is justified with H&H modeling. This effort provides depths at each property before and after mitigation.
- Project uses standard design principles to convey stormwater away from the areas experiencing flooding to discharge the flow into a downstream basin. The subapplication refers to this basin as suitable for infiltration but also refers to it as a wet basin with 2 feet of storage space. For infiltration, geotechnical investigations would be needed to confirm technical feasibility prior to Phase 2.
- Subapplicant identifies residual risk for each impacted property based on their modeled depth of flooding during the 2-, 10-, 15-, and 100-year events. Upstream areas are not expected to be impacted by the project. With increased conveyance capacity, potential downstream impacts could result from larger storms overflowing from the proposed downstream basin. Confirmation that this project will not negatively impact areas downstream would be needed to assess technical feasibility prior to Phase 2.

Based on the documentation provided, the project is technically feasible and effective at reducing risk to individuals and property from natural hazards. The following Phase 1 condition was identified:

- The cost estimate should be verified or amended as necessary to match supporting documentation. The cost in the subapplication should match the cost estimate provided by the engineer.

The following Phase 1 deliverables are needed to determine technical feasibility and effectiveness prior to Phase 2:

- H&H data/modeling and other relevant technical data, including documentation illustrating that the project will not negatively impact downstream areas.
- Engineering design (typically 30/60/90) and updated line-item cost estimate, which matches the updated engineering plan set and is consistent with the project scope of work and support documentation.
- Technical body of information needed to support the desired level of effectiveness/protection or amount of risk reduction, including results of geotechnical investigations confirming any assumed infiltration benefits at the downstream basin.

Cost-Effectiveness

The BCA for this project was completed based on professional expected damages using the damage-frequency assessment (DFA) module of the FEMA BCA Tool. The BCA evaluated the impact of diverting flow from the flood prone area to a storage basin downstream.

The following was found during review of the submitted BCA:

- *Project Useful Life (PUL):* PUL utilized was 50 years, which is consistent with the FEMA standard value for a major infrastructure project.
- *Annual Maintenance Cost:* Annual maintenance cost is estimated at $1,000, which appears reasonable. Costs were estimated based on inspection, testing, and general maintenance and includes maintaining the drainage infrastructure, cleaning culverts and outfalls, preventative maintenance and repairs from embankment erosion. The City of Fayetteville is responsible for all maintenance after the project is complete, except that the North Carolina Department of Transportation (NCDOT) will perform maintenance within their right-of-way.
- *Total Mitigation Project Cost:* Total mitigation project cost (including maintenance) indicated in the BCA was $3,554,561.60. The initial project cost in the BCA is consistent with the project cost estimate.
- *Lowest Floor Elevations (LFEs):* Elevations were determined based on GIS information, LiDAR, and available survey data. The subapplicant presents three elevations (ground elevation, adjusted ground elevation, and foundation elevation); however, it is unclear as to which LFE values were used in their calculations because only pdfs were provided.
- *Damage Curve:* Damage curve selected was USACE Generic Riverine depth-damage functions (DDFs) specific to the characteristics and occupancy of the structure. This appears to be appropriate.
- *Flood Hazard Data:* Subapplicant submitted an H&H study, completed by an engineering firm, which established flood elevations and depths through modeling and GIS, LiDAR, and available surveying data. This analysis provided a flood depth at the affected properties for each recurrence interval (RI) modeled (2-, 10-, 25-, and 100-year), before and after mitigation. It is unclear which modeled flood elevations were applied to which properties. Some properties show flooding even when the foundation elevations are higher than the modeled water surface elevations. To confirm cost-effectiveness, documentation showing modeled water surface elevations and flood depths should be provided.

- *Building Information:* Cumberland County, NC tax administration data were used to gather building attributes, such as building footprints, number of stories, total area, and building use.
- *Building Replacement Value (BRV):* BRV was based on nonstandard values ranging from $142.83 to $212.67/sq ft, depending on the HAZUS Occupancy code and accounting for inflation to 2021 dollars.
- *Contents Costs:* Subapplicant used 100 percent of the BRV to determine the content replacement value per the USACE Generic DDFs.
- *Loss of Function:* Loss of function for Reilly Road, the only road impacted, was assessed using annual average daily traffic (AADT) values of 16,000 trips per day with 11 minutes of detour time for a distance of 6.7 miles, as determined through Google Maps.
- *Displacement Costs:* Displacement costs were calculated using the 2006 HAZUS values, inflated to 2021 using the Bureau of Labor Statistics calculator. A table of values was included in the BCA methodology report, but the spreadsheet was not provided.
- *Before-Mitigation Damages:* Before-mitigation damages for buildings were calculated outside of the BCA tool and entered as lump-sum values for each of the modeled storm events. Loss of function is included as 1 day of downtime during each storm event. The methodology appears reasonable; however, the spreadsheet calculations were not provided and could not be verified.
- *After-Mitigation Damages:* After-mitigation damages were calculated in the same manner as before-mitigation damages using the after-mitigation flood depths, as determined in the H&H study.

Reanalysis BCA

A reanalysis BCA was performed for this subapplication, and the following edits were made:

- Spreadsheet was developed that followed the same methodology as the BCA tool to evaluate the before- and after-mitigation damages to buildings, contents, displacement costs, and loss of function of the roadway. The depths of water and LFEs provided by the subapplicant were utilized, but the standard BRV of $100/sq ft was used.
- Total for all properties was input into the BCA tool as professional expected damages for the 2-, 10-, 25-, and 100-year RIs.
- Social benefits were added to include impacts to residents in the proposed project area. To be conservative, a rate of two residents per household and one worker per household was assumed, for a total of 36 residents and 18 workers.

Based on the reanalysis BCA, the total benefits associated with this project, $3,687,489, are greater than the total project cost of $3,568,362, producing a BCR of 1.03.

Based on the documentation provided, the project is cost-effective. The following are Phase 1 conditions:

- Proper documentation showing LFEs and flood depths for all properties included in the BCA should be provided. It is unclear which LFEs were used in the damage calculations, and it is unclear which modeled flood elevations were applied to which properties. This documentation could consist of detailed H&H modelling results tables correlating each of the model nodes to each of the properties.

- Spreadsheets (as opposed to PDFs) should be provided showing the before- and after-mitigation damages that were calculated outside of the BCA Tool.

The following Phase 1 deliverables are needed to assess the cost-effectiveness of Phase 2:

- Refinement of the BCA reflecting the final scope of work and cost. This submittal should include all supporting documentation, including any updates to the spreadsheets showing the before- and after-mitigation damages that were calculated outside of the BCA Tool.

Conclusion

Based on the information provided, the project was found to be technically feasible and cost-effective; therefore, it is recommended for further consideration with the following conditions:

- Phase 1 conditions:
    - The cost estimate should be verified or amended as necessary to match supporting documentation. The cost in the subapplication should match the cost estimate provided by the engineer.
    - Proper documentation showing LFEs and flood depths for all properties included in the BCA should be provided. It is unclear which LFEs were used in the damage calculations, and it is unclear which modeled flood elevations were applied to which properties. This documentation could consist of detailed H&H modelling results tables correlating each of the model nodes to each of the properties.
    - Spreadsheets (as opposed to PDFs) should be provided showing the before- and after-mitigation damages that were calculated outside of the BCA Tool.
- Phase 1 deliverables needed to determine technical feasibility and effectiveness prior to Phase 2:
    - H&H data/modeling and other relevant technical data, including documentation illustrating that the project will not negatively impact downstream areas
    - Engineering design (typically 30/60/90) and updated line-item cost estimate that match the updated engineering plan set and is consistent with the project scope of work and supporting documentation
    - Technical body of information needed to support the desired level of effectiveness/protection or amount of risk reduction, including results of geotechnical investigations confirming any assumed infiltration benefits at the downstream basin
    - Refinement of the BCA reflecting the final scope of work and cost. This submittal should include all supporting documentation, including any updates to the spreadsheets showing the before- and after-mitigation damages that were calculated outside of the BCA Tool.

This review only constitutes an evaluation of the technical feasibility and cost-effectiveness of the proposed project. Additional EHP, eligibility and completeness, and funding limitation considerations may affect the selection of this subapplication for further consideration and funding.