March 6, 2014

Mr. Steve Roth, City Administrator
City of New Haven, City Hall
101 Front Street
New Haven, MO 63068

RE: **Engineering Services for completion of FEMA 65.10 Levee Certification in support of a FEMA LAMP freeboard deficient mapping scenario.**

Dear Mr. Roth:

AMEC Environment & Infrastructure, Inc., (AMEC) is excited about the opportunity to provide the City of New Haven our proposal for engineering services for FEMA levee certification services. **AMEC Environment & Infrastructure, Inc.** will serves as the prime contractor on the project and is one of the largest multi-disciplinary engineering and construction firms in the world, with over sixty five hundred people in North America, including a multi-disciplinary office in St. Louis, MO and one in Topeka, KS, both of which are one of AMECs seven hubs for levee certification services for AMEC's national program. We believe the experience of our Project Team is ideal for providing the type of proactive support critical to the success of this project. Our team includes highly specialized staff able to provide timely and efficient support.

The AMEC Team brings the following unique benefits to the City of New Haven.

- National levee engineering and certification experience both as a USACE IDIQ contractor as well as FEMA levee certification consultant for local Communities and Drainage Districts. Our project experience ranges from Pennsylvania to California, including **14 certification projects** encompassing over **250 miles** of levee system within FEMA Region VII alone. One of these projects, the Wichita Valley Center Flood Control Project, includes over 120 miles of new hydraulic analysis and analysis of over 80 internal drainage structures and ponding areas including six storm water pumping stations. Another project for the City of Augusta, KS, was for certification of a levee segment less than two miles in length. Our levee certification experience uniquely qualifies us to complete the assessment, analysis and any improvements on this project working closely with the City, USACE and FEMA throughout the process.

- A proven Project Management Team with substantial **Levee Certification Experience** that is easily accessible and has successfully managed complex multi-discipline projects in the past. Proposed project manager **Larry Sample** works out of our Topeka, KS Office, and has served as project manager for numerous levee certification projects in Kansas, Missouri and Oklahoma in the past. **Stephen Noe** will serve as Technical Director and Agency Liaison for the project, drawing on his extensive nationwide levee certification and FEMA Mapping experience, and his close relationships with FEMA Region VII and USACE KS District staff. **Joe File** will draw on his large multi-discipline project management and oversight experience and implement a QA/QC process to assure implementation of QA/QC procedures that meet and exceed City of New Haven's compliance standards. This Senior Management Team has extensive experience working together and has successfully lead multiple communities through the levee certification process while **maximizing federal dollar** contributions from USACE and FEMA.

- A strong commitment to client services that has won us the respect of, and repeat opportunities for, cities around the world, especially throughout the levee certification community. Strong working **relationships** with the **St. Louis and Kansas City District USACE** and with **FEMA Region VII**.

- A commitment to provide the necessary staffing and material resources that will be required to fully support your needs for this project.

We would welcome the opportunity to present our qualifications and discuss a certification approach in person. Should you have any questions, contact Larry Sample at 785-272-6830.

Bradley D. Johnson, PE
Topeka Office Manager

Larry Sample, PE
Project Manager

Proposal for

Levee Accreditation Engineering Services

for the

The City of New Haven

Submitted to:
City Hall
City of New Haven
101 Front Street,
New Haven, MO 63068

Submitted by:
AMEC Environment & Infrastructure, Inc.
100 SE 9th, Suite 400
Topeka, KS 66612

INTRODUCTION:

AMEC Environment & Infrastructure, Inc. (AMEC) is pleased to present our qualifications to the City of New Haven for evaluation, analysis and preparation of a partial Levee Certification Submittal Package for the purpose of showing that the levee system, with the exception of freeboard, meets the requirements of 44 CFR 65.10. The AMEC Team brings a unique blend of USACE St. Louis District and FEMA Region VII certification expertise, Franklin Countywide hydrology and hydraulic experience, and local civil engineering experience for this project. We believe this team is well equipped to provide the knowledge, capacity and efficiency required for the successful completion of these projects.

Successful programs begin with good people and good systems. AMEC has assembled a team that offers: (1) an exceptional depth and breadth of **full-service** levee certification expertise; (2) strong **relationships** with regulatory agencies, namely FEMA Region VII and the USACE St. Louis and Kansas City Districts; (3) detailed **knowledge** of hydrology and hydraulics on the **wet and dry sides** of several Missouri and Mississippi River levee systems; (4) a wide range of **local** and regional relevant project experience; and (5) a unique and experienced management structure that controls **costs** and **schedules** for each project. This combination of technical skills, experience, relationships, and project/program management experience distinguishes the AMEC Team from our competitors. This is a dedicated team, carefully assembled to meet the needs of the City of New Haven for this project.

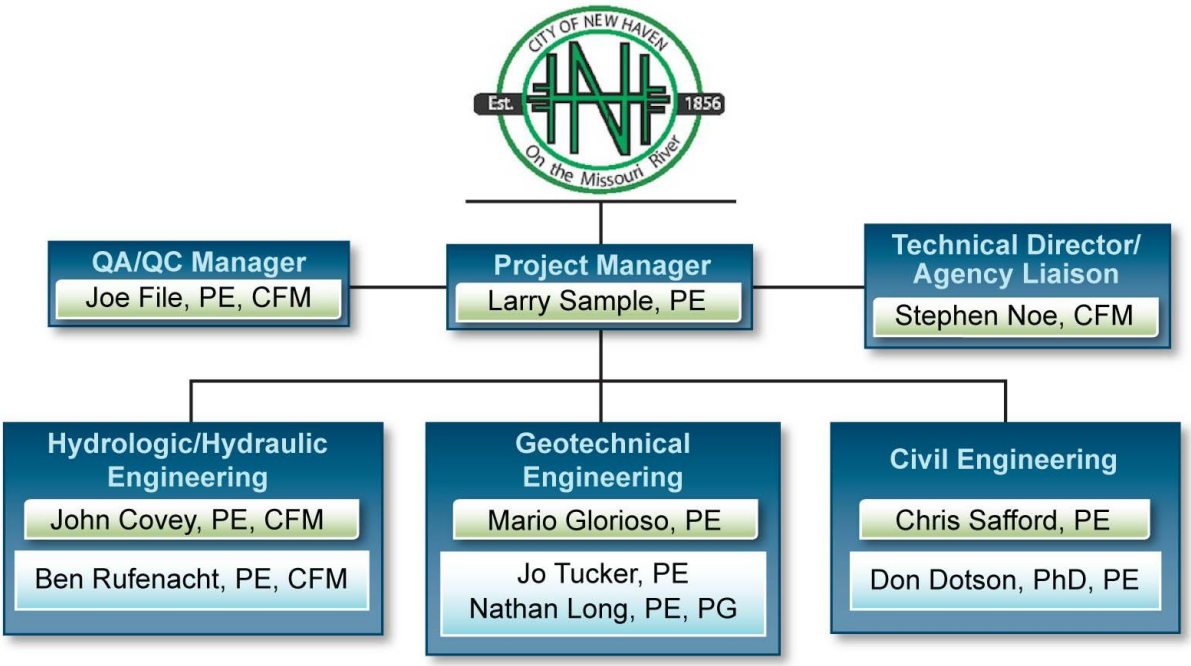
AMEC Environment & Infrastructure, Inc. will serve as the prime contractor for these projects. AMEC is a multidiscipline engineering firm licensed in all 50 states and throughout Canada. The AMEC family of companies represents one of the largest international engineering services organizations in the world, according to Engineering News Record, with over 6,500 people located in 189 offices in North America. High-quality services, on-time delivery, financial effectiveness, and client responsiveness are the core of our corporate culture. AMEC applies a unique blend of technical disciplines and management services that result in a single, full-service source of focused professional support in addressing client requirements.

AMEC's national leadership in FEMA Levee Certification and Map Modernization/Risk MAP Services provides the relationships, knowledge, and experience necessary to lead the proposed services related to the FEMA certification process. AMEC's personnel, tools, procedures, and relationships with Federal agencies have allowed us to rise to the top of the industry in developing a nationwide program in understanding and addressing FEMA's levee certification requirements.

Project Team

The proposed project organizational chart lists the key leaders of the team. The team is centered around the proposed project manager **Larry Sample**, Technical Director **Stephen Noe**, and QA/QC Manager **Joe File**. Combined Larry Sample and Joe File has served as project manager or certification lead on over 20 projects in Missouri, Kansas, Iowa, and Oklahoma. The three upper level leaders have worked successfully on numerous levee certifications that are similar to this levee system. Mr. Sample is supported by the interior drainage expertise of John Covey, geotechnical experience of Mario Glorioso, the, and the Design and Construction Management abilities of Chris Safford. Each of these discipline leaders for this project has a stable of qualified professionals to support them as the project progresses along the certification path.

Project Organizational Chart

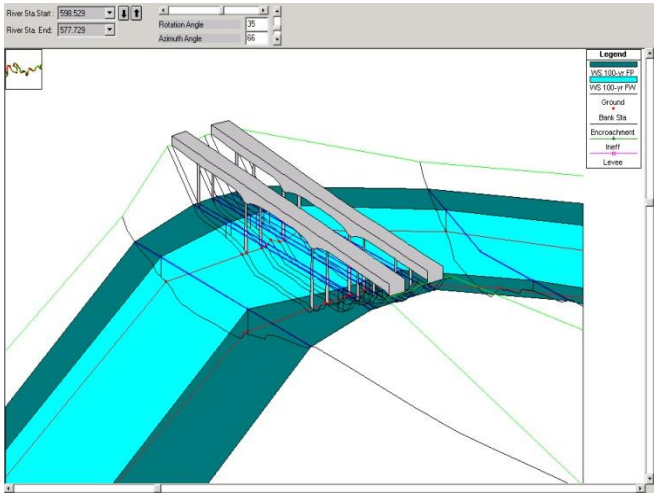


Experience with Similar Work:

Our long history with FEMA and USACE is a testament to the quality of work AMEC provides. AMEC serves as a mapping contractor for FEMA as well as for multiple State CTP clients including the States of Missouri, Kansas, and Iowa. We are intimately familiar with the FEMA requirements of CFR 65.10 Levee Certification requirements, Map Modernization guidelines, Risk Map hurdles and have a good working relationship with staff at FEMA Region VII and SEMA, and are also well versed in the LAMP process. In addition, AMEC currently holds numerous USACE IDIQ contracts across the nation, and is part of a team responsible for conducting levee Periodic Inspections (PI's) for USACE levee systems. We have a good working relationship with the St. Louis District and have coordinated with them on numerous projects in the past, including recent levee certification services in and around St. Louis.

Key Team Strengths

- **Industry leader in providing multidiscipline levee assessment, certification and design services across the country per 44 CFR 65.10.**
- **Experienced team of water resources, geotechnical, civil, and structural engineers, as well as full-service surveying and GIS professionals.**
- **A team that routinely performs hydrology & hydraulics analyses per FEMA Guidelines and Specifications (G&S) and Data Capture Standards (DCS).**
- **Exceptional relationships with local FEMA Regions and comprehensive familiarity with USACE Regulations, policies and procedures.**
- **Successful processing of FEMA Letters of Map Revision (LOMRs) and Conditional Letters of Map Revision (CLOMRs).**
- **Design and Construction Management experience with significant expertise in value engineering on levee rehabilitation related projects.**



Project Experience and References

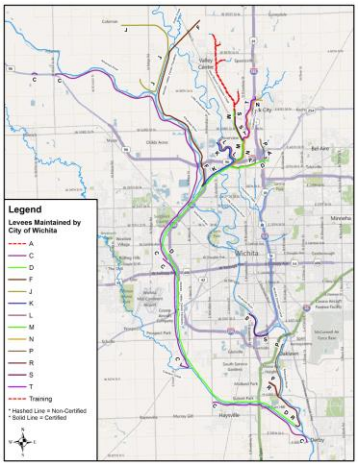
The following are a few examples of levee certification or related projects that AMEC has completed. Additional projects and references can be made available upon request, and we would welcome an opportunity to tell you more about our levee certification projects in person.

Displayed below is a matrix which cross references some of our projects with the RFP's scope of work.

		Fieldwork	Surveying / Aerial mapping coordination	Hydraulics and hydrologic studies	Geotechnical Analysis	GIS mapping	Design	Construction administration	Construction Inspection	FEMA flood map revision
Relevant Projects	SW Illinois Levee Certification (East St. Louis), IL	X	X	X	X	X	X	X	X	X
	Wichita, KS - Levee Certification and Design Repairs of the Wichita Valley Center Flood Control Levee System	X	X	X	X	X	X	X	X	X
	Atherton, MO Levee District, Levee Certification	X	X	X	X	X				X
	Levee Certification of the Saxonville Local Protection Project, Framingham, MA	X	X	X	X	X				
	Levee Certification of Statewide Flood Control Systems, Statewide PA	X	X	X	X	X	X			
	City of Salina, KS - Levee Certification	X	X	X	X	X	X	X	X	X
	City of Hutchinson, KS - Levee Certification	X	X	X	X	X	X			X
	City of Osawatomie, KS - Levee Certification	X	X	X	X	X	X			
	City of Augusta, KS – Levee Certification	X	X	X	X	X	X	X	X	
	City of Manhattan, KS - Levee Certification	X	X	X	X	X	X		X	X
	City of Ottawa, KS - Levee Certification	X	X	X	X	X	X	X	X	
	City of Council Bluffs, IA – Levee Certification	X	X		X		X			
	City of Dodge City, KS – Levee Certification	X	X	X	X	X	X			X
	Tulsa County, OK – Levee Certification	X	X	X	X	X				
	Tulsa Drainage District 12, OK – Levee Certification	X	X	X	X	X				
	City of Marion, KS – Levee Certification	X	X	X	X	X				

Project Title/ Location	**Levee Certification and Design Repairs of the Wichita Valley Center Flood Control Levee System, Wichita, KS**
Client POC	**Scott Lindebak, PE, CFM, City Stormwater Engineer, (316) 268-4545**

AMEC was selected by the City of Wichita, Kansas for a comprehensive $2.9 million levee certification project. The project involved detailed analyses of 97 miles of levees protecting Wichita from flooding. The levee system is one of the largest in the nation. It is also the largest levee system within the USACE Tulsa District, consisting of nearly half of the levee miles within the District's PL 84-99 Program. **AMEC coordinated a Memorandum of Understanding between the City and the USACE Tulsa District, establishing the District as a valuable partner throughout the execution of this comprehensive evaluation.** The District completed an update of the Arkansas River Hydrology under this MOU, and provided independent technical review for portions of the hydrologic, hydraulic and geotechnical analyses as well as review of the updates to the Operations and Maintenance Manual.



Water Resources Engineering – A critical component of every certification package is the accuracy of the flood frequency elevations and durations for the wet side of the levee system. Since the wet side frequency elevations were either never developed or over 25 years old, as a part of this project, new hydrologic and hydraulic studies were completed for over one hundred miles of river/stream channels, and for 80 interior drainage areas. River hydrology was completed using a combination of gage analysis and rainfall-runoff modeling using HEC-HMS. Parameter development for all hydrologic models was performed using AMEC's automated GIS tools that will allow the local regulatory community to adjust and regulate accordingly to future condition changes. Riverine hydraulic modeling was completed using either steady state or unsteady state HEC-RAS, depending on the floodplain characteristics. Interior drainage hydrology was completed using both XP-SWMM and PCSWMM. Joint probability analysis was applied to most internal drainage locations to better assess the actual 100-year event. Pump station assessments and hydraulic analyses for the systems seven pump stations were also completed. Analyses for both riverine and interior drainage analyses were submitted to FEMA and subsequently approved.

Geotechnical Engineering - Geotechnical analyses were conducted to determine the subsurface behavior of the constructed levee system. The subsurface investigation included a combination of traditional soil borings with SPTs along with Cone Penetrometer Test (CPT) soundings. CPT soundings incorporated measurements of pore pressures, shear wave velocities, and soil resistivities. State-of-the-art finite element analyses were performed to evaluate the seepage, stability, and seismic characteristics of the levee at varying flood elevations. Slope stability and seismic-related stability were performed using GeoStudio's Slope/W software application and seepage analyses were performed using the Seep/W module of that same application. The in-place condition of toe drains were examined using a combination of smoke testing and video camera surveys. Georeferenced digital deliverables were developed to allow easy viewing and comparison of results.

Design and Construction Phase Engineering – During the initial visual levee assessment, AMEC identified four areas "worst first" where deficiencies needed to be corrected in order to provide FEMA levee certification. These remediation projects were initiated parallel to the detailed systemwide analysis. Through analyses required for certification, AMEC identified two additional areas of deficiencies. The deficient areas covered in total approximately three, of the ninety seven miles of levee system. AMEC developed plans and specifications on five of the six required projects to achieve certification. For the sixth, AMEC coordinated with the bridge designer to incorporate floodwall type wing walls into the ongoing box bridge design, in order to provide adequate freeboard at this location. During construction, the City provided construction management and inspection services, and AMEC coordinated with the City to ensure that all requirements were met for certification.

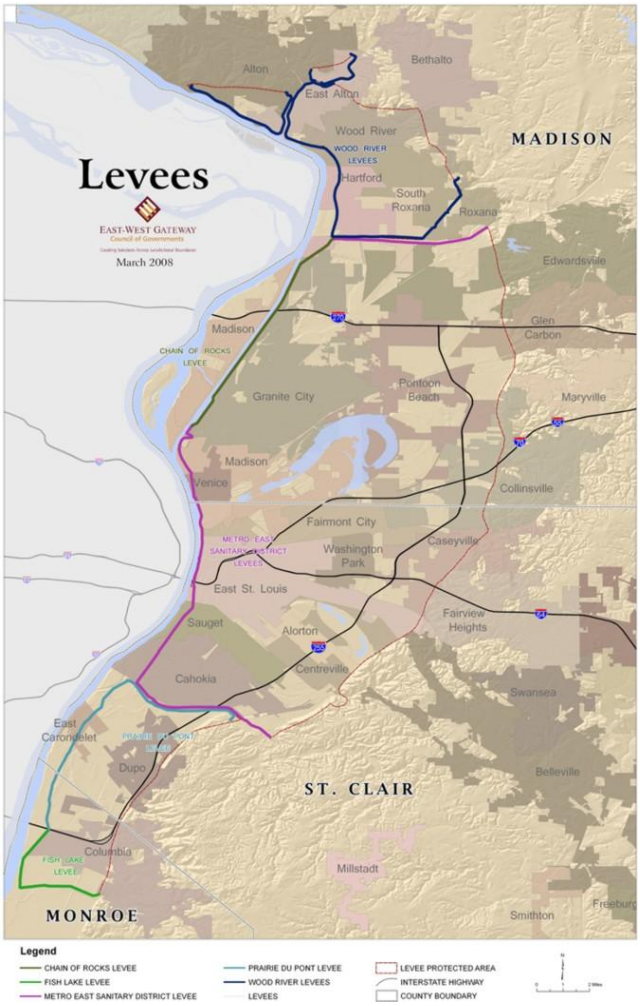
As-is drawings and updates to the Operations and Maintenance manual were made to reflect the levee's existing conditions. The entire certification package was finalized, submitted and is now fully accredited by FEMA.

Project Title/ Location	**SW Illinois Levee System Geotechnical Services, IL**
Client POC	**Les Sterman, Southwestern Illinois Flood Prevention District Council, (618) 343-9120**

FEMA notified Madison, St. Clair and Monroe counties in Illinois that the levee systems protecting the American Bottom in Southwestern Illinois (the Wood River Drainage and Levee District, the Chain of Rocks Levee, the Metro East Sanitary District, the Prairie Du Pont Levee and Sanitary District and the Fish Lake Levee District) would likely be de-accredited in 2010 because the levees cannot be certified by the USACE to protect against a 1% exceedence flood event.

AMEC was selected to provide professional services for the rehabilitation and certification of 86 miles of levee and floodwall in the American Bottoms floodplain along the east side of the Mississippi River. The 5 levee system is made-up of 4 private levee districts and a USACE operated system.

The geotechnical analysis portions of this project included advancing over 300 SPT borings, 150 CPT borings, and 20 sonic borings. A rigorous laboratory testing program, including typical index testing and sophisticated engineering properties testing such as consolidation and triaxial compression tests, was implemented during this project. Additionally, AMEC performed an evaluation of the relief well systems at each levee. The evaluation included a determination of the sanding within, and efficiency of, each well.



AMEC incorporated the subsurface investigation and well testing data into our geotechnical analyses. We analyzed the seepage and stability characteristics of the levee embankments for the 1% event using steady-state analyses per USACE guidance for slope stability analyses, seepage analyses, and levee design contained in EM 1110-2-1913, EM1110-2-1902, and ETL 1110-2-569. Additionally, AMEC performed analyses specifically related to underseepage performance and control using the USACE methodology defined by TM 3-430 and TM 3-424.

Upon completion of the analyses, it was determined that underseepage controls were needed to improve seepage performance of the levee system. AMEC designed underseepage controls consisting of relief wells (D-type and T-type), seepage berms, and seepage cutoff walls that extend over 100 feet and into the underlying bedrock. The controls were designed to withstand the 1% exceedence flood event. Additionally, AMEC evaluated the impact of and contribution by, these underseepage controls to combat the USACE's design flood event. The designs were reviewed and accepted by members of the USACE's Memphis District, Tulsa District, St. Paul District, and the Risk Management Center.

Execution of this work included significant involvement with local and/or small-business firms. In fact, AMEC subcontracted over $5.5M of the total $18M contract award to 17 of these firms.

Project Title/ Location	**Levee Certification of the Saxonville Local Protection Project, Framingham, MA**
Client POC	**Katherine Weeks, PE, Town of Framingham, Department of Public Works, (508) 532-6020**

AMEC was selected by the Town of Framingham, Massachusetts for a comprehensive levee certification project. This approximately ¾-mile levee system includes multiple interfaces between earthen embankments and floodwalls. Specifically, the Saxonville levee system consists of approximately 2,500 feet of earthen embankments, 1,350 feet of concrete floodwalls (T-walls, L-walls, and I-walls), a vehicular gate closure, and a pump station with associated drainage and appurtenances. The levee was designed and constructed by the U.S. Army Corps of Engineers between 1972 and 1979. Certification is required by the FEMA in order to keep the land protected by the levee system out of the floodplain as designated by the NFIP.

The evaluation began with a site visit to document obvious deficiencies and/or anomalies in the levee system. Additionally, a desktop review of available information was conducted. Together, information and analyses performed during these activities culminated in a report that was used by the Town when deciding whether to proceed with the certification process. The report addressed estimated costs that would be required to complete the certification as well as the financial impact to the community if the levee system was allowed to become de-certified.

Additionally, AMEC evaluated the structural integrity of the levee, floodwalls, and related components such as pump stations. The hydrologic and hydraulic analyses were conducted using industry approved software and techniques. The analyses included an evaluation of the interior drainage systems.

Evaluation of the floodwalls consisted of analyses based on current requirements that included a new failure mode identified during a post-Katrina study. The complex geotechnical conditions were analyzed to determine the behavior of the constructed levee system. State-of-the-art finite element analyses were performed to evaluate the seepage, stability, and seismic characteristics of the levee at varying flood elevations. The subsurface investigation included a combination of traditional soil borings with SPTs along with Cone Penetrometer Test (CPT) soundings.

AMEC prepared a submittal package for FEMA for levee segments meeting requirements of the National Flood Insurance Program Section 65.10 (44 CFR Part 65.10). The final certification package was accepted by FEMA on its first submittal, and FEMA has since accredited the levee system.

Client Quote

"I'd like to thank you and your colleagues at AMEC for the work you performed to certify the Saxonville Levee to meet FEMA requirements under Regulation 44 CFR 65.10 "Mapping of Areas Protected by Levee Systems." AMEC performed all tasks within budget and well ahead of the certification deadline . . . .

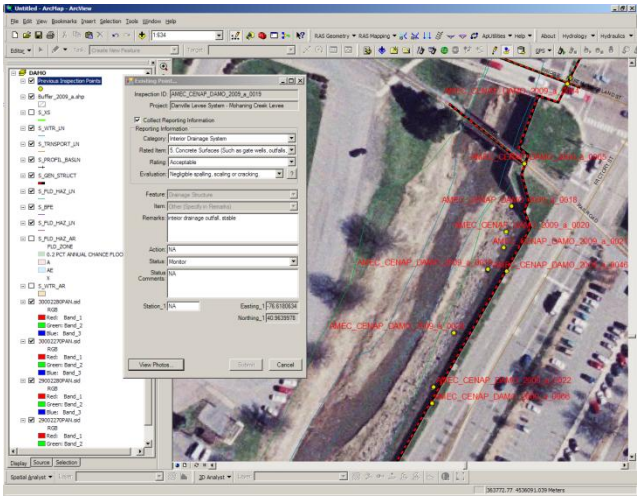
Katherine Weeks, PE
Senior Stormwater and Environmental Engineer

Project Title/ Location	**Levee Certification of Statewide Flood Control Systems, Statewide PA**
Client POC	**Raymond Zomok, PE, Chief, Division of Project Inspection (717) 787-7433**

AMEC was selected by Pennsylvania Department of Environmental Protection to evaluate, for the purposes of FEMA certification, a network of state-constructed levee systems. The project includes 42 levee systems throughout Pennsylvania. The flood-protection systems include either earthen embankment levees, floodwalls, or a combination of the two.

AMEC is performing this work in accordance with USACE Engineering Circular 1110-2-6067 Certification of Levee Systems for NFIP. This process includes an initial screening and scoping phase, a detailed engineering evaluation and reporting phase, and a certification (or decertification) letter and improvement design phase.

The screening/scoping phase includes a review of available historic documents related to the design, construction, operations/maintenance, and past performance of the subject levee systems. Additionally, this phase includes a detailed visual inspection and documentation of the existing levee system and its appurtenances using the USACE-developed Levee Inspection System, which is a GIS-based inspection documentation tool. A preliminary hydrologic and hydraulic analysis is conducted using available models to assess freeboard/overtopping.



During the detailed engineering phase, AMEC is evaluating the geotechnical and structural integrity of the levees and related components such as earthen embankments, floodwalls, pump stations, jetties, drainage pipes and ponds. Additionally, AMEC is responsible for analyzing existing flood-protection systems, preparing levee certification/deficiency letters, designing flood-protection improvements to address any deficiencies and/or preparing FEMA Letters of Map Revisions (LOMR).

Hydrologic studies are performed on river systems using a Log-Pearson Type III statistical analysis and/or rainfall-runoff models (i.e. HEC-HMS) to generate discharge-frequency/probability curves. Additional hydrologic studies are conducted using the SWMM model to determine interior drainage characteristics of each system. River hydraulics are modeled using HEC-RAS for the designated flooding sources evaluating the 10%, 2%, 1%, and the 0.2% annual chance exceedance floods. Additional hydraulic studies, including scour/aggradation and ice jam analyses, employ the HEC-RAS 4.0 software application.

Subsurface explorations conducted for each project vary depending upon the local geology. Generally, subsurface explorations are performed using a combination of traditional SPT borings, Cone Penetrometer Test (CPT) soundings (including pore pressure, shear wave velocity, and soil resistivity measurements), geophysical surveys (for example, Ground Penetrating Radar), and test pit excavations. Collected soil samples are returned to our AASHTO Material Reference Laboratory (AMRL) accredited laboratory where they are subjected to a wide range of index and engineering properties testing, including Atterberg Limits determinations, gradation analyses, triaxial testing, and hydraulic conductivity determinations. Parameters yielded by the laboratory testing are incorporated into the geotechnical analyses, which are conducted to determine the behavior of the constructed levee system. State-of-the-art software applications, including finite element analyses (FEA), are performed to evaluate the seepage, stability, settlement and seismic characteristics of the levee at varying flood elevations. Geostudio's Slope/W, Seep/W, and Sigma are among the programs used for FEA.

Project Title/ Location	**Levee Certification Assessment, City of Salina, KS**
Client POC	**Dan Stack, City Engineer, City of Salina, KS, (785) 309-5725**

The City of Salina selected AMEC to complete Levee Certification Services for their 18 mile levee system. The project included a comprehensive review of the levee system and all available data to develop a scope of work to complete certification for the City. In addition, AMEC reviewed the FEMA preliminary mapping recently completed, to evaluate the adequacy of new floodplain mapping studies on the wet and dry side of the levee system.

The Salina Levee System consists of four levee sections 17 miles in length. In addition, the City maintains one additional mile of levee that ties one of the levee sections together. The system provides protection to the City of Salina from flooding caused by the Saline River, Smoky Hill River, Mulberry Creek, Dry Creek and the Dry Creek Cutoff. In addition to earthen levees, the system is composed of two cutoff channels, 25 interior drainage structures, 8 sandbag closure structures, two stream gages, and freeboard gages. The City operates and maintains the Smoky Hill Pumping Plant and the Dry Creek Pumping Plant as part of this levee system.

A summary of the levee assessment tasks on this project are as follows:

1) Phase I Levee Assessment
2) Detailed City Stormwater Model for interior Drainage Analysis
3) Geotechnical Analysis for 18 miles of Levees
4) Embankment Protection Analysis for levee system

As part of the Levee Assessment, AMEC reviewed available gage data, previously completed hydrologic and hydraulic analyses, and the recently completed mapping for the interior of the levee system throughout the City of Salina. Specific recommendations for updating or modifying the existing data were provided to the City as part of this project based on the review of this mapping. Additional recommendations for modifying the preliminary mapping to more closely match the modeling were provided in addition to the proposed modeling changes.

AMEC is nearing completion of Phase II services for the City of Salina, taking advantage of H&H studies that were provided for use by the State of Kansas, Division of Water Resources using FEMA funding. During Phase 2 it was determined that small segments of the levee did not meet freeboard. In effort to not delay certification the City of Salina contracted AMEC to complete Phase 3 rehabilitation designs that have been done in parallel with Phase 2. The levee is currently on track to be certified upon completion of rehabilitation construction.

➢ Additional Relevant Projects

City of Hutchinson Levee Certification, KS - The City of Hutchinson has a 27 mile levee system along the Arkansas River, Cow Creek, and the Harsha Canal. A Phase 1 assessment of the system including review of COE as-built plans, the operations and maintenance manual, inspection reports, and FEMA DFIRM data was completed, along with a visual assessment of the levee system. The project was completed and a Phase 2 scope of work was developed to complete the analysis required to determine compliance with FEMA levee certification requirements. AMEC completed riverine hydrology and hydraulics services for the project, along with all geotechnical and embankment studies during Phase 2 services. Phase 3 design services to address interior drainage structure and freeboard issues are currently underway.

City of Osawatomie Levee Certification, KS - The City of Osawatomie has a 5.5 mile levee system along the Marais des Cygnes River and Pottawatomie Creek. A Phase 1 assessment of the system including review of COE as-built plans, the operations and maintenance manual, inspection reports, and FEMA DFIRM data was completed, along with a visual assessment of the levee system. The project was completed and a Phase 2 scope of work was developed to complete the analysis required to determine compliance with FEMA levee certification requirements. AMEC completed all geotechnical and embankment protection services for Phase II of the project. Phase 3 design services to address freeboard deficiencies where the levee overtopped in 2007 are currently underway.

Certification of the Augusta Local Flood Protection Project, Augusta, KS - AMEC was selected by the City of Augusta, Kansas to perform a comprehensive levee certification project per requirements of 44 CFR 65.10. The project involves detailed analyses of approximately 2 miles of levees protecting the east flank of Augusta from flood waters. Certification is required by the Federal Emergency Management Agency (FEMA) in order to keep the land protected by the levee system out of the floodplain as designated by the National Flood Insurance Program (NFIP).

The Augusta system is composed of earthen embankments, floodwalls, and other appurtenant features, such as stop log structures, drainage structures, and pump stations. The Phase 1 assessment of the system was completed and screened against criteria of EC 1110-2-6067. The field inspection portion of this Phase included collecting and documenting our observations into a GIS application.

Based on our findings from the Phase 1 study and our review of historic documentation, including as-built plans and inspection reports, AMEC developed a program for completing the certification process. The program included geotechnical exploration of subsurface soils, hydrologic and hydraulic studies, and a review/update of the Operations & Maintenance manual.

Geotechnical analyses were conducted to determine the behavior of the constructed levee system. The subsurface investigation included a combination of soil borings, CPT soundings, and in-situ testing of parameters, including shear wave velocities and soil resistivities. State-of-the-art finite element analyses were performed to evaluate the seepage, stability, and seismic characteristics of the levee at varying flood elevations. Slope stability and seismic-related stability were evaluated using GeoStudio's Slope/W software application

and seepage analyses are being evaluated using the Seep/W module of that same application.

➢ Additional Listed Projects

AMEC has a long list of related levee certification projects throughout the country as well as specifically within the FEMA Region VII. The following is a listing of some additional relevant projects in the region:

- **Manhattan, KS Levee Certification** Project – 5.5 miles of levee certification and construction ~ 450K
- **Ottawa, KS Levee Certification** Project – 4.5 miles ~35 K Phase 1, Phase 2 ~250K
- **State of Kansas DFIRM** and RISK Map CTP Contractor – Countywide mapping updates in over 15 Kansas Counties ~ 1M per year for last 7 years
- **State of Missouri DFIRM** and RISK Map CTP Contractor – Countywide mapping updates in over 45 Missouri Counties ~3M annually
- **FEMA Countywide Mapping in Iowa and Nebraska** – Mapping updates in Woodbury, Mills and Harrison County Iowa, and Butler and Saline County Nebraska ~800K
- **Atherton Levee District**, Jackson County, Missouri – Phase I and II Services for certification of approximately 11 miles of levee ~ 380K
- **State of Kansas** on call Dam Breach Mapping Contractor – Completed over 100 analyses to date ~700K
- **NRCS Dam Assessments** – AMEC completed 45 dam assessments in the State of Kansas under the NRCS Nationwide IDIQ Dam Services contract. Each dam assessment consisted of a physical site inspection, site surveys, sediment surveys, sediment capacity analyses, detailed hydrology and hydraulics analyses, dam breach analyses, breach inundation mapping, and failure risk analyses.
- **NRCS Dam Assessments** – AMEC completed 8 dam assessments in the State of Missouri under the NRCS Nationwide IDIQ Dam Services contract. Each dam assessment consisted of a physical site inspection, site surveys, sediment surveys, sediment capacity analyses, detailed hydrology and hydraulics analyses, dam breach analyses, breach inundation mapping, and failure risk analyses.

Technical Expertise

Levee Certification Expertise

The engineering assessment of the flood control systems must be performed with an understanding of the City's ultimate goal – complying with the requirements of Section 65.10 of the NFIP Regulations and at a minimum meeting the Freeboard Deficient criteria under the LAMP process, so that FEMA will map the levee system as Zone D. Each aspect of our analysis will focus on this goal. We are proposing a three phased approach to showing compliance with certification criteria. Contained in this three phased approach are all the services that the City of New Haven has outlined in the RFP. We have developed this approach for levee certification for which we have successfully used on eight levee certification projects in Missouri and Kansas as well as projects all across the nation.

The AMEC Team will provide an evaluation and assessment of the City of New Haven's levee system in accordance with FEMA's current 44 CFR 65.10 criteria, with the exception of freeboard which will be evaluated by others. This includes evaluations necessary to determine which portions of the levee system currently meet FEMA's criteria, determination of any areas that are currently not in compliance with this criteria, and if necessary the development of construction drawings and specifications so the levee system can be modified accordingly and can ultimately be certified and accredited. The AMEC Team will utilize a three phased process to accomplish the goal of Levee Certification. Phase 1 will consist of a historical review, visual levee assessment, and a preliminary report indicating which of the certification requirements the system currently meets, which of the requirements require additional analyses, and which, if applicable and can be determined in this phase, does the system currently not meet. Phase 2 will consist of the additional analyses required to determine the systems compliance with 44 CFR 65.10. Finally, Phase 3 will consist of construction drawings and specifications necessary to bring the system into compliance with 65.10 (if required), construction management services (if required), and ultimately a final levee certification package.

We have assembled a team of Water Resources, Geotechnical and Civil Engineering Professionals with extensive levee related experience and expertise within their respective discipline. Our project management team has experience in managing complex multidiscipline projects and has successfully completed numerous levee assessment, investigation, design, construction, and certification projects. The combination of the team's expertise and our St. Louis office being in close proximity to the City of New Haven, we will be able to respond quickly to the City throughout this project no matter what issue may arise. It is our belief that for this project we have assembled a highly skilled team of professionals that have the necessary experience to complete this project, are easily accessible to the City, have a proven track record in managing and executing complex multidiscipline projects, and most importantly understand the City's needs and goal which is to achieve levee certification as quickly and efficiently as possible.

AMEC's Levee Certification Approach for the City of New Haven

Phased Approach

AMEC has developed a three phased approach to achieving levee certification which we employ across the company. The AMEC team proposes to complete the certification assessment of the levee system in three phases.

Phase 1 will consist of a historical record and data review to determine what existing information can be used to complete the levee certification, a visual inspection/assessment of the levee, a preliminary assessment report of findings including a listing of major non-compliance items on the levee system, and a detailed work plan and cost estimate to provide the City a "roadmap to levee certification".

Phase 2 will consist of the completion of work and analyses required to determine whether the levee system meets the requirements of 44 CFR 65.10. A completed draft certification report is the deliverable of this phase. The report will be written to readily incorporate the results of Phase 3, should Phase 3 be necessary.

Phase 3, if necessary, will consist of repair, maintenance, design and construction phased services required to remediate the levee system, and completion of the 65.10 certification package following the completion of construction. If the levee is determined to be 65.10 compliant at the end of phase two, then certification documentation will be provided at the end of that phase.

Following is a detailed Phase 1 and Phase 2 approach, and an overview of potential Phase 3 services. Actual Phase 2 and Phase 3 services will be dependent on the results of Phase 1, and therefore some of the services listed in Phase 2 and Phase 3 may need to be modified at the conclusion of Phase 1, based upon additional findings at the conclusion of Phase 1.

Phase 1 – Preliminary Assessment Report and Road Map to Certification:

Phase 1 – Task 1 Complete Review of Historical Data/Information

The AMEC Team will collect and review plans, reports and other information from the City and other sources as needed including but not limited to the St. Louis USACE District and FEMA Region VII. This information will include plans, design memorandums, manuals, construction documents, analyses, available topography and other relevant information. The Task 1 review will include past inspection reports, flood reports, photographs, historical evidence related to past performance of the existing levees and floodwalls, design drawings, reports, calculations, gage data, peak water elevations of past flood events, and other relevant information provided by the City.

The AMEC Team will review the hydrology, hydraulics and floodplains of the streams associated with the levee system and will provide an assessment of the "currency" of the data for certification. This will include a review of the current preliminary FEMA Flood Insurance Studies (FIS) and maps and research of other available information. Available hydrologic and hydraulic data that can be obtained will be reviewed to determine its adequacy for use in accreditation, and what additional analysis is required.

The AMEC Team will review the geotechnical information made available to us, including previous boring logs, CPT data and sounding locations, soil characterizations, lab tests and analyses, to determine if information exists which can be used to complete the geotechnical analysis.

The AMEC Team will evaluate the adequacy of other information made available to assist with the certification process. These items may include recent topography, recent aerial imagery, GIS or CAD files, or other valuable information.

Phase 1 – Task 2 Visual Levee Assessment

A site visit will be made to the levee system. The site visit will document the condition of the levee as well as provide GPS coordinates for the documented features of the levee system. The

mapping grade GPS data will be exported into ArcGIS and a shape file will be created. Photographs taken at the site will be geo-referenced to GPS points or physical features. It is proposed that a civil engineer, water resources engineer and geotechnical engineer be present at the site visit during the visual assessment of the levee. The primary purpose of the trip will be to locate conveyance structures throughout the levee system, hydraulic crossings over the system, toe drain structures if applicable, utilities visible at the time of the inspection that may penetrate the system, and obvious problem areas or anomalies that may need special attention throughout the certification process. Potential items of note during the inspection include:

- Signs of past overtopping or high water marks
- Evidence of settlement/subsidence
- Embankment lining deterioration
- Riverbed or toe scouring or undermining
- Sedimentation
- Low flow channel migration
- Signs of seepage/piping/settlement/slumping
- Interior drainage facilities
- Closure structures

AMEC will compare the findings from the field observations with previous USACE inspections, and create a dynamic GIS geodatabase to track issues identified. AMEC will then begin to determine which issues are road blocks to 65.10 certification. These will be compared to those issues that are road blocks to PL 84-99 compliance, but meet the requirements of 65.10. During Phase 1 it is anticipated that some issues will be able to be categorized, while others will require additional analysis during Phase 2 for proper categorization.

Phase 1 – Task 3 Phase I Certification Summary Report

To provide the City with a preliminary summary of the initial evaluation/assessment results, we will prepare a brief "snapshot" report of the condition of the system, which will include a description of obvious major non-compliance portions of the levee system based upon the visual levee inspection and the historical review. The report will focus on the findings of the AMEC Phase 1 assessment, making conclusions when possible and recommendations for Phase 2 analyses as necessary.

Phase 1 – Task 4 Development of Phase 2 Work Plan – "Roadmap to Certification"

Based upon the results of the historical review and visual inspection, the AMEC team will develop a work plan and cost estimate to provide the City a "roadmap to levee certification". This work plan will include a revised scope of services for Phase 2 if any revisions are necessary based upon the assumptions at this time. This plan may also include preliminary budget level cost estimates for assumed Phase 3 items of work known at this time, including order of magnitude design, construction, and administrative fees, that the City must address prior to certification. The budget level estimate would be based only on data determined from the Phase 1 investigation, provided that sufficient information exists to produce these estimates at that time. The work plan will include a geotechnical investigation plan, and internal drainage investigation plan, a structural investigation plan, and plan for obtaining prior approval from the USACE for geotechnical investigations, which is typically required.

Phase 1 Deliverables

- Phase 1 Preliminary Certification Report including a summary of inspection findings, summary of historical review findings, and photographic documentation of visual inspection
- Electronic copies of information obtained during the historical review
- GIS shape file of "points of interest" obtained during the visual levee inspection
- Photos of the visual levee inspection referenced to the GIS shape file
- If necessary , updated Scope of Services, Fee and Schedule to complete Phase 2 of the levee certification process
- Summary of areas of concern identified, including those by AMEC as well as those determined by the COE during the annual or periodic inspections. This will be a dynamic list during Phase 1 and 2, which will eventually be used to determine which issues require remediation prior to FEMA 65.10 certification.

Phase 2 – Engineering Analyses:

The Phase 2 scope of services described below is based upon our current understanding of the levee system and the information that we believe is available for the levee system, which will be verified during Phase 1. At the completion of Phase 1, a revised Phase 2 scope, schedule and fee will be provided for review and consideration if anything is revealed in Phase 1 that changes the original Phase 2 assumptions.

Phase 2 - Task 1 Data Collection

AMEC will designate an individual who will be responsible for document management. Dedicating resources to the task of document management will ensure that the required materials are provided to FEMA and that a consistent form of the data, in accordance with FEMA requirements, is maintained.

2.1.1 Field Survey of Levee structures

AMEC plans to use the existing LiDAR to estimate levee structure elevations, along with field measurements and as-built plans. If during the course of the project it is necessary to obtain survey for the existing levee structures and pipes to obtain an additional level of accuracy, this will be considered a supplemental service for an additional fee. However, at this time we do not anticipate survey being needed.

2.1.2 Survey Top of Levee

AMEC plans to use the existing LiDAR to defined the levee geometry. Since freeboard assessment is not required in this project, no levee survey is proposed.

2.1.3 Bathymetric and Hydraulic Structure Field Survey

Bathymetric survey is not anticipated to be required for Phase 1 or 2 of this project.

2.1.4 Soil Borings Location Survey

The locations of exploration will be included in the As-Is drawings. We propose to use a hand held mapping grade GPS unit during drilling to locate the borings horizontally. We would then utilize the statewide LiDar data set to establish the elevations. This approach minimizes survey cost and eliminates the risk of removal of flag or other markers prior to boring activities.

2.1.5 LiDar Acquisition and Development

AMEC will obtain available Countywide LiDar for Franklin County to use on this project. We will develop a DEM with an appropriate grid cell size for the project, which will then be utilized as our primary topographic dataset for all interior drainage H&H, and geotechnical analyses. Note that this task does not include the physical acquisition of new LiDar data, just collection and processing of existing LiDar. Current Franklin County aerial imagery is anticipated to be sufficient for the project, and no new aerial mapping is proposed at this time.

Phase 2 - Task 2 FEMA Design Criteria Investigation

Section 65.10 of the NFIP regulations requires several deliverables. The following deliverables will be required to be produced as part of the Phase 2 submittal. Some of these deliverables may already exist and during Phase 1 verified as acceptable, the remainder will be required to be developed during Phase 2.

- Record drawings "As Is"
- Hydrologic and Hydraulic analysis to support interior drainage analysis and embankment protection criteria.

- Embankment protection design analysis
- Embankment and foundation seepage and stability analyses
- Settlement analysis
- Closure Structure Assessments
- Interior Drainage Analyses
- Operation and maintenance plan updates

2.2.1 Evaluation of Closure Structures

AMEC will review interior drainage structure videos (provided by City of New Haven), and view the operation of closure structures (City of New Haven to provide staff and equipment to operate structures) to determine whether structures are in adequate condition for certification. If the City of New Haven has not recently videoed the interior drainage structures for a recent COE inspection, or does not wish to do so for this project, AMEC can add the videoing of the structures to the Phase 2 work plan at the conclusion of Phase 1.

2.2.2 Hydrologic Studies

The hydrologic and hydraulic (H&H) analysis will require an assessment of conveyance geometry compared to the conditions when the previous water surface elevations were established. The hydrology and hydraulic analysis will be performed compliant to FEMA Map Modernization guidelines and specifications such that the results can be utilized during map updates to the countywide flood insurance study. The interior drainage systems will require analysis of the dry side ponding areas and the impacts of the changes to these areas since their original system designs.

2.2.2.1 River Hydrology

As per the City's RFP, assessment of freeboard will not be included in this project and therefore no riverine studies will be completed unless models are needed to establish embankment protection thresholds. In addition, the UMRSFFS study completed by the USACE is recommended to be the basis of any freeboard determination, therefore, no additional hydrology would be required if freeboard were part of the analysis.

2.2.2.2 Interior Drainage Hydrology

Interior drainage hydrologic analysis begins with data gathering, including information on conveyance systems on the landward side of the levee and updated topographic conditions, specifically those areas that may have experienced fill or development near the designated ponding areas.

The approach to analyzing the interior drainage hydrology varies depending on site-specific conditions. For those areas with significant pipe-networks, the hydrologic module of the PC-SWMM computer model would be utilized. Contributing drainage areas with primarily overland and open-channel flow may be analyzed using HEC-HMS since it's a more simplistic program. Parameter development will rely heavily on automated GIS processes to improve efficiency and accuracy. The interior drainage hydrologic analysis will provide peak discharges and flow hydrographs to predict ponding elevations.

2.2.3 Hydraulic Studies

2.2.3.1 River Hydraulics

As per the City's RFQ, assessment of freeboard will not be included in this project and therefore no riverine studies will be completed unless models are needed to establish embankment protection thresholds. Again, the UMRSFFS study completed by the USACE is recommended to be the basis of any freeboard determination, therefore, no additional hydrology would be required if freeboard were part of the analysis.

2.2.3.2 Interior Drainage System Hydraulics

The interior drainage system hydraulics will focus on those areas on the interior side of the levee that are potentially influenced by ponding of stormwater as predicted during the hydrologic analysis. This analysis will coincide with the hydrologic and pump station hydraulic analysis to ultimately determine if the interior drainage systems are appropriately designed to avoid excessive interior flooding and may include HEC-RAS (steady and unsteady), and PC-SWMM computer simulations. The USACE UMRSFFS study will be used to provide the basis for determining the Missouri River discharge exceedances to support any Coincident Frequency Analyses necessary for the interior drainage study.

2.2.3.3 Pump Station Hydraulics

The pump station will be evaluated to determine if the existing pumps can perform as designed during the newly defined flood conditions, keeping the interior ponding elevations at an acceptable level. The coincidence of flooding on the river side of the levee will be investigated. The pump station analysis will include low river stage simulations (gravity conditions) and high river stage simulations (blocked conditions).

2.2.4 Geotechnical Exploration

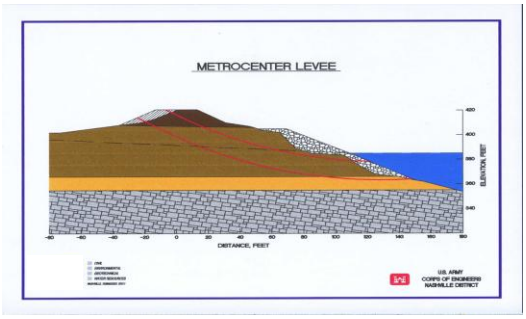
It is anticipated that further geotechnical assessments will be required to adequately evaluate the geotechnical aspects of the system. This work is proposed to include subsurface exploration, laboratory testing, and geotechnical analysis.

The extent of the proposed subsurface exploration is dependent upon the size of the levee or levee segments and anticipated subsurface conditions as well as the current conditions. In general, subsurface data will be needed at intervals of 1000 feet or less. Exploratory methods proposed at this time include SPT hollow stem auger borings utilizing a high torque truck mounted drill rig. It is our understanding that the USACE has completed CPT soundings along the levee system. AMEC intends to evaluate these soundings and use this information to supplement the SPT borings we propose to collect. Where utility penetrations may be an issue, we have the ability to use geophysical exploration techniques to verify the location of the buried lines, and to help assess the soil integrity at those potentially weak areas. At this time, we do not anticipate the need for additional geophysical exploration techniques; however, if it is determined during Phase 1 that geophysical methods are necessary, they may be added to the Phase 2 scope with a corresponding negotiated fee at the end of Phase 1.

Soil samples will be collected and subject to laboratory testing to assess the index and engineering characteristics of the materials encountered. Based on conditions observed in the field and information obtained in the document reviewed, laboratory testing will include moisture content and Atterberg limits determinations, in-situ; density, grain size distribution, shear strength, hydraulic conductivity and one dimensional consolidation tests.

For this project, we will evaluate the recent geotechnical analysis completed by the USACE during Phase 1 of the Project and utilize the data collected to the extent possible, to minimize additional investigations to the extent possible.

2.2.5 Geotechnical Engineering (Stability/Seepage/Settlement) Analysis Models



The geotechnical assessment will involve utilizing existing data and the data developed to evaluate the geotechnical performance of the subject levees. The type and extent of the subsurface investigations will depend on the size of the levee and anticipated subsurface conditions. Where sustained water flow levels indicate that embankment or foundation seepage could be problematic then seepage analysis will be performed using seep/w (a finite element software program that can perform both transient and steady-state seepage modeling).

Slope stability of levee embankments will be performed utilizing

slope/w(a computer program that can perform a variety of limit equilibrium stability analysis methods including Bishops, Janbu, Morgenstern-Price, etc. under both static and pseudo-static loading conditions). Slope stability will be evaluated in accordance with the methodology outlined in COE Engineering Manual EM 1110-2-1913. Long-term settlement potential of levees will be evaluated by a method appropriate to the subsurface conditions including Standard Penetration Test (SPT) correlations as well as consolidation analysis.

Stability Analysis Flood Walls and Earthen Levees: Each critical cross section will be analyzed for each of the following cases:

- Peak flood pool
- Steady state normal pool
- Rapid draw-down

Earthen Levee Critical Sections: Perform sufficient analysis to determine factor of safety against the following failure modes:

- Global stability
- Liquefaction
- Foundation bearing capacity

Seepage Analysis and Earthen Levees: Analyze each critical section relative to:

- Steady state seepage at normal pool elevation
- Steady state seepage at flood pool elevation

Perform sufficient analysis to determine phreatic surface levels to be used in the:

- Steady state
- Peak flood
- Rapid draw-down

The analyses completed by AMEC during Phase 2 will be those required to evaluate the levee system for compliance with FEMA 65.10. It should be noted that if modifications to the levee are required to achieve 65.10 compliance, then additional analyses may be required during Phase 3 to obtain USACE District and possibly 408 approvals. This is due to the fact that the USACE requires additional analyses beyond those required by FEMA for 65.10 certification. If additional USACE analysis is required during Phase 3, it will be limited to those areas where construction is required to achieve FEMA 65.10 compliance.

2.2.6 Embankment Protection Analysis Models

Scour/Aggradation analyses are performed where the visual assessment or maintenance record indicates it is appropriate or where engineering judgment based on our experience in the watershed (or similar watersheds) indicate it is necessary. Design assessment will be performed to ensure that riprap sizing is adequate, closures are sufficient, and interior drainage is properly handled. It is anticipated that sufficient HEC-RAS modeling has been completed for the Embankment Protection Analysis. AMEC proposes to complete the Embankment Analysis Modeling through a combination of historical record review, visual assessment, extracting velocity grids from the existing HEC-RAS models, and simplistic design calculations on existing rip-rap. If an area is identified as being susceptible to erosion, then additional analyses may be necessary to further characterize whether a problem exists or to complete the design of the repairs for the area.

Phase 2 - Task 3 Additional Certification Requirements

2.3.1 Operating and Maintenance Criteria and Manuals

The AMEC team will review the existing plans and if necessary develop an addendum to update the plan. The plan will have a general operation section and then incremental levee system sections. For example: the general criterion applies to the overall system, but the specific section would apply to a particular area where maybe a closure structure needs to be installed. This organization of the plan provides easy training and implementation by providing specific instructions to the staff/employees that have specific responsibilities during a flood event.

AMEC will review the manual for sufficiency with respect to FEMA certification requirements on levees. The AMEC team will review the existing operation and maintenance plans for the system and if necessary amend the plan to meet the requirements of Section 65.10 of the NFIP Regulations. The operation and maintenance requirements will be reviewed to assure coverage of items such as pump station operation and maintenance, settlement, scour along the levee toe, levee revetment deterioration, erosion on the dry side, evidence of through seepage, connectivity at control structures, and side drain functionality. It is assumed that the existing plan(s) reasonably well characterize the system. The types of modifications anticipated are those such as updating operations contacts, adding utility locations or interior drainage structure locations. Major rewrites or updating entire sections of the plan are not anticipated to be necessary.

2.3.2 As-is Drawings

AMEC assumes that the as-built plans adequately and correctly characterize the system. Therefore, development of as-builts is not included in this proposal at this time. If it is determined that as-builts are out of date, development of an as-is data set can be added to the Scope of Work at a later time.

2.3.3 Certification Program Requirements

Through our strong relationship with FEMA, AMEC will stay apprised of proposed and enacted changes to the levee certification process. AMEC will advise the City of changes that may impact the PAL agreement or ultimately certification.

2.3.4 Final Levee Compliance Inspection

A final levee walk through will be completed prior to levee certification. AMEC will have two senior engineers complete this assessment, and the final inspection report will become part of the final certification report. The purpose of this final walk through is to ensure that required maintenance activities identified during Phase 1 have been completed, and construction, if required as part of Phase 3 has been completed. This final walk through will document the condition of the system just prior to certification.

2.3.5 Report of Findings

At the conclusion of Phase 2, a report of our findings will be prepared and submitted to the City. The report will include the results of the site inspections, engineering assessments, and the geotechnical analyses. For those levees that meet the requirements of Section 65.10(b)(2) through (7) of the NFIP Regulations, the report will include a submittal package for FEMA. This package will include the forms and supporting information required for certification. The format will follow the requirements established by FEMA (digital format, separate form for each levee, etc.) The specific submittal requirements will be identified as part of ongoing coordination with FEMA. If the levee does not meet the requirements of Section 65.10(b)(2) through(7) of the NFIP Regulations, the report will include a description of the deficiencies in the levee system and a recommendation of measures that need to be taken to address the deficiency in Phase 3.

2.3.6 Project Management and Coordination Meetings

Due to the complexity of this multidiscipline project and the ever changing timelines and requirements associated with levee certification projects, it is proposed to hold monthly coordination meetings throughout the course of the project. Additional FEMA and COE meetings may be necessary at various times throughout the course of the project. These meetings will be a mixture of web meetings, conference calls and in person.

Phase 3 – Design and Construction Services (if required) and Final Certification Report:

If during Phase 1 or Phase 2 it is determined that there are modifications to the levee system required for 65.10 certification, then design and construction of these modifications will be required prior to final certification. Working with the City, a preliminary schedule would be developed to provide the levee repairs and upgrades necessary to meet FEMA certification requirements. Due to the uncertainty of the need for Phase 3 or the effort required should design and construction services be needed, a detailed scope of work has not been developed for

this portion of the scope of services. A defined Phase 3 scope and fee would be developed at the end of Phase 2 if needed.

Phase 3 – Task 1 Design Services (if required)

The AMEC team has the expertise necessary to complete design, construction drawings and specifications. This includes specialty geotechnical or structural modification designs to the system that may be needed, or more traditional civil design modifications which may include drainage structure or pump station repairs or modifications, or other typical civil design services. Our team has provided these or similar design services to numerous municipalities throughout the Midwest, and are staffed to complete these services in an efficient and timely manner. We have worked directly with the applicable State and Federal permitting agencies, and understand their requirements in order to obtain timely permits to prevent delays in the start of construction.

Phase 3 – Task 2 Construction Phase Services (if required)

The AMEC team has experienced surveyors, inspectors, technicians and engineers able to provide the full suite of construction phase services. Typical services may include approval of shop drawings, construction stake out, construction inspection, and as-built drawings.

Phase 3 – Task 3 Final Certification Report

The format and included data will be a result of the continuous coordination with the FEMA Region VII staff and other applicable governing agencies including the USACE St. Louis District. The exact format is dynamic as the PAL and levee certification process continues to evolve between these two federal agencies. The requirements are not expected to change, but the desired presentation may change over the course of this project. We will notify the City as we become aware of such modifications. The AMEC team has multiple licensed engineers in the State of Missouri in each of the specific practices areas, and each component of the final report (ie – closures, seepage and stability, settlement, interior drainage, embankment protection) will be sealed by the appropriate practice lead.

Project Management and Coordination:

Throughout the project, the AMEC team will maintain appropriate coordination with the City. In addition to ongoing informal coordination, this task will include a kick-off meeting and monthly meetings via face to face meetings, webex, or conference calls. We will work with the City to modify this schedule to best meet the needs of the City of New Haven.

Project Schedule

The AMEC team has the staff and resources available to begin work on this project tomorrow. Mr. Sample, Mr. File, and Mr. Noe are committed to dedicating the time and resources to this project to ensure timely completion. We will negotiate a schedule with the City to complete all Phases of Certification. Phase 1 services are proposed to be executed in a two month period once receiving notice-to-proceed. Following completion of Phase 1, Phase 2 services are proposed to be executed over a six month period in order to maximize efficiency on the project and control costs. If a more condensed schedule is necessary, that can be negotiated. AMEC could complete the entire Phase 1/Phase 2 scope of work in as little as a four month period if desired, although certain efficiencies may be sacrificed. If construction is required, a schedule will be negotiated representative of the type of repairs required. AMEC has successfully worked with Federal, State and Local agencies on levee rehabilitation projects in the past involving levee setbacks, raising or bank stabilizations. For these projects, we have completed the entire design process, construction drawings and specifications, and obtained necessary permits including USACE Section 408 when required and 404 approvals, and had the projects out to bid in as little as five months from the date that design began. The following is a proposed schedule.

- Phase 1 NTP –0 4/15/2014
- Phase 1 Completion – 06/15/2014
- Phase 2 NTP – 07/01/2014
- Phase 2 Completion – 01/01/2015
- Phase 3 Services – TBD (Dependent on Phase 1 and Phase 2 results)

If during Phase 1 or early on in Phase 2 deficiencies are identified where it would be advantageous to construct improvements during 2014, Phase 3 design services can be initiated during Phase 2 so that design services run in parallel to the completion of Phase 2. This can allow for the project to be designed and bid so that construction can still occur in the latter portion of the 2014 construction season, should this be desirable to the City.

Cost Control

AMEC's cost and schedule control system procedures are designed to provide project/task managers and clients with timely, accurate information concerning project progress. Through our management systems, project managers monitor expenditures, identify potential cost overruns, and take corrective actions before problems develop.

AMEC will work with the City to specify the metrics, reporting mechanisms, and control procedures necessary to measure, report, and control the product requirements, the project schedule, budget, resources, and the quality of work processes and work products.

- Project requirements will be documented in the deliverables.
- Schedules will be tracked by email or telephone calls.
- Budgets will be managed per the contract terms.
- Quality control will be managed consistent with City and AMEC policies.
- Reporting will occur as a monthly status report by email or mail consistent with methods preferred by the City.

Quality Control

AMEC Team members use industry-recognized quality control procedures and have developed a firm-wide quality assurance (QA) program for all engineering projects. AMEC has established quality control (QC) plans for Levee Certification that cover checking procedures, documentation, guidelines, design and document preparation checklists, quality control responsibilities, and employee training requirements. Our internal process emphasizes that quality is not a "one time, it's fixed" commitment, but rather a continuous process of improvement by employees, managers and subcontractors.

AMEC has designated Joe File as our QAQC manager for this project. Mr. File has served as Project Manager on over 10 levee certification projects in the last 3 years and is recognized nationwide for his levee expertise. He will draw on this experience to implement a QAQC plan for all aspects of the project, including analysis, design, construction management, and USACE and environmental permitting coordination.

Capability to Perform the Work

The AMEC Team provides national levee certification and geotechnical experience uniquely combined with local design and storm water experience. Our Topeka and Nashville offices are considered "AMEC Centers of Excellence" for providing levee certification services across the nation and our St. Louis office has recent levee certification experience and is an "AMEC Center of Excellence" for civil and infrastructure design.

AMEC is a leading provider of FEMA Map Modernization and Risk MAP consulting services and has over 150 engineers and GIS professionals dedicated to providing these services in North America. AMEC has expertise in a variety of water resources services, including surface water modeling, water quality modeling, GIS applications in water resources, floodplain management and flood hazard mitigation. Floodplain mapping (and associated mitigation services) has been a core service for AMEC since we performed our first flood studies for FEMA in the early 1980's. AMEC's practice has grown as the Map Modernization program came on line, and AMEC has played a key role in implementing the program at a national, regional and state level.

AMEC has numerous USACE IDIQ contracts across the nation, where we provide a variety of geotechnical, hydrologic and hydraulic, and design services for dams and levees. Projects include dam remediation and design projects, dam and levee assessments, periodic inspection services for levees in the PL 84-99 program, as well as a variety of additional related projects.

Familiarity with Project Area

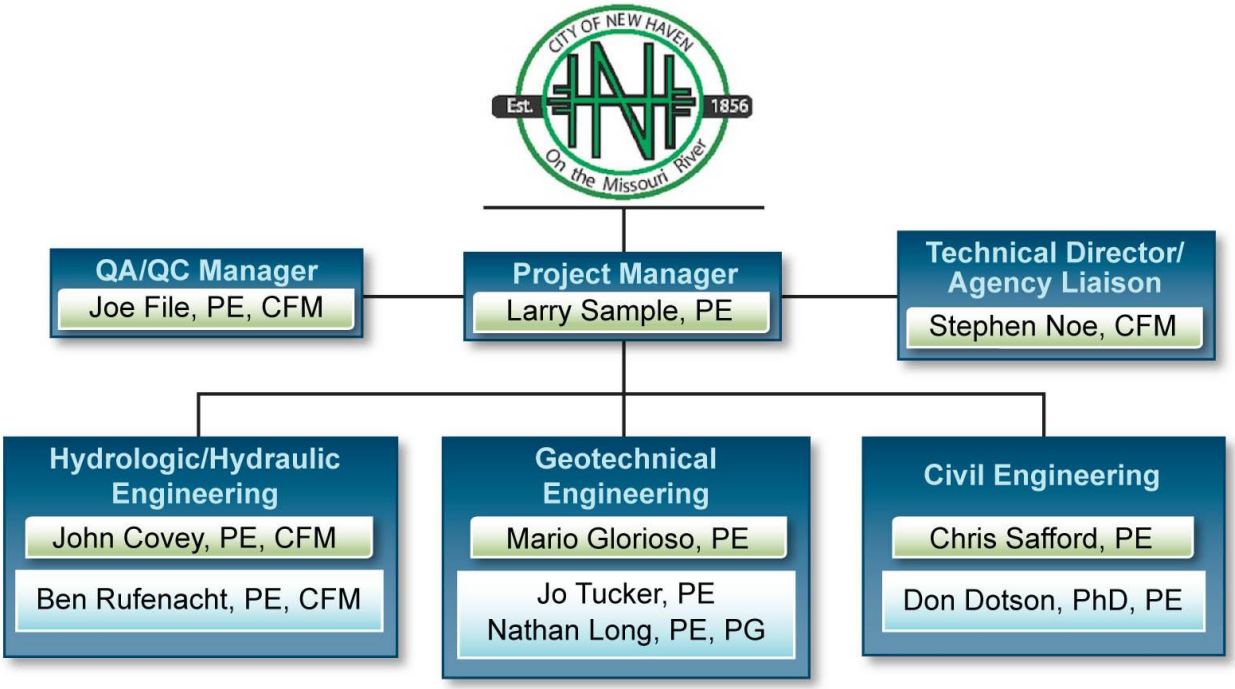
AMEC is uniquely familiar with the project area. In 2007 AMEC assisted the Missouri State Emergency Management Agency by providing floodplain mapping services for the current effective FEMA DFIRM of Franklin County. We redelineated new floodplains using existing detailed studies for 32 streams within the county in addition to incorporating new approximate Zone A floodplains developed by USGS. Also, we are exceedingly familiar with the USACE UMRSFFS study of the Missouri River and Mississippi River. This USACE study was incorporated by AMEC into numerous Missouri FEMA DFIRM studies and has been used on other levee certification projects along the Missouri and Mississippi Rivers

Our regional levee certification experience within the St. Louis District includes work for drainage and levee districts such as MESD, Prarie Du Pont, Fish Lake, Wood River, and Chain of Rocks. We have nearly completed all Phase 2 services for these levees and are in the process of completing construction on the levees that required Phase 3 services. Across the state in Atherton, MO we were able to certify the Atherton Levee after completion of Phase 2 with no Phase 3 services required. We have gained a vast understanding of the Missouri River soils and the St. Louis and Kansas City District's construction techniques throughout these projects, and will bring this knowledge to bear on this project.

Organization and Resumes

The AMEC Team provides national levee certification experience uniquely combined with regional storm water and local design expertise. Proposed Project Manager, Larry Sample, has significant experience related to managing complex levee certification and water resources type projects. Mr. Sample has a proven track record of successfully leading cities and drainage districts through the FEMA certification process. Stephen Noe will serve as Technical Director and Agency Liaison for the project, drawing on his extensive nationwide levee certification and FEMA Mapping experience, along with his close relationships with the KC USACE District and FEMA Region VII. Together, Mr. Sample and Mr. Noe are committed to guiding the City through the FEMA levee certification process.

Our Discipline Leads identified for the project each have extensive project management experience within their areas of expertise. Each is uniquely qualified to lead their specialty area, and each has extensive experience in the assessment, investigation, design, construction and certification of levees. Following are resumes for our project team.



Larry Sample, PE

Project Manager

Summary of Qualifications

Mr. Sample has nearly 18 years of experience as water resources engineer as well as two years of municipal engineering experience. He has been involved with a variety of projects that required hydrologic, hydraulic, geotechnical, and structural analysis and design. These projects include dam design, dam rehabilitation design, levee rehabilitation design, storm water management, dam breach analysis, and dam and levee certifications. Mr. Sample's modeling experience includes HEC-RAS, HEC-HMS, TR-20, TR-55, Hydro-CAD, and SITES as well as nearly 15 years of AutoCAD drafting experience. Mr. Sample has planned, designed, and overseen construction on numerous dams, levees, lagoons, as well as structural conservation projects in Kansas, Nebraska, and Missouri. Mr. Sample also has extensive experience working with Federal, State and Local environmental permitting agencies.

Education

MS/1996/Agricultural Engineering

BS/1994/Agricultural Engineering

Years of Experience

18

Professional Qualifications

Professional Engineer

(KS, NE, MO, OK, IA, TX)

Professional Affiliations

American Society of Agricultural and Biological Engineers

American Society of State Dam Safety Officals

Relevant Experience

Southwest Illinois Flood Protection District, Madison/St. Clair/Monroe Counties, IL: Lead Engineer for Phase 1 services of the Chain of Rocks levee system totaling approximately 5 miles. This role included management of historic data collection, coordinating inspection teams, compiling results of the levee inspections, and developing a list of necessary analysis to complete Phase 2 services with respect to 44 CFR 65.10.

Atherton Levee Certification, Atherton Levee District, Atherton, MO: Assistant Project Manager for Phase 1 and Phase 2 levee certification services. Participated in initial inspections and assisted with determining Phase 2 services required to certify which included new H&H on a Missouri River tributary to demonstrate freeboard, new geotechnical investigations and analysis, interior drainage analysis, embankment protection evaluation, closure inspections, on O&M updates. Through our coordinated efforts with the Levee District and FEMA we were able to save the levee district money by demonstrating with modified H&H on the Little Blue River that the levee had freeboard. In addition, cost savings were passed on the client by only amending the O&M instead of rewriting it. At the conclusion of Phase 2 services we were able to certify the levee. The certification package was submitted and the levee has since been accredited by FEMA.

Levee Certification of Wichita Valley Center Local Flood Control Project, City of Wichita: Assisted with inspection of 97 mile levee system to determine compliance with FEMA's 44 CFR Section 65.10 criteria. Developed levee rehabilitation designs for areas not meeting certification requirements. Managed the completion of the hydrologic and hydraulic analyses to ensure compliance with freeboard requirements as well as the geotechnical design to ensure structural stability of levee. Led design effort for an armoring system to protect the levee from excessive erosion and meet embankment protection requirements of 65.10. Responsible for developing a clear concise set of design plans with construction specifications and design memorandum.

Manhattan Levee Certification, Manhattan, KS: Project Manager for the evaluation and assessment of approximately 5.5 miles of levee system to determine compliance with FEMA's Section 65.10 criteria. Phase 1 consisted of a detailed historic data and record review, visual assessment, and "road map" to certification. Phase 2 consisted of the remaining hydrologic, hydraulic, interior drainage, stability, seepage and settlement analyses required to determine compliance with FEMA's 44 CFR Section 65.10 criteria. Phase 3 consisted of design and construction services to raise the levee one half of a foot over a one mile segment to meet 65.10 requirements. The project is completed and the levee has received FEMA accreditation.

Hutchinson Levee Certification, Hutchinson, KS: Project Manager for Phase 3 services which include minor rehabilitation designs in order for the 26 mile long levee system to be certified per FEMA 65.10 criteria. During

Phase 1 and Phase 2 services, Mr. Sample assisted with field inspection of approximately 26 miles of Hutchinson's flood protection levee system and helped develop the necessary analyses needed for certification. The inspection was completed to determine compliance with FEMA CFR 65.10 requirements and to identify areas that need further analyses and areas that "as-is" do not meet compliance. Located, photographed, and noted all components of the levee system including areas of concern that were out of compliance with FEMA CFR 65.10.

Levee Certification for the City of Salina, KS: Lead design engineer responsible for developing minor rehabilitation designs and updating emergency operations plans and amending the O&M manual to meet certification requirements per FEMA's 44 CFR Section 65.10 criteria. The project consists of a multidisciplinary design evaluation, coordination with FEMA, USACE, State of Kansas, and other permitting agencies, and collaboration with the City staff to develop a comprehensive EOP for the levee system.

Levee Certification of the City of Augusta and Butler County Levee System, City of Augusta: Project Manager for developing rehabilitation design for a deficient drainage structure through the levee. Rehabilitation was required for the levee to be in compliance with FEMA's Section 65.10 criteria. Mr. Sample also has lead the effort to write a new O&M manual for levee system and compiling all studies and analysis for a final certification package to be submitted to FEMA upon completion of the rehabilitation project.

Missouri NRCS Dam Assessments, Statewide: Project Manager for the assessment of 8 NRCS designed dams in the State of Missouri. Project includes traditional and bathymetric survey, visual inspection of each dam including the embankment, spillways, intakes, toe drains, other appurtenances, as well as an assessment of the downstream hazard classification, new hydrologic analysis of the drainage area and flood routing of the reservoir, alternatives analysis for remediation, unsteady flow dam breach analysis and inundation mapping.

USDA - Natural Resources Conservation Service, Nationwide: Assistant Project Manager for nationwide contract to provide dam assessment, design, design review and construction management services. Assisted with the management of over 100 dam assessments in 8 states, over 7000 square miles of LiDAR acquisition, 2 dam design reviews, and 2 rehabilitation designs. Dam assessments have included bathymetric surveys, LiDAR surveys, video inspection of spillway conduits, failure modes and risk analyses, dam breach analyses, and rehabilitation concept designs. Dam designs have included developing comprehensive dam rehabilitation designs for aging flood control dams. Review of dam designs has included third party review of dam designs for compliance with federal and state standards and regulations. Construction management includes providing dam construction oversight and inspection for compliance with dam design.

Joe File, PE, CFM

QA/QC Manager

Summary of Qualifications

Mr. File has 16 years of experience as a water resources, dam and levee engineer. He has been the project manager on a variety of projects including FEMA DFIRM projects, FEMA levee certification projects, and NRCS Dam Assessment projects. In addition, he has been Engineer of Record on a variety of water resources engineering projects including levee certification, hydraulic and hydrologic modeling, dam design and construction, dam breach inundation mapping, emergency action planning, unsteady flow modeling, urban stormwater management and design, dam and levee feasibility studies, and land development and design. His modeling experience includes HEC-RAS (steady and unsteady), TR-20, TR-55, HEC-HMS, SITES, XPSWMM and PCSWMM. Mr. File has completed safety evaluations and reports for numerous dams and levees throughout Kansas, Missouri and Oklahoma. Mr. File has served as Project Manager or Assistant Project Manager for nine FEMA levee certification projects in the States of Kansas and Missouri. He has designed new dams, completed rehabilitation designs for existing dams and levees, and provided oversight during construction of these projects. Mr. File previously served as the State of Kansas ASDSO State Representative for three years. He served as the technical advisor and project engineer for multiple Watershed, Drainage and Levee Districts in Kansas who are responsible for the operation and maintenance of flood control dams and levees. Mr. File also has extensive experience working with Federal, State and Local environmental permitting agencies on complex permitting issues.

Education

BS/1997/Civil Engineering, Secondary Major /Natural Resources and Environmental Sciences

Years of Experience

16

Professional Qualifications

Professional Engineer

(KS, OK, MO, NE, IA)

Certified Floodplain Manager

Professional Affiliations

American Society of Civil Engineers

Association of State Dam Safety Officials

Association of State Floodplain Managers

American Public Works Association

Relevant Experience

Southwest Illinois Flood Protection District, Madison/St. Clair/Monroe Counties, IL: Lead Engineer for Phase 1 services of the Prarie du Pont, Wood River, MESD and Fish Lake levee systems totaling approximately 86 miles. This role included management of historic data collection, coordinating inspection teams, compiling results of the levee inspections, and developing a list of necessary analysis to complete Phase 2 services with respect to 44 CFR 65.10.

Levee Certification of the Wichita Valley Center Local Flood Control Project, City of Wichita: Assistant Project Manager for the evaluation and assessment of approximately 97 miles of levee system to determine compliance with FEMA's 44 CFR Section 65.10 criteria. The project consisted of a multidisciplinary evaluation of the flood control system including a visual assessment, video of a portion of the interior drainage structures, hydrologic and hydraulic analysis of both riverine and internal drainage areas, geotechnical analysis, embankment protection analysis, and the development of "as-is" plans and updating the O&M Manual. This project included a rainfall frequency analysis to update the City's rainfall frequency curves. It also includes production of a historical documentary of the system and a web site development component to assist with flood forecasting throughout the City. During this project, eight areas were identified as not being able to be certified without remediation. Mr. File also served as Assistant Project Manager and a key member of the design team in the development of construction drawings and special provisions to remediate these deficiencies.

Multi-County FEMA DFIRM Project, State of Kansas Division of Water Resources: Project Manager for the last five years for the development of floodplain mapping in 8 Kansas counties. Projects include new hydrologic and hydraulic modeling, collection of survey and LiDar data, redelineation of existing detailed studies on updated topography, refinement of Zone A modeling with automated hydrologic and hydraulic modeling techniques, development of DFIRM mapping files, and completion of "Post Preliminary" services, all in accordance with the requirements of FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners.

45 Kansas NRCS Dam Assessments, Natural Resources Conservation Services: Project Manager for the assessment of 45 NRCS designed dams in the State of Kansas. Project included traditional and bathometric survey, visual inspection of each dam including the embankment, spillways, intakes, toe drains, other appurtenances, as well as an assessment of the downstream hazard classification, new hydrologic analysis of the drainage area and floodrouting of the reservoir, alternatives analysis for remediation, unsteady flow dam breach analysis and inundation mapping, and production of assessment reports.

Levee Certification of the City of Augusta and Butler County Levee System, City of Augusta: Project Manager for the evaluation and assessment of approximately 2 miles of levee system to determine compliance with FEMA's Section 65.10 criteria. The project consisted of a two phased approach, in which Phase I consisted of a detailed historic data and record review, visual assessment, and "road map" to certification. Phase 2 consists of the remaining hydrologic, hydraulic, interior drainage, stability, seepage and settlement analyses required to determine compliance with FEMA's 44 CFR Section 65.10 criteria.

Kansas Dam Breach Analysis and Inundation Mapping Project, State of Kansas Division of Water Resources: Project manager for an on-call dam breach inundation mapping project with the State of Kansas in which 34 dams have been modeled, and an additional 21 are currently in the process of being modeled. This project includes completing survey of downstream hydraulic structures such as bridges and culverts, and habitable structures. HEC-RAS unsteady flow models were completed for the project, and dam breach inundation maps and GIS deliverables all in a FEMA DFIRM compatible format were completed.

Site 33 Dam Design, Cross Creek Watershed Joint District No. 42, KS: Project engineer responsible for the design, specifications, bid documents and construction management of the Watershed District's Site 33 dam, which is a high hazard dam located in Jackson County, KS. Project consisted of hydrologic and hydraulic analysis, earthen embankment, primary spillway and auxiliary spillway design. In addition to design, a dam breach analysis was completed for this project using HEC-RAS unsteady flow modeling techniques. An Emergency Action Plan and Dam Breach Inundation Map were completed for this dam.

Tri-County Drainage District No. 1, KS: Served as technical advisor and project engineer for the Drainage District. Served in the Capacity of Drainage Commissioner for five years, before resigning that position in 2011. This includes periodically evaluating the condition of the District's levees, making O&M recommendations for the three levee sections the District is responsible for, and serving as the District's liaison for USACE design and construction projects. Attendance at quarterly Board meetings and coordination of all activities with the Kansas City USACE District as necessary so the District will remain in compliance with and eligible for the USACE PL 84-99 program.

Levee Certification for the City of Salina, KS: Project manager responsible for certification of approximately 17 miles of levee per FEMA's 44 CFR Section 65.10 criteria. The project consists of a multidisciplinary evaluation of the flood control system including new geotechnical analyses, new interior drainage analyses and embankment protection analyses. The project also includes coordination with the State of Kansas, who is updating the River Hydrology and Hydraulics on the System.

Levee Certification for the City of Manhattan – AMEC project manager for Phase I and Phase II Services for the City of Manhattan. Services included new interior drainage analyses, coordination with USACE Kansas City District to update their HEC-RAS model to make it FEMA compliant, Geotechnical Investigations and Analyses, and O&M manual updates. Construction to raise a short stretch of levee was also completed and the levee has since received accreditation from FEMA.

FEMA Region III IDIQ Map Modernization Services: Project Manager and Engineer of Record for the project, which consists of Map Modernization services in five counties within FEMA Region VII (run through Region III IDIQ Contract). These counties include Butler and Saline County Nebraska, and Woodbury, Mills and Harrison County Iowa. Project includes Floodplain Mapping, DFIRM and Panel Production, and Post Preliminary Services for these five counties. Project includes 11 miles of new detailed study, 160 miles of redelineation, and incorporation of the UMRFFRS Missouri River Study in three counties.

Stephen Noe, CFM

Technical Director / Agency Liason

Summary of Qualifications

Mr. Noe has 24 years of experience on a wide range of water resource and hydraulic design projects that encompass watershed management/master plans, storm water regulatory compliance, hydraulic/scour analysis, and secondary drainage studies/designs. During his 16 years with AMEC as a water resources engineer he has managed numerous projects including; FEMA, USACE, Nashville District Hydraulic Services; Kentucky Transportation Cabinet Bridge Scour Program Development; and South Carolina Department of Transportation Open Hydraulics Contract. He has been a leader in the development of innovative technology tools used by AMEC to perform hydrology, hydraulic, floodplain analysis, and DFIRM submittals. Mr. Noe has comprehensive knowledge of many local, state and federal regulations, as they pertain to water resource engineering. He has successfully lead cities and states through the NPDES Phase I program. Bridge Scour Analysis and Assessment Program, and FEMA Map Modernization. He has led AMEC's DFIRM Team to a premiere national Map Modernization service provider to 20 plus states across 5 FEMA regions.

Education

BS/ 1984/ Agriculture Engineering/ University of Kentucky

Years of Experience

24

Professional Qualifications

Certified Floodplain Manager

Professional Affiliations

American Society of Civil Engineers

National Society of Professional Engineers

Society of American Military Engineers

Kentucky Association of Mitigation Managers

Kansas Floodplain Managers Association

Oklahoma Floodplain Managers Association

Indiana Floodplain Managers Association

Relevant Experience

Kansas DFIRM Development, Statewide, KS: Project Director and Technical Lead for data collection, validation, hydrology, hydraulics, flood hazard boundary delineation, panel production, database development, and FIS production. Assisted Kansas DWR in developing a process to comply with FEMA Region VII and NSP principles and guidelines using the county and regional data sets of Kansas. These services include 7 counties in 2005 and 5 counties in 2006. These services covered 9300 miles of enhanced Zone A, 1440 redelineation miles and 280 panels across 7 counties.

Kansas Map Modification Services Statewide: Project Director providing FEMA Map Modernization services to the Kansas Division of Water Resources statewide. Performing and managing the scoping through panel production activities of the Map Modernization Program for Kansas as a CTP with FEMA Region VII. AMEC has assisted DWR in formulating guidelines that bridge the use of FEMA guidance documents to the unique terrain throughout the state. McPherson County alone had 1565 drainage flow change points, 1345 miles of streams, and 642 individual HEC-RAS models, all organized in personal geo-databases for a "living floodplain". In total, AMEC has developed enhanced Zone A floodplains for over 6000 linear miles of stream, 10 miles of detailed stream, and over 280 DFIRM profiles under this contract.

State of Kansas, Dam Failure Analyses, Lincoln and Jefferson Counties, KS: Program Manager for providing dam failure analysis services to the Kansas Department of Agriculture Division of Water Resources. There are approximately 700 dams throughout the two counties. AMEC provided the State with a prioritization scheme ranking the dams according to size, hazard class, and purpose. The unsteady flow module of HEC-RAS version 3.1.1 is being utilized to simulate dam failures and the resulting flood wave routing for approximately 50 dams.

State Emergency Management Agency (SEMA)– FEMA Map Modernization and Emergency Management Services – State of Missouri: Program Manager for state wide development of digital flood insurance rate maps DFIRMs and statewide emergency management plan. All work under is being performed in accordance with *FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners*. Project tasks include business plan updates, policy development, quality control plans, county scoping, managing other consultant services, logistics for disaster services, public meetings, FEMA coordination, data capture standard process development and panel production. Services in 2005 included managing others to prepare countywide DFIRMs.

The services for 2006 include 40 scoping meetings and resultant analysis as well as 27 counties of approximate studies – 20,210 miles within 6300 HEC-RAS miles.

Kentucky DFIRM Services, Statewide, KY: Project Manager and Technical Lead for Map Mod Services statewide providing pre-scoping to post preliminary. The 2007 floodplains encompass 7527 miles of Enhanced Zone A streams, 239.6 miles of detailed studies (new and leverage), 125 AE sinkholes, and 815 panels. Developed policy and process definitions for KY DFIRM and coordinated with other departments. Developed project Quality Control Plan (QCP) and assisted state in developing CTP QCP.

Program Director/Project Manager for the development and implementation of a GIS system for the Upper Cumberland River Watershed upstream of the Cumberland River crossing of the Harlan County Line: Guided the assembly of data sets several of the state, regional, and federal agencies. The digital data information was converted from multiple graphics platforms and numerous projections to the ESRI platform and UTM projection. Metafiles were created to document data history and modifications to the file for transformation to a common platform and projection. Assisted in the development of hydrologic and hydraulic tools to assist in modeling efforts. Hydrologic parameter development and hydraulic geometric descriptions are the two most useful pre-modeling tools. Floodplain mapping and timing analysis sub-basin shading were developed for post modeling tools.

United States Army Corps of Engineers – Nashville District: Clover Fork Watershed HEC2 / HEC-RAS Conversion: Project Manager responsible for overall guidance and direction of task order. The services include the conversion of an existing HEC-2 model of approximately 25 miles of Clover Fork to HEC-RAS format and to produce floodway and floodplain mapping. The hydraulics model was calibrated to the high water marks of 1977. The calibrated model was used to define the 100-year frequency floodplain and floodway limits. Results are displayed digitally and accessible for application to GIS tools for future assessments.

Hydrodynamic Analysis CSO Phase I; Nashville, TN: Project Manager/Engineer for a hydrodynamic analysis of approximately 7 square miles of heavily developed downtown Nashville, TN, for a combined sewer overflow tunnel/storage study. The study included the development of rainfall - frequency/depth relationships, analysis of in-line detention facility, detailed timing analysis, inverted siphons, surcharged outfall conditions and many other detailed hydrologic and hydraulic configurations. The system was modeled with HEC-1 and linked to EXTRAN (SWMM) for hydraulic modeling.

Browns Creek CSO Alternative Analysis; Nashville, TN: Project Manager for a hydrodynamic analysis of the Browns Creek CSO system. The system had 5 existing CSO regulations. A multiple alternative analysis was performed using remediation of existing conveyance system, and construction of new interceptors, tunnels and underground detention facilities. The selected alternative was based on hydraulic response per state regulator criteria, economics, socioeconomics, constructability, environmental concerns and many other site-specific parameters.

Wolf Run Watershed; Lexington, KY: Project Engineer for urban storm water drainage improvements to Wolf Run Watershed. Responsibilities included hydrologic and hydraulic analyses, plus construction plans, determination of flood hazard protection, analysis and design of channel improvements, including vegetative and gabion revetment matt sections, and design and analysis of two storm water detention basins (each larger than 15 acres).

Fulton County, GA; Johns Creek Basin Master Planning: Project Manager for major and minor drainage structure inventory of a 13.7 square mile watershed for Fulton County. Task manager responsibilities included scheduling, cost estimation, staff management, and quality control of field surveys and GIS data. Field surveys included the use of GPS and traditional survey methods. Project engineer for hydrologic and hydraulic analysis of numerous sub-basins. Project engineer responsibilities included hydrologic analysis using HEC1, hydraulic analysis of open channels using HEC-RAS, and hydraulic analysis of closed systems using XP-SWMM.

Tennessee Department of Transportation (TDOT) - Bridge Scour Assessment Review: Project Engineer for review of Hydraulic and Scour Analysis Reports prepared by other consultants and submitted to TDOT. Reports reviewed for hydraulic analysis and scour assessment procedures.

John Covey, PE, CFM

Lead Hydrology & Hydraulic Engineer

Summary of Qualifications

Mr. Covey is a Water Resources Engineer with experience in the areas of hydrology & hydraulic engineering and geographical information systems. As a project manager and engineer he has supported a variety of projects including FEMA Map Modernization & Risk Map DFIRM projects, FEMA levee certification projects, NRCS Dam Assessment/Inundation projects, urban stormwater projects, and watershed studies. His experience has utilized key software including HEC-1, HEC-2, HEC-HMS, HEC-RAS (steady & unsteady), HEC-DSSVUE, HEC-FFA, HEC-SSP, XPSWMM, PCSWMM, EPA-SWMM, and FLO-2D.

Education

BS/2004/Agriculture, Soil and Water Science/Natural Resources and Environmental Sciences

Years of Experience

9

Professional Qualifications

Professional Engineer (CO)

Certified Floodplain Manager

Professional Affiliations

Association of State Floodplain Managers

American Society of Civil Engineers

Relevant Experience

Levee Certification, Various City/County Municipalities: Functioned as technical engineer to manage, perform, and review hydrologic and hydraulic analyses of riverine and interior drainage areas for over 200 miles of levee system providing flood relief to multiple jurisdictions. Developed and/or reviewed riverine H&H as well as interior drainage modeling utilizing HEC-HMS, HEC-RAS (steady and unsteady), FLO-2D, XP-SWMM, and PC-SWMM to compute static ponding areas and detailed floodplain mapping in urban areas in and around the levee systems. Detailed analyses were developed using survey data, existing Stormwater Master Plans & stormwater infrastructure data, detailed topography, and high resolution imagery. Interior analyses were performed for both complex rural and urban stormwater systems including interconnected storage areas and pump station locations. Coincident Frequency Analyses of both dependent and independent systems were developed. Coincident Frequency Analysis of independent systems were performed in accordance with USACE EM1110-2-1413 guidelines by combining interior ponding frequencies with riverine stage exceedances from detailed riverine hydraulic analyses including the USACE UMRFFS Study of the Missouri River and Mississippi River. Managed and/or reviewed hydrology and hydraulics for riverine and interior analyses to ensure compliance with acceptable modeling practices, USACE EM1110-2-1413 guidelines, and FEMA levee certification 44 CFR 65.10 standards. Levee projects in which these skills were utilized include:

- Wichita Levee Certification, City of Wichita, KS
  - 97 levee miles, 137 Drainage Structures, and 8 Pump Stations
- Augusta Levee Certification, City of Augusta, KS
  - 2 levee miles and 7 Drainage Structures
- Hutchinson Levee Certification, City of Hutchinson, KS
  - 27 levee miles and 43 Drainage Structures
- SW Illinois Levee Certification, Multiple Illinois Counties
  - 86 levee miles, 50 Drainage Structures, and 31 Pump Stations
- Atherton Levee Certification, City of Atherton, MO
  - 13 levee miles and 10 Drainage Structures
- Salina Levee Certification, City of Salina, KS
  - 18 levee miles, 25 Drainage Structures, and 2 Pump Stations
- Manhattan Levee Certification, City of Manhattan, KS
  - .5 levee miles, 16 Drainage Structures, and 2 Pump Stations
- Greybull Levee Certification, City of Greybull, WY
  - 2.6 levee miles and 12 Drainage Structures
- Ottawa Levee Certification, City of Ottawa, KS
  - 4.5 levee miles. 6 Drainage Structures, and 3 Pump Stations

Ben Rufenacht, PE, CFM

Hydrology & Hydraulic Engineer

Summary of Qualifications

Mr. Rufenacht has 8 years of experience as a Water Resources Engineer and has worked on a variety of FEMA Map Modernization projects, levee certification projects, and dam assessment projects. Ben has developed detailed rainfall runoff models, performed gage analysis, steady as well as unsteady flow hydraulic models, and various other support analysis. He is an experienced ArcMAP user and develops many 100% digital deliverables. His experience currently includes hydrologic analysis, hydraulic analysis, and floodplain mapping using modelling software including ArcHydro, HEC-RAS, HEC-HMS, GeoRAS, XP-SWMM, and SITES. Mr. Rufenacht has analyzed many of the most complicated scenarios in Kansas including extremely flat urban terrain to large riverine systems like the Kansas River.

Education / Training
BS/2006/ Civil Engineering

Years of Experience
8

Professional Registrations
Professional Engineer (KS)
Certified Floodplain Manager

Professional Affiliations
American Society of Civil Engineers

Relevant Experience

Wichita Levee Certification, City of Wichita, Kansas: Hydraulic and Hydrologic Engineer and field inspector for the certification effort for 97 miles of Levees, assisting in the levee site inspection, preliminary data development, and hydrologic and hydraulic modeling. He also logged borings for the geotechnical investigations, performed modeling for upgrading parts of the levee system, and performed the embankment protection analysis.

Dodge City Levee, Wilson & Company, Dodge City, KS: Hydraulic Engineer for the certification effort. He performed hydraulic modeling, assisted in the design of system upgrades, and performed embankment protection analysis for the Dodge City Levee Certification project.

Augusta Levee Certification, City of Augusta, KS: Performed riverine hydraulic modelling for the Augusta Levee project.

Manhattan Levee Certification, Manhattan, KS: Assisted with the levee site inspection and reviewed existing modelling to perform freeboard analysis for the levee system.

29th Street Drainage, City of Topeka, KS: Updated existing hydrologic and hydraulic modelling to develop design alternatives to replace a deficient culvert and alleviate flooding issues upstream of 29th St on Butcher Creek in Topeka, KS.

Kansas NRCS Dam Assessments, NRCS, Salina, KS: Performed dam breach modelling, dam inspections, SITES modelling, and written reports for the Kansas NRCS Dam Assessment Project.

NRCS Missouri Dam Assessments, NRCS, Columbia, MO: Performed dam breach modelling, SITES modelling, and written reports for the NRCS Missouri Dam Assessment Project.

KDA Dam Breach Project, KDA, Topeka, KS: Performed dam breach modelling and written reports for the KDA Dam Breach Project.

Missouri DFIRM Services, SEMA, Statewide, MO: Hydraulic and Hydrologic Engineer for scoping 40 counties in State of Missouri, performing hydrologic and hydraulic analysis for multiple county wide studies using both approximate and detailed methods in compliance with local, state, and federal regulations. He also assisted with incorporation of existing studies and redelineation of detailed studies on updated topographic data. He also assisted with development of DFIRM mapping files in accordance with the requirements in FEMA's Guidelines and Specifications for Flood Hazard Mapping Partners.

Mario Glorioso, PE

Lead Geotechnical Engineer

Summary of Qualifications

Mr. Glorioso is a geotechnical engineer with over 12 years experience in geotechnical/geo-design engineering, quality control testing, laboratory soil testing, and Forensic Engineering. Mr. Glorioso serves as the Project Manager, QA/QC Reviewer and Geotechnical Task Manager for many of our levee certification and design projects. He has provided levee certifications in general accordance with FEMA's 44 CFR Section 65.10, Procedure Memoranda PM 34 and PM 43, and USACE EC 1110-2-6067. He has also successfully managed levee design projects in accordance with USACE guidelines, which includes geotechnical investigations, hydrologic and hydraulic modeling, and civil/infrastructure design culminating in bid-ready documents. Mr. Glorioso has provided Construction Quality Control services on a variety of projects.

He has authored several papers and provided presentations focused on water-related facilities, including "Levee Certification Decision-Making", which he presented to the USSD in 2010.

Education

MS/2002/Civil Engineering/ Mississippi State University

BS/2001/Civil Engineering/ Mississippi State University

Years of Experience

12

Professional Qualifications

Professional Engineer, TN

Professional Affiliations

American Society of Civil Engineers

Relevant Experience

Wichita and Valley Center Flood Protection, Wichita, KS: Geotechnical/Geo-design Lead in charge of satisfying the requirements of FEMA's levee certification protocol (stated previously). This project involves certifying an approximately 100 mile levee system, which includes flood protection levees and training levees. We are working closely with the Tulsa District of the Army Corps of Engineers (levee designer) and the City of Wichita (owner) to gain valuable historic information of the levee system. This project also involves using LiDAR technology to develop surface topography to be used in determining "as-is" conditions and help identify old river meanders. Additional geophysical exploration techniques are incorporated into the subsurface exploration plan to gain a better understanding of subsurface conditions. Analytical solutions related to the stability/settlement/seepage performance of the levee system are performed with state-of-the-art software programs, including finite element modeling.

City of Hutchinson, Levee Certification of the City of Hutchinson Local Flood Protection Project, Hutchinson, KS: Project Manager and Geotechnical Lead for the 27 mile levee system along the Arkansas River, Cow Creek, and the Harsha Canal. A Phase I assessment of the system including review of COE as-built plans, the operations and maintenance manual, inspection reports, and FEMA DFIRM data was completed, along with a visual assessment of the levee system. The Phase II geotechnical evaluation included subsurface exploration (advancing 76 conventional soil borings and performing 110 CPT soundings), detailed geotechnical analyses of levee embankment seepage/stability/settlement, and an evaluation existing floodwalls using current standards and codes.

Southwest Illinois Flood Protection District, Madison/St. Clair/Monroe Counties, IL: Levee Manager and Geotechnical Lead of the Prarie du Pont and Fish Lake levee systems (totaling approximately 16 miles of the overall 86 mile system). This role included managing nine engineering disciplines and subcontractors to identify deficiencies in the existing levee with respect to 44 CFR 65.10 and design rehabilitations/remediation to the existing such that FEMA certification can be achieved upon completion of construction. This project includes designs for underseepage and through-seepage solutions (seepage berms/relief wells) and interior drainage solutions, such as pump stations.

Jo C. Tucker, PE

Geotechnical Engineer

Summary of Qualifications

Ms. Tucker has provided project management and engineering services on hundreds of geotechnical explorations and geotechnical related construction projects in the Mid-Western and Southeastern United States for the past 36 years. Her duties on these projects have consisted of planning, executing and managing the collection and performance of the field geotechnical explorations, soil/rock sample identification and laboratory testing, analysis and evaluation of field and laboratory data, and preparation of reports of recommendations for design and construction of various levee certification projects. Typical geotechnical projects include subsurface explorations for seepage, slope stability and settlement analyses. ment of geotechnical explorations has included direction of drilling crews during soil sampling, rock coring, in-situ soil testing, in-place permeability testing, direct push methods and geophysical explorations. She has performed studies including monitoring vibrations of structures during construction operations. Other experience includes observation and consultation for deep foundation test programs, production pile and drilled shaft installations and ground improvement techniques.

Education

MS/1985/Civil Engineering/ University of Louisville

BS/1977/Civil Engineering/ University of Wisconsin

Years of Experience

36

Professional Qualifications

Professional Engineer, (KY, WI, MI, FL, IL)

Professional Affiliations

American Society of Civil Engineers

Ms. Tucker has worked with the St. Louis USACE District office recently on numerous projects concerning 65.10 geotechnical criteria and rehabilitation designs for levees along the Illinois side of the Mississippi River through St. Louis.

Relevant Experience

Southwest Illinois Flood Protection District, Madison/St. Clair/Monroe Counties, IL: Levee Manager and Geotechnical Lead of the Wood River, MESD, and Chain of Rocks levee systems (totaling approximately 70 miles of the overall 86 mile system). This role included being responsible for the data collection, geological investigations, geotechnical analyses for underseepage, slope stability, and settlement.. Analyses included the incorporation of toe drains and relief wells. Where deficient sections of levee were found Ms. Tucker was responsible for developing solutions to bring the levee systems into compliance with FEMA 65.10 criteria. These Phase 3 rehabilitations/remediation designs for underseepage and through-seepage solutions (seepage berms/relief wells) and interior drainage solutions, such as pump stations.

Wolf Creek Dam, Russell County, Kentucky. Peer review of results from subsurface exploration; quality assurance review of laboratory results from rock testing program and comparison with published values for similar formations.

Geotechnical Evaluation for New Bridge/Culverts, Louisville Metro Public Works, Louisville, KY. Task order manager for geotechnical studies at various bridge sites. Project manager and geotechnical engineer of record responsible for coordinating geotechnical investigation and providing foundation recommendations and site preparation recommendations for replacement of three bridges. AMEC completed field exploration and laboratory testing programs to support the recommendations and conclusions of this report. Bearing capacity and settlement calculations were performed to optimize shallow spread footing foundation systems for these sites. Foundation systems included spread footings bearing on rock, and spread footings bearing on soil, depending on the site conditions.

Nathan Long, PE, PG

Geotechnical Engineer

Summary of Qualifications

Mr. Long is a Professional Engineer and Geologist with 10 years of experience in geotechnical engineering, quality control testing, and laboratory testing. He has been involved with several levee certification projects. The levee certifications are in general accordance with FEMA's 44 CFR Section 65.10, Procedure Memoranda PM 34/43, and, where applicable, USACE's EC 1110-2-6067 Certification of Levee Systems for NFIP (formerly ETL 1110-2-570). In addition to levee certification projects, Nathan has observed various drilling activities within levee/dam embankments. He has utilized conventional and all-terrain drilling rigs and Sonic rigs for soil sampling and bedrock coring. Mr. Long has also observed the installation of PVC and wireline piezometers and inclinometers for embankment monitoring. His expertise includes performing site investigations, full-time field engineering for projects in construction, soil and rock sampling, field and laboratory testing, slope stability modeling, seepage modeling, report preparation, cost estimating, plan preparation, and development of construction specifications.

Education / Training

BS/2003/ Geological Engineering

Years of Experience

10

Professional Registrations

Professional Engineer (TN, KS)

Licensed Professional Geologist (TN)

Professional Affiliations

American Society of Civil Engineers (ASCE)

Relevant Experience

Manhattan Levee Certification, Manhattan, KS: Geotechnical Engineer of record for levee certification project. The project included about 5 miles of levee embankment and 96 feet of floodwall (stop log structure). The subsurface exploration consisted of drilling 32 borings. Mr. Long performed detailed geotechnical analyses of levee embankment stability, potential for future settlement, and groundwater seepage based on the results of the subsurface exploration and laboratory testing. Analytical solutions related to the stability/settlement/seepage performance of the levee system are performed with state-of-the-art software programs, including finite element modeling applications. In addition to the geotechnical analyses related to earthen embankments, analyses were also performed to evaluate performance of the floodwalls using current standards and codes.

Salina Levee Certification, Salina, KS: Geotechnical Engineer of record for ongoing levee certification project. The project includes 3 levees totaling about 18 miles of levee embankment. The subsurface exploration consisted of drilling 69 borings and performing 92 CPT soundings. Mr. Long is currently performing detailed geotechnical analyses of levee embankment stability, potential for future settlement, and groundwater seepage based on the results of the subsurface exploration and laboratory testing. Analytical solutions related to the stability/settlement/seepage performance of the levee system are being performed with state-of-the-art software programs, including finite element modeling applications.

Augusta Levee Certification, Augusta, KS: Geotechnical Engineer of record for levee certification project. The project included 1½ miles of levee embankment and 1,300 feet of floodwalls. The subsurface exploration for the project consisted of drilling 9 borings and performing 12 CPT soundings. Mr. Long performed detailed geotechnical analyses of levee embankment stability, potential for future settlement, and groundwater seepage based on the results of the subsurface exploration and laboratory testing. Analytical solutions related to the stability/settlement/seepage performance of the levee system are performed with state-of-the-art software programs, including finite element modeling applications. In addition to the geotechnical analyses related to earthen embankments, analyses were also completed to evaluate performance of the floodwalls using current standards and codes.

Osawatomie Levee Certification, Osawatomie, KS: Geotechnical Engineer of record for levee certification project. The project included about 4.7 miles of levee embankment and 540 feet of floodwalls (stop log structures). The subsurface exploration consisted of drilling 22 borings. Mr. Long performed detailed geotechnical analyses of levee embankment stability, potential for future settlement, and groundwater seepage based on the results of the subsurface exploration and laboratory testing. Analytical solutions related to the stability/settlement/seepage performance of the levee system are performed with state-of-the-art software programs, including finite element modeling applications.

Chris Safford, PE

Lead Civil Engineer

Summary of Qualifications

Mr. Safford has more than 11 years of professional engineering experience, including designing water supply systems, sanitary sewer systems, storm sewer systems, and drainage facilities, as well as roadways and earthwork grading. Mr. Safford has also served as the on-site field engineer for numerous design-build projects in St Louis and throughout the United States.

Education / Training
BS/2002/ Civil Engineering
Colorado State University

Years of Experience
11

Professional Qualifications
Professional Engineer,
(CO, MO)

Professional Affiliations
American Society of Civil Engineers
Americn Water Resources Association
Society of Military Engineers

Relevant Experience

Southwest Illinois Flood Protection District, Madison/St. Clair/Monroe Counties, IL: Project manager for design and construction of several new pump stations on the Wood River, MESD, Prarie Du Pont, Fish Lake and Chain of Rocks levee systems. This role includes developing design plans to handle increased interior flooding caused by the necessity for additional relief wells to protect the levee from underseepage failures. In addition to plan development, Mr. Safford is responsible for overseeing construction on the levee segments targeted for rehabilitation to meet FEMA 65.10 criteria. Mr. Safford has worked and coordinated efforts with St. Louis USACE District and has good working relationship with the District.

Federal Emergency Management Agency (FEMA) Digital Flood Insurance map (DFIRM) Modernization:

DFIRM Map Modernization Project, Various Counties, Missouri, North Dakota, South Dakota, and Kansas Assistant project manager. Managed the engineering team for DFIRM creation of multiple counties in various states. Analysis included limited detailed studies, detailed studies, and approximate studies. All projects were completed in FEMA compliant data capture standards and accordance with approved hydrology and hydraulic methods and procedures.

Roadway Design and Roadway Drainage System Design, Wayne County, TN

State Route 15 (US-64), Tennessee Department of Transportation, Wayne County, Tennessee
Lead drainage engineer for widening a 5.5-mile section of SR-15 in rural southern Middle Tennessee. The project involves widening an existing two-lane roadway into a four-lane divided median facility. It includes survey, roadway design, and geotechnical engineering. The eastern one third of the project lies within a geologically-sensitive area. The extreme relief and nature of the rock formations will require special slope considerations. The project also includes relocation of 1,500 feet of stream channel.

Drainage System Master Plan, Air Force Center for Engineering and the Environment (AFCEE), Buckley Air Force Base, CO

Project manager and water resources engineer responsible for preparing a base-wide Master Drainage Plan (MDP) for Buckley Air Force Base that evaluates conveyance capacity of the existing storm drainage system; recommends areas of eventual replacement, maintenance, or expansion; provides a conceptual storm drainage layout plan; and incorporates recommendations for potential Low Impact Development (LID) practices to minimize or reduce stormwater runoff from major and minor storm events. The MDP analyzes the 100-year, 10-year, and 2-year storm events. This project incorporates a United States Environmental Protection Agency (USEPA) 5.0 SWMM model and a HEC-RAS model of Toll Gate Creek.

Don Dotson, PhD, PE

Structural/Civil Engineer

Summary of Qualifications

As Senior Engineer and Chief Designer, Mr. Dotson performs foundation and pile cap design, deep foundation designs, ground modification, underpinning, soil liquefaction detection and mitigation, permanent and temporary retaining wall and shoring designs, finite element analysis of tunnels and bridge piers, and slope stability analysis and repair.

He spent nine years with the US Army Corps of Engineers as a senior design engineer and technical manager in the Geotechnical Branch. During his tenure with the Corps, he worked on numerous projects ranging from the geotechnical aspects of $60 million flood control levee projects in Southeast Kentucky, to smaller geotechnical projects. He has developed subsurface exploration plans to determine subsurface conditions and laboratory testing plans to evaluate soil properties. He has been responsible for the design of levees, T-walls, and structures on pile foundations.

Education / Training

PhD/1997/Science and Technology Studies

MS/1993/Civil Engineering

BS/1980/Civil Engineering

Years of Experience

30

Professional Qualifications

Professional Engineer AL, AZ, AR, CO, DE, FL, GA, ID, IN, KS, KY, LA, ME, MD, MN, MO, MS, NV, NM, NC, NY, OH, OK, OR, PA, SC, TN, TX, VA, WV

Structural Engineer: UT

Georgia Dept. Dam Safety: Engineer of Record

Professional Affiliations

American Society of Civil Engineers

Relevant Experience

Levee Certification, Wichita and Valley Center Flood Protection, Wichita, KS - Engineer for FEMA levee certification of an approximately 100 mile levee system, which includes flood protection levees and training levees. Worked closely with the Tulsa District (levee designer) and the City of Wichita (owner) to gain historic information of the levee system. Reaches of the levee system that were deemed non-compliant with FEMA criteria were redesigned in general accordance with USACE Engineering Memoranda and Technical Letters. The designs were reviewed by the USACE Tulsa District. The redesign effort involved channel improvement, setback levee, planting berms and/or standalone levee embankments.

City of Augusta Levee Certification, Augusta, KS: Structural Engineer for the comprehensive levee certification project per requirements of 44 CFR 65.10. The City of Augusta levee system is composed of earthen embankments, floodwalls, and other appurtenant features, such as stop log structures, drainage structures, and pump stations. The project involved detailed analyses of approximately 1.5 miles of levees protecting the east flank of Augusta from flood waters. Certification was required by the Federal Emergency Management Agency (FEMA) in order to keep the land protected by the levee system out of the floodplain as designated by the National Flood Insurance Program (NFIP). The Phase I assessment of the system was completed and screened against criteria of EC 1110-2-6067.

Metro Center Levee Improvements, Nashville, TN; USACE Nashville District - Project Engineer for geotechnical engineering study to assess the stability of the proposed improved levee over a three-mile length. A series of seepage analyses were performed to determine steady-state and rapid drawdown phreatic surfaces. Stability analyses were performed for end-of-construction, rapid drawdown and long-term, steady-state conditions using USACE methods and criteria to assess the factors-of-safety against instability.

East Saint Louis Levee District, St. Louis IL: Performed structural evaluation of flood walls and closure structures for the improvements and certification for the East St. Louis Levee District. AMEC was selected to provide professional services for the rehabilitation and certification of 86 miles of levee and floodwall in the American Bottoms floodplain along the east side of the Mississippi River. Underseepage analyses were conducted relating to performance and control using the USACE methodology defined by TM 3-430 and TM 3-424.AMEC evaluated the impact of and contribution by, these underseepage controls to combat the USACE's design flood event. The designs were reviewed and accepted by members of the USACE's Memphis District, Tulsa District, St. Paul District, and the Risk Management Center.

Proposed Fee for Phase 1 and Phase 2 Services

AMEC Environment & Infrastructure, Inc., (AMEC) is pleased to provide our cost proposal for levee certification services for the City of New Haven. This cost proposal includes all services that are anticipated for the investigation and analyses required to determine the levee's compliance with FEMA 65.10 requirements. The Cost Proposal follows the scope of work contained within our technical proposal.

AMEC has proposed a three phased approach to certification of these four levee units.

The cost estimate for Phase 1 and Phase 2 are based on our understanding of the project, the data that we anticipate will be available and found to be adequate for use in certification during Phase 1, and our assumptions on additional analyses that will be required because they are unavailable and/or do not exist. During Phase I, we will verify these assumptions and determine if changes are needed to the Phase 2 scope of services. Any changes to scope and fee associated with changes in these assumptions will be presented for discussion at the end of Phase 1.

It is unknown if Phase 3 services will be required at this time, or what the required extent of these services may be. Therefore, no Phase 3 services have been included in the cost estimate at this time.

We would welcome the opportunity discuss our certification approach in person. Should you have any questions, contact either Larry Sample or Bradley Johnson at 785-272-6830.

Proposed Fee for Phase 1 Services - $24,500.00

Proposed Fee for Phase 2 Services - $73,983.00

Combined Fee for Phase 1 and Phase 2 Services - $98,483.00

An itemized breakdown of the fee and assumptions that went into the fee build up can be found on the following page in Table 1.

Table 1 - New Haven Levee Certification Cost Proposal and Proposal Assumptions

	Phase I Costs	AMEC	Sub/Expenses	Total	Assumptions
1.1	Review of Existing Data	$4,920		$4,920	
1.2	Levee Walk	$7,640	$1,780	$9,420	**Assumes 3 people for one day**
1.3	Phase I Summary Report	$6,310		$6,310	**Simple screening report to discuss initial findings**
1.4	Roadmap to Levee Certification	$3,850		$3,850	**Phase II Scope of work, including any certification hurdles identified**
	Phase I Final Costs	**$22,720**	**$1,780**	**$24,500**	
	Phase II Cost Estimate (May be revised at the end of Phase I)				
2.1	Data Collection	$0			**Assumes Franklin County LiDar Data will be sufficient**
2.1.1	Field Survey of Levee Structures	$0		$0	**Assumes Franklin County LiDar Data will be sufficient, along with field measurements**
2.1.2	Survey Top of Levee	$0		$0	**Assumes Franklin County LiDar Data will be sufficient**
2.1.3	Baythymetric and Hydraulic Structure Field Survey	$0		$0	**Not anticipated at this time, since new hydrauilc modeling is not anticipated**
2.1.4	Soil Borings Location Survey	$0		$0	**Assumes mapping grade GPS used to locate borings, and elevations extracted by LiDar**
2.1.5	LiDar Acquisition and Development	$0		$0	**Assumes Franklin County LiDar Data will be sufficient, AMEC already has this data**
2.2	FEMA Design Criteria Investigation	$0			
2.2.1	Closure Evaluation & Review	$3,460		$3,460	**Assumes City of New Haven provides pipe videos and gate operations. AMEC can video the pipes for an additional fee if requested.**
2.2.2	Hydrologic Studies				
2.2.2.1	River Hydrology Update/Validation	$0		$0	**Does not include any riverine analyses. Freeboard not evaluated as part of this Task.**
2.2.2.2	Interior Drainage Hydrology	$3,840		$3,840	**Assumes analysis of up to 5 interior drainage structures. Does not include any analysis of the Sanitary Sewer Pump Station which is not required for levee certification.**
2.2.3	Hydrologic Studies				
2.2.3.1	River Hydraulics and Freeboard Analysis	$0		$0	**Does not include any riverine analyses. Freeboard not evaluated as part of this Task.**
2.2.3.2	Interior Drainage System Hydraulics	$5,260		$5,260	**Assumes analysis of up to 5 interior drainage structures. Does not include any analysis of the Sanitary Sewer Pump Station which is not required for levee certification.**
2.2.3.3	Pump Station Hydrualics and Assessment	$1,060		$1,060	**Does not include any analysis of the Sanitary Sewer Pump Station which is not required for levee certification.**
2.2.4	Geotechnical Exploration				
	Drilling Coordination/Setup	$2,040		$2,040	
	SPT Borings	$5,730	$8,498	$14,228	**Assumes no data beyond as-built plans are available for certification**
	Laboratory		$6,600	$6,600	**Assumes no data beyond as-built plans are available for certification/Lab Testing billed as a fee, not hourly**
2.2.5	Geotechnical Analysis				
	Stability/Seepage	$6,050		$6,050	
	Underseepage	$405		$405	
	Settlement	$3,420		$3,420	
	Data Review	$1,080		$1,080	
2.2.6	Embankment Protection Analysis	$3,970		$3,970	**Assumes embankment protection will be based on USACE UMRFFS Study (HEC-RAS Model). Assumes that Zone D will be based on LAMP Natural Valley Procedure and therefore levee breach or overtopping analyses not included.**
2.3	Additional Certificaiton Requirements	$0		$0	
2.3.1	O&M Manual Amendment	$6,670		$6,670	**Assumes an addendum of the O&M manual may be required for certifcation, but no rewrite**
2.3.2	As-Is GIS Deliverable	$0		$0	**Assumes As-Builts accurately reflect Levee System, and no updates are required.**
2.3.3	Certification Program Requirements	$0		$0	**Included in overall certification costs**
2.3.4	Final Compliance Inspection	$3,400		$3,400	
2.3.5	Certification Report with List of Corrections Required prior to Final Certification	$6,480		$6,480	
2.3.6	Project Management and Coordination Meetings (City, USACE, FEMA, and SEMA)	$6,020		$6,020	**Assumes 40 hours of meeting time, split between PM, Asst. PM, and Technical Director**
	Phase II Cost Estimate	**$58,885**	**$15,098**	**$73,983**	
	Phase I and II Total Cost Estimate	**$81,605**	**$16,878**	**$98,483**	

General Assumption/Limitations

1. A complete set of Record Drawings (as-builts) and Operation and Maintenance Manuals are available and will be provided

2. Testing of relief wells is not included. We assume the City will provide testing documentation on the existing wells.

3. We assume the City will provide video documention of all of the interior drainage structures or gravity flow utilities penetrating the levee system, for review by AMEC