Statement of Qualifications

Floodplain Engineering

for

National Flood Insurance Program Compliance

2016

H & H RESOURCES
CIVIL ENGINEERS

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STATEMENT OF QUALIFICATIONS

INTRODUCTION

H & H Resources, Inc. (HHR) was founded and incorporated in 2001 as a civil engineering consulting firm to assist clients in finding practical, feasible, and economical civil engineering design and permitting solutions. Our goal is to deliver products and services that are on time, accurate, and within budget. **HHR** specializes in drainage and floodplain engineering, and also provides other related civil engineering services. **HHR** is registered as a consulting engineering firm to practice in the states of Texas, Georgia, and North Carolina.

The majority of our engineers are Certified Floodplain Managers. Our staff has taught training courses on drainage design, published technical papers, and provided expert witness services. HHR is not only capable of providing practical and economical hydraulic design results but has a reputation in the industry for "thinking out of the box" and developing cost-effective solutions to complex issues. HHR has established a client trust that is proven over time and a confidence that precise results will be achieved from a select group of highly respected engineers and technical staff.

Our principals, Eric Friedrich, P.E., CFM and Wayne Fowler, P.E., CFM, each have over 30 years of experience. The staff includes registered professional engineers, GIS specialists and technical and administrative support, bringing to the firm a vast amount of engineering design experience and understanding for accomplishing all types of project responsibilities.

To illustrate our company's comprehensive background, our engineers have worked as staff or consultants for the following public entities:

- U.S.D.A Natural Resources Conservation Service
- Texas Department of Transportation
- Georgia Department of Transportation
- Fort Bend County Toll Road Authority, Texas
- Cities of Houston, Fort Worth, Bryan, Georgetown, Texas
- Cities of Albany, Jefferson, Kennesaw, Dallas, and Hiawassee, Georgia
- Georgia Counties: Union, Henry, Lee, Fulton, Tift, Douglas, Hall
- Harris County, TX Flood Control District
- Texas A&M University's Texas Engineering Extension Service
- UT Austin Center for Lifelong Engineering Education
- University of Texas at Arlington

In an effort to serve our clients better, our engineers continue to update their skills by receiving continuing education in various software programs and engineering topics related to drainage and transportation. As leaders in our profession, HHR provides instructors and training courses in the fields of hydrology, hydraulics, and erosion control. Our principals and employees have been involved in the development of drainage standards, policies, and procedures for local and state governments.

FLOODPLAIN ENGINEERING SERVICES

HHR has expertise to offer the following services on floodplain-related projects:

- Engineering
  - Watershed hydrology and analysis
  - Floodplain mapping
  - Bridge and culvert hydraulics
  - Channel improvements
  - Stormwater management (detention, retention, water quality)
  - Floodplain impact analysis
  - Bridge Scour analysis
  - Master planning
- Floodplain Management
  - Floodplain administration
  - Hazard Mitigation planning
  - Third party review of reports/designs
  - CRS program assistance
  - Expert Witness/Pre-Litigation Analysis
- NFIP-related Submittals
  - MT-1: CLOMA, LOMA, e-LOMA, CLOMR-F, LOMR-F
  - MT-2: CLOMR/LOMR
  - Floodway No Impact analysis and certification
  - Base Food Elevation (BFE) determinations

Our drainage engineering work requires us to be knowledgeable about coordination with local floodplain administrators and regulations, state departments of transportation, the U.S. Army Corps of Engineers, state environmental agencies, and local flood control districts.

Our engineers have extensive experience in a variety of design software, technical manuals, and procedures including:

- HEC-1, HEC-HMS, HEC-geoHMS
- HEC-2, HEC-RAS, HEC-geoRAS
- EPA-SWMM, XP-SWMM
- NRCS TR-20, TR-55, WSP-2
- USGS PeakFQ
- ArcMap, Spatial Analyst, 3D Analyst
- Microstation, Geopak Drainage
- Georgia Stormwater Management Manual
- FEMA Flood Insurance Studies (FIS), Flood Insurance Rate Maps (FIRM)
- FEMA *Guidelines and Specifications for Flood Hazard Mapping Partners*
- FHWA HDS 6, *River Engineering for Highway Encroachments*
- FHWA HY-8, *Culvert Analysis*
- FHWA HEC No. 18, *Evaluating Scour at Bridges*
- FHWA HEC No. 20, *Stream Stability at Highway Structures*
- FHWA HEC No. 23, *Bridge Scour and Stream Instability Countermeasures*

Certified Floodplain Managers

HHR's outstanding credentials as Certified Floodplain Manager (CFM) demonstrate our exceptional ability to provide floodplain engineering for public and private clients. Nine members of our staff, including both principals, have CFM credentials by either the Texas Floodplain Management Association (TFMA) or the Association of State Floodplain Mangers (ASFPM).

Floodplain Management

HHR has experience with various issues related to floodplain management. We can assist a community with ordinance review, recommendations for changes, and review by the state floodplain coordinator. Out staff can guide a community as it implements and updates its floodplain program, and integrate it with building permitting and inspections. **HHR** can assist a community prepare a hazard mitigation plan in order to be eligible for a Hazard Mitigation Assistance (HMA) program grant from FEMA. Communities that participate in the Community Rating System (CRS) earn flood insurance premium rate discounts. **HHR** can assist a community in planning its approach, documenting its activities, applying for CRS status, and coordinating with the ISO/CRS Specialist.

Floodplain Mapping/Revisions

In general, NFIP regulations related to changes in a mapped floodplain are found in 44 CFR 60.3 and 65. These regulations specify allowable impacts for construction in a floodplain or floodway, and the processes for documenting these impacts. The "Guidelines and Specifications for Flood Hazard Mapping Partners" describes FEMA's methods for analyzing or revising floodplains. **HHR** has completed at least 8 projects in the last 2 years that required a working knowledge of the procedures described in these documents. Many communities have adopted local regulations to supplement the minimum required by NFIP. We always coordinate with the local floodplain administrator to ensure compliance with local regulations.

A Conditional Letter of Map Revision (CLOMR) is FEMA's comment on a proposed project that would affect the hydrologic and/or hydraulic characteristics of a flooding source, including its floodway and base flood elevations (BFE). Typically, a request for Letter of Map Revision (LOMR) is filed within 180 days of completing the project approved in the CLOMR, and formalizes the changes. Both of these submittals to FEMA require a review of the effective hydrologic and hydraulic models, new models to show the revisions, preparation of exhibits depicting the proposed project, and possibly notifications to affected property owners. Analysis of effective floodplain models often requires knowledge of modeling techniques less commonly used today. **HHR** has interpreted and used effective data modeled in TR-20, SWFHYD (aka: NUDALLAS), HEC-1, HEC-2, and WSP-2.

If a project is shown to have No Rise/No Impact, then a CLOMR is not required under NFIP. A community has the option to require FEMA review even if NFIP regulations do not. Floodway no rise is interpreted as 0.00 ft. in the base flood elevation (BFE, or 100-yr event). If no floodway is defined, rise in BFE is limited to 1 ft. of impact according to NFIP, but some communities have adopted a stricter standard of allowing no (0.00 ft.) of rise in BFE. Meeting these standards often requires trial attempts to identify appropriate

mitigation measures. The preparation of No Rise/No Impact certification requires steps similar to CLOMR/LOMR. The document is submitted to the local community's floodplain administrator who may elect to accept it, review and comment on it, or refer it FEMA. No Rise certifications referred to FEMA must be submitted as a CLOMR with associated review fees.

According to FEMA guidelines, new hydrology should be prepared as gage analysis, regression equation, or rainfall-runoff model, with preference in that order unless limiting factors exist. If no gage analysis is applicable, regional regression equations should be used. If a watershed has been modified by urbanization, channelization, regulation or other factors affecting runoff volume, timing, or storage volume, then rainfall-runoff may be more applicable.

Floodplain revisions require the following hydraulic models:

- Duplicate Effective - Copy of the hydraulic analysis used in the effective FIS.
- Corrected Effective - Corrects errors in duplicate effective or adds detailed data.
- Existing Conditions - Reflects modifications in the floodplain since effective date.
- Revised Conditions - Includes proposed or completed project.

Hydraulic modeling is sometimes as simple as replacing an existing structure, but often it requires more complex analysis, including development of alternative designs.

Legal Issues

Some communities have adopted stricter standards than required in the NFIP. Part of the reason is that courts have commonly held governments liable for increasing flood and erosion damages on private property by changing natural drainage patterns and by increasing the location and rates of runoff due to drainage projects. Courts have often held governmental units liable for inadequately maintaining or operating culverts, bridge crossings, and channelization projects. Courts have held government units liable under a variety of legal theories including riparian rights, nuisance, trespass, negligence, strict liability, and "taking" private property without payment of just compensation. **HHR** has provided expert witness on drainage-related issues and pre-litigation design as result of complaint. As such, we are aware of the implications of drainage designs and the potential effect on properties. Compliance with NFIP regulations does not insulate government from pleas for legal remedy.

KEY PERSONNEL

At **HHR**, we value our employees and believe they are second to none. Our experienced professional staff of civil engineers, hydraulic engineers, GIS professionals, technical support and administrative personnel are selected based on their exceptional qualifications in our areas of expertise to provide our high standard of quality to ensure consistent client satisfaction.

Wayne E. Fowler, P.E., CFM
Task Leader
B.S. Engineering, Auburn University, 1983
Post-graduate studies, Auburn University, 1984

Mr. Fowler is a registered professional engineer in Georgia, Texas, North Carolina, and Alabama. He has over 30 years of experience in a variety of public and private sector civil engineering projects, particularly in hydrology and hydraulics analysis and design. He has managed roadway, drainage, floodplain, utility, and land development projects. He has served as a County Engineer and Floodplain Administrator. In 2001, he founded a consulting firm that later merged with **H & H Resources, Inc.** Prior employment experience includes USDA-NRCS; engineering consulting firms in TX, GA, and AL; and a 2-yr international assignment in water resource development.

Mr. Fowler is especially qualified for projects that have National Flood Insurance Program (NFIP) implications, having prepared over 90 Conditional Letter of Map Revision (CLOMR) and LOMR applications, No-Rise certifications, and other NFIP- or FEMA-related submittals in Texas, Georgia, and North Carolina. He has assisted with countywide floodplain mapping and floodplain map modernization projects. He has extensive experience in watershed hydrology, floodplain analysis, bridge, floodway, and encroachment modeling, coordination with FEMA, and floodplain/floodway delineation.

Mr. Fowler has completed the course "E273-Managing Floodplain Development through the National Flood Insurance Program" provided at FEMA's Emergency Management Institute in Emmitsburg, MD. He has a working relationship with the FEMA staff in Region VI (Texas) and Region IV (Georgia, North Carolina), as well as state floodplain coordinators.

He has provided engineering design and analysis for water resources projects including, bridge hydraulics and scour analysis, municipal and transportation storm sewers, pump stations, detention facilities, pavement drainage, and erosion control. Software experience includes HEC-1, HEC-HMS, SWFHYD, HEC-2, HEC-RAS, HY-8, WSP2, PeakFQ, XP-SWMM, EPA-SWMM.

Mr. Fowler is a member of the American Society of Civil Engineers (ASCE), Association of State Floodplain Managers (ASFPM), and Georgia Association of Floodplain Management (GAFM). He is an instructor in Georgia's Erosion Control Certification Program.

Eric R. Friedrich, P.E., CFM
Senior Project Manager
B.S. Civil Engineering, University of Texas, 1983

Mr. Friedrich has over 30 years of professional experience in project management and engineering analysis/design of water resources and transportation projects. His NFIP experience consists primarily of ensuring that transportation projects are in compliance with floodplain regulations (CLOMR, LOMR, No Rise). His extensive experience includes all phases of project development, from preliminary engineering to PS&E development for highway and bridge projects, with particular expertise in hydrology and hydraulics analysis and design.

In 2001, Mr. Friedrich founded **H & H Resources, Inc. (HHR).** Prior to launching HHR, Mr Friedrich gained valuable experience during his 11 years at TxDOT where he worked in the project design group with the Fort Worth District and subsequently moved on to serve as the Director of the Hydraulics Section for the TxDOT Bridge Division. In that capacity, Mr. Friedrich was instrumental in developing course material, and ultimately rolling out the drainage design sections of the statewide in-house Level I and Level II training program where he also served as lead instructor.

He has provided drainage studies, analysis and design of culverts, bridges, storm sewer systems, open channels and ditches, detention ponds, erosion and sediment control systems, and pump stations; analysis for bridge scour; and floodplain/floodway coordination with FEMA. Modeling expertise includes THYSYS Culvert and WinStorm; HEC-1, HEC-HMS, HEC-2, HEC-RAS; SCS TR-20, WSP-2, USGS PeakFQ, Geopak Drainage and EPA SWMM. Mr. Friedrich is an instructor under contract with University of Texas at Arlington teaching hydrology and hydraulics to TxDOT personnel.

Mr. Friedrich has been involved in the development of the following technical publications, standards development, and policy-generation:

- TxDOT Bridge Division Hydraulic Manual 3rd Edition, 1985
- AASHTO Task Force on Hydrology and Hydraulics, 1985 – 1990
- TxDOT Bridge Scour Evaluation Program, 1990
- TxDOT IH 10 Katy Freeway Reconstruction Program, Drainage Design Criteria, 2001-05
- Texas Engineering Extension Service, Professional Development Training Program, Hydrologic and Hydraulic Design for Culverts and Storm Drains, 2003-04.
- TxDOT US 290 / Hempstead Corridor Program Management, Drainage Design Criteria, 2006-09

Mr. Friedrich is a member of the American Society of Civil Engineers (ASCE), and the Texas Floodplain Management Association (TFMA).

Charles D. Absher, P.E., CFM
Senior Project Manager
B.S. Civil Engineering, Georgia Institute of Technology, 1989

Mr. Absher manages the Atlanta area branch office. He has over 26 years of engineering experience in water resource assessments and modeling, floodplain mapping, hydrologic/hydraulic analysis, and civil design and is a registered professional engineer in Georgia, Texas, North Carolina, South Carolina, Florida and Tennessee. His expertise includes unsteady flow analysis for bridge tidal hydraulics using HEC-RAS, and its precursor, UNET. In addition, he has developed transportation hydrology/hydraulics using SWMM for a variety of transportation drainage designs. He is also experienced in the application of Geographic Information System (GIS) databases as related to water resource systems planning, analysis, and design.

Mr. Absher is a member of the Georgia Association of Floodplain Management, is a Certified Engineer of Record for Civil and Hydrologic/Hydraulic Design under Georgia Safe Dams Program, and is a Certified Design Professional in Erosion & Sediment Control by the Georgia Soil & Water Conservation Commission.

Cynthia R. Carle, P.E., CFM
Project Manager
B.S. Civil Engineering, Texas A&M University-Kingsville, 1998

Ms. Carle manages HHR's Sugar Land, Texas branch office. Her primary area of expertise is surface water hydrology and hydraulics. For over 17 years, she has served as Project Manager and Engineer on numerous transportation drainage projects. Her project experience includes storm sewer improvements, floodplain studies, drainage and storm water management, bridge and culvert hydraulic analysis, hydrologic and hydraulic computer modeling, drainage mitigation analysis, and bridge scour analysis.

Ms. Carle has computer modeling experience using models developed by the U.S. Army Corps of Engineers including HEC-1, HEC-2, HEC-HMS, HEC-RAS; the Soil Conservation Service including TR-20, TR-55 and WSP2; the Texas Department of Transportation including CULVERT, WINSTORM, THYSYS RUNOFF and, THYSYS PUMP; and the Environmental Protection Agency (EPA) Stormwater Management Model (SWMM). Ms. Carle is a member of the Texas Floodplain Management Association (TFMA).

Jaime Benoliel, P.E., CFM
Project Engineer
B.S. Civil Engineering, University of Houston, 2001

Ms. Benoliel specializes in hydrology and hydraulics. Prior to joining H&H Resources, Inc., she was employed with the Harris County Flood Control District. She has served as Project Engineer on multiple flood study and transportation drainage projects. Her 15 years of project experience includes storm sewer improvements, bridge, culvert, detention pond sizing, hydrologic and hydraulic computer modeling, and drainage mitigation analysis.

Ms. Benoliel has experience with HEC-1, HEC-2, HEC-RAS (steady and unsteady), GEO-RAS, HEC-HMS; UNET, Geopak Drainage, THYSYS CULVERT and WINSTORM, XP-SWMM, and GIS (Arcmap, Spatial Analyst, 3D analyst), and the Environmental Protection Agency (EPA) Stormwater Management Model (SWMM).

Ms. Benoliel is a member of the Texas Floodplain Management Association (TFMA), and has been an instructor in drainage engineering courses.

Ms. Benoliel co-authored the following papers with Dr. Yu-Chun Su:

- Sediment Transport Modeling of Dredged Disposal Materials Near Sabine Pass." Coastal Texas 2020 Technical Erosion Conference 2005, Houston, Texas, September 14-16, 2005.
- "Modeling of Flood Control Channels Using SMS/RMA2." TFMA 17th Annual Texas Flood Conference, Fort Worth, Texas, 2004.

Adam Faulkner, P.E., CFM
Engineer
B.S. Biological Systems Engineering, Virginia Polytechnic Institute & State University (Virginia Tech), 2002

Mr. Faulkner works from the Blairsville, GA office, and has over 14 years of experience in public works improvement projects, stormwater facility maintenance management, land development, and stream/wetland restoration. His recent employment experience includes the Hall County Georgia Public Works Department where Mr. Faulkner performed permit review, design and construction phase services. He has also participated in stream and wetland restoration projects and land development projects.

Mr. Faulkner is a member of Georgia Association of Floodplain Management and a Certified Floodplain Manager in the State of Georgia. He is experienced in the use of various computer programs including ArcMap, Spatial and 3D Analyst, HEC-RAS, Microstation and Geopak.

PROJECTS

Our floodplain engineering projects vary in size from BFE determinations for subdivisions, to CLOMR/LOMR submittals based on complex revisions to hydrology, hydraulic structures, and floodways. In the last 10 years we have completed almost 100 NFIP-related engineering projects in Georgia, North Carolina and Texas. We have also provided leadership and guidance through floodplain ordinance review, multi-jurisdictional hazard mitigation planning, and other floodplain management issues. The following project list illustrates **HHR's** recent and ongoing projects that have required detailed knowledge on NFIP, floodplain mapping procedures, and various state and federal program compliance.

- **US 290 / Hempstead Tollway (IH 610 to FM 2920), TxDOT Houston District, TX (2006-present)**; HHR is part of the Program Management Consultant (PMC) team as Drainage Task Manager. HHR is a sub-consultant to HNTB to provide drainage impact studies for Hempstead Tollway and US 290 from IH 610 to FM 2920 along a 34 mile corridor. Our services include preliminary storm sewer analysis, bridge hydraulics, floodplain impact/mitigation studies, stormwater management facilities, development of corridor-wide drainage design criteria, contract coordination, review of drainage design tasks by Section Design Consultants, and construction phase services.
- **Flint River Preserve, Warwick, GA (2013)**; Base flood elevation and Letter of Map Revision (LOMR) for proposed 300+ acre residential development along the Flint River in Worth County, Georgia. Design software: USGS PeakFQ, HEC-RAS, Microstation.
- **Percosin Flood Study, Albany, GA (2012)**; Base flood elevation determination and Letter of Map Revision for existing residential community located within an A Zone. Project included coordination with local community and elected officials. Design software: HEC-RAS, ArcMap, Microstation.
- **Update Community Floodplain Models, Griffin, GA (2012-present)**; Update floodplain models to reflect stormwater conveyance improvements. Provide revised floodplain boundary delineation. Design software: ArcGIS, HEC-RAS.
- **Floodplain Mapping, Douglas County, GA (2011-2013)**; Quality Control reviews of hydrologic and hydraulic modeling for the Dog River, Upper Sweetwater Creek (Town Creek), and Wolf Creek Basins to assure compliance with accepted engineering practices and FEMA mapping standards.
- **Floodplain Mapping, Dallas, GA (2011)**; Providing engineering services for analysis of the City of Dallas' future floodplain mapping required by Metropolitan North Georgia Water Planning District. Tasks include converting HEC-2 models to HEC-RAS, Limited Detailed hydraulic analysis to map existing and proposed floodplains. Design software: HEC-RAS, HEC-GeoRAS, HEC-HMS, HEC-GeoHMS, ArcMap, Microstation.
- **Caddo Creek Resources, Harrison County, TX (2010-2011)**; Floodplain, base flood elevation, and non-encroachment zone determination for 3600 sm watershed of Sabine River and 125 sm watershed of Eightmile Creek. Purpose was to facilitate compliance with NFIP regulations. Design software: USGS PeakFQ, HEC-RAS, Microstation.

- **Whalen Law Firm Expert Witness Services (2010-present)**; Providing on-call expertise and expert withness services on drainage engineering issues. Services include preparing exhibits, design recommendations, provide depositions and /or testimony to legal team.

- **Legacy Park Circle, Kennesaw, GA (2010-2011)**; Hydrology/hydraulics design, NFIP compliance, scour analysis, complete PS&E for replacement of bridge-class culvert with ConSpan® precast bridge. Project team leader and prime consultant. Coordination with local utilities. Project funded by FEMA for City of Kennesaw. Design software: HEC-1, HEC-RAS, Microstation.

- **Marsh Landing, Albany, GA (2010);** No rise submittal. Hydrologic and hydraulic analysis of floodway impact due to proposed residential development.

- **Beck Street Extension Project, Bryan, TX (2005-2009)**; Hydrology/ hydraulics design for storm sewer improvements, storm water management. Floodplain studies (CLOMR, LOMR requests) including revisions to hydrology, detention ponds, new road crossings. PS&E included four new location bridge-class culverts and two detention basins. Design Software: HEC-1, HEC-2, HEC-RAS, Geopak Site.

- **Countywide Floodplain Mapping, Henry County, GA (2008-2009)**; Drainage sub-consultant. Future floodplain mapping required by Metropolitan North Georgia Water Planning District. Tasks include: converting HEC-2 models to HEC-RAS, Limited Detailed hydraulic analysis to map existing and proposed floodplains. Design software: HEC-RAS, HEC-GeoRAS, HEC-HMS, HEC-GeoHMS, ArcMap, Microstation.

- **College Street at San Gabriel River, Georgetown, TX (2008-2011)**; Bridge hydrology/ hydraulics design, scour analysis, floodplain study, floodway revisions, CLOMR and LOMR requests, storm sewer improvements, culvert design, Water Pollution Abatement Plan (WPAP). Coordinated with City FPA, FEMA's review contractor. Design software: HEC-HMS, WSP2, HEC-RAS, Microstation, Geopak Drainage, Geopak Site.

- **Sabine Mining Company Haul Road at Sabine River, Rusk County, TX; (2008-2010)**; Watershed study for 3500 sm drainage area, hydraulic analysis of multiple alternatives for road crossing, impact analysis of crossings, sediment ponds on floodplain. Coordinated with County FPA, Railroad Commission of Texas (RCT). Design software: USGS PeakFQ, HEC-RAS, Microstation.

- **Multi-Jurisdictional Hazard Mitigation Plan Update, Lee County, GA (2009-2010);** Assist in establishing and implementing Planning Committees, update potential hazards and potential risks. Assist County with public hearings and addressing public comments. Assist with data input into GMIS system. Prepare and present draft and final reports/documents to all municipalities and GEMA.

- **Flood Mitigation Assistance Plan, Lee County, GA (2008-2009);** Assist County in developing mitigation strategies to reduce/eliminate losses associated with Severe Repetitive Loss Properties. Prepared written document for approval by FEMA. Coordinated with County FPA, GEMA and FEMA.

- **North Mitchell County Elementary School, Mitchell County, GA (2009);** Base flood elevation determination for federally funded school site. Hydrologic and hydraulic

analysis of a Zone A flood zone to determine existing and proposed base flood elevations. Included 6 bridges, split flows. Coordinated with County, Architect, General Engineering Consultant. Design software: HEC-HMS, HEC-GeoRAS, ArcMap, Microstation.

- **Precinct Line Rd. at Walker Branch, Fort Worth, TX (2006-08)**; Hydrology and hydraulic design of bridge replacement and approach embankment in floodplain. Watershed analysis, channel improvements and lining, impact/mitigation analysis, floodplain study (CLOMR request). Coordinated with City FPA, FEMA's review contractor. Design software: SWFHYD, HEC-2, HEC-RAS, Microstation, Geopak Site.

- **Crisp County Courthouse Flood Study, Crisp County, GA (2008);** Base flood elevation determination. Hydrologic and hydraulic analysis of a Zone A flood zone to determine existing and proposed base flood elevations. Coordination with County, City FPA, architect. Design software: HEC-RAS, Microstation.

- **DFIRM Map Modernization, Union County, GA (2005 – 2007)**; Assist with administration of map modernization program, including base mapping and copyrighting of GIS data, modeling using limited detail study methods, floodplain and floodway delineation, QC existing floodplain and floodway models, FIS and dFIRMs.

- **IH 35 at Lake Creek, Round Rock, TX (2007);** Hydrology and hydraulics design of bridge modifications to IH 35 frontage road and ramp bridge. Updates to existing FEMA hydrology and hydraulics modeling, analysis of bridge and channel improvements to achieve no impact to floodplain/floodway elevations. Coordination with City FPA, TxDOT. Design software: TR-20, WSP2, HEC-RAS, Microstation.

- **Jal Draw at SH 349 Channel Realignment, Ector County, TX (2007);** Hydrologic and hydraulic modeling for channelization, bridge, culvert crossings for new roadway. Drainage study and report, and floodplain study (CLOMR request). Complex coordination with City FPA, FEMA due to (1) floodway encroachments on the FIRM not matching effective model; (2) Unmapped, but revised hydrology from a previous LOMR; (3) Structures omitted from the effective model; and (4) Revised floodway.

- **Hog Pen Ditch, Albany, GA (2005-2006)**; Hydrologic and hydraulic analysis of proposed improvements to levee to alleviate interior flooding along Flint River. Prepared CLOMR and LOMR documentation. Coordinated with US Army Corps of Engineers, City FPA, GDOT, and FEMA.

- **SH 105 at E. Fork San Jacinto River, Liberty County, TX (2005-06);** Hydrology and hydraulics design of bridge and channelization for new location of major river crossing. CLOMR request. Coordinated with TxDOT, FEMA. Design software: TR-20, HEC-RAS.

- **IH 10 Katy Freeway GEC, TxDOT Houston District, TX (2001-2005)**; HHR was the Drainage Task Leader for this interstate corridor improvement project. Design included storm sewer improvements, drainage and storm water management, drainage design coordination, floodplain impact studies, and third party review of drainage designs (PS&E) for 21 miles of freeway main lanes and frontage road reconstruction. Our role was also to coordinate drainage with external stakeholder agencies. The challenges of the project included hydraulics design of seven stream crossings and three stormwater pumping stations. Permitting issues required coordination of drainage design to

minimize impact on jurisdictional waters. As part of project management, HHR provided PS&E review of drainage construction for ten construction contracts and preparation of corridor-wide drainage design criteria and special specifications.

- **Sunset Valley RV Park Bridge, Union County, GA ; HHR**s services on this new development project included design and permitting for the community water and sewer systems, hydraulic design of covered bridge, and determination of floodplain elevations. The floodplain evaluation included two mountain streams that converge on this site. The 1% flood diverts between the streams, requiring complex modeling in HEC-RAS. We also evaluated the impact of the proposed bridge crossing on the Zone A floodplain.

- **Cox Circle Development, Forsyth County, GA; HHR** developed a floodplain impact study and No-Rise Certification for a new residential development adjacent to Dick Creek. The study included hydrologic and hydraulic analysis to determine both upstream impacts due to floodplain encroachment, and downstream impacts due to loss in storage volume. This analysis determines the need for onside stormwater management. Local regulations required a floodplain storage assessment to ensure that 100-year storage volume was not decreased.

- **Water Supply Improvements, Cornelia, GA;** The City is upgrading its water supply system, including the reservoir. HHR conducted hydrologic analyses of the Hazel Creek Multiple-Purpose Dam No. 7, built in the early 1960's as both water supply for the City of Cornelia and for flood control. As an Engineer-of-Record with Georgia Safe Dams Program, HHR prepared this analysis to show that upgrades meet Georgia Safe Dams Program Category I Standards, including dam breach study. HHR provided safe yield calculations for the stream to meet state environmental regulations.

- **Little Willeo Road Pedestrian Bridge, Cobb County, GA;** As part of its transportation enhancement activities, the County is improving pedestrian access along this route which includes a stream crossing. HHR developed a No-Rise Certification for the proposed crossing, which is upstream and adjacent to Little Willeo Road. The detailed study reach for this stream in the effective FEMA hydraulic model ended downstream of the subject crossing, so HHR extended the model to include both the existing road bridge and the proposed pedestrian bridge.

REFERENCES

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