Chapter 27

Hydraulic Data and U.S. Coast Guard Permits

THIS PAGE LEFT BLANK INTENTIONALLY

Chapter 27

Hydraulic Data and U.S. Coast Guard Permits

27.1 Bridge Hydraulic Report (BHR)

A Bridge Hydraulic Report (BHR) package consisting of the BHR and, as applicable, the Bridge Hydraulics Recommendation Sheet, bridge hydraulic calculations, and scour calculations shall be prepared as specified in ***Chapter 4*** of the FDOT ***Drainage Manual, Topic No. 625-040-002***. The BHR package shall be processed as specified later in this chapter.

27.2 Bridge Hydraulic Recommendation Sheet (BHRS)

A Bridge Hydraulic Recommendation Sheet (BHRS) for new structures and widenings shall be prepared as specified in ***Chapter 4*** of the FDOT ***Drainage Manual***. The BHRS package shall be processed as specified later in this chapter.

27.3 U.S. Coast Guard Permit

For Federal Aid projects, a U.S. Coast Guard Permit may be required for the construction of a bridge or causeway over navigable waters. If a water body is tidally influenced, a permit will probably be required. The FDOT District Permit Coordinator will determine when a permit is required for a particular site. If a determination is made that a permit is not required, FHWA concurrence is necessary (see, ***Project Development and Environment Manual, Topic Number 650-000-001***).

The permit shall be prepared in accordance with the ***U.S. Coast Guard Bridge Permit Application Guide***. The official instructions for preparing and handling the permit drawings will be issued by the District Permit Coordinator. Additional information is available in ***Environmental Management Office Procedure No. 650-040-001***.

Prior to preparation of the permit, the U.S. Coast Guard office having jurisdiction over the waterway for the project shall be notified of the intent to file a permit, and preparation of the permit shall be coordinated with that same office to minimize the chance for conflict, incorrect clearances, or other requirements not being shown.

27.4 Scour Considerations

Scour estimates shall be developed using a multi-disciplinary approach involving the Hydraulics Engineer, the Geotechnical Engineer, and the Structures Design Engineer. Bridges and bridge culverts shall be designed to withstand the design flood without damage and should withstand the 500-year flood (super flood) without failure. Refer to the ***Structures Design Guidelines*** for specific foundation design steps.

27.4.1 Development of Scour Design Criteria

The extent and the mitigating steps needed to resolve scour problems should be resolved early in the design process. The Bridge Development Report (BDR), or 30% structures plans submittal when a BDR is not required, is a means of addressing and resolving all major design issues early in the total design process and should also define the need for scour considerations, establish the scour parameters, and arrive at possible solutions. This can be achieved through the concerted and cooperative efforts of the Hydraulics, Geotechnical, and Structures Design Engineers. The necessary steps are as follows:

1. The Drainage Design Engineer evaluates stream stability and scour potential based on all available data, assumed soil conditions, structure positioning, and foundation designs. The Drainage Design Engineer's assumptions (hydraulic, geotechnical, and structural) and design parameters should be discussed with both the Geotechnical and Structures Design Engineers. When evaluating stream stability and scour potential, the recommendations developed from FHWA's ***Hydraulic Engineering Circular (HEC) 18 and 20*** should be followed as well as the design requirements provided in ***Chapter 4*** of the FDOT ***Drainage Manual***. This work should take place early in the PD&E study where changes in the alignment could affect the severity of general scour.
2. Given the scour potential and based on known subsoil conditions and where knowledge of the local variability of the subsoil is available, the Geotechnical Engineer will then consider the possible alignments. It may be necessary to conduct exploratory work if variability of subsoil conditions are suspected but not sufficiently defined. The results of exploratory investigations should be discussed with both the Hydraulics and Structures Design Engineer, and any previous scour assumption verified and/or modified.
3. The Structures Design Engineer should provide approximate span ranges, pier configurations, and pier locations necessary for the different alternates. In addition, possible foundation types and approximate size should be developed

such that the Drainage Design Engineer can estimate local scour potentials. Conditions to be considered are:

a. The extent and severity of scour along the alignment must be developed. For example, for bridges over a wide body of water, general scour could vary in extent and severity. It may be reasonable, therefore, to consider fewer foundations in the most severe areas (i.e., span the problem), or take appropriate steps to assure the structural integrity of the foundation in those locations.

b. The pile driving resistance, which must be overcome at the time of construction, may be greater than the ultimate pile capacity at a later date due to subsequent scour activity.

c. Likewise, design drilled shaft capacity must account for the possibility that ultimate capacity will be reduced as a result of future scour activity.

4. The Drainage, Geotechnical and Structures Design Engineers shall develop the scour potential and rate each location and furnish the results to the District Environmental Management Office (DEMO) Engineer for consideration in establishing the recommended alignment(s).

5. The preferred alignment is established by others.

6. The Structures Design Engineer develops more detailed calculations showing possible span arrangements and types and sizes of foundations.

7. The three engineers review the proposed configuration to assure that scour has been properly addressed. (The Drainage Design Engineer reviews both the general and local scour potential and recommends continuation or changes).

8. The Structures Design Engineer finalizes his configuration and proceeds with an even more detailed analysis of the foundation including the anticipated pile tip elevations. All three Engineers shall review and concur. The final results are then incorporated into the BDR or 30% Plans Stage as applicable.

The eight (8) steps described above are shown as a flow diagram in ***Exhibit 27-A.***

27.4.2 Submittal Requirements for Scour Design

During the 30% and 90% structures plans stage reviews, the EOR shall coordinate the reviews of the design of both the Drainage and Geotechnical Engineers to assure compliance with the results of the scour calculations. This review activity is shown diagrammatically in ***Figure 27.2***. The Scour Calculations shall be processed as specified hereinafter.

27.5 Debris Accumulation

Debris accumulation on the upstream side of substructure units can significantly affect the flow of water and cause significant scour. The designer shall evaluate the type of vegetation upstream from the bridge and consider the probability of debris accumulation in establishing types and locations of substructure units. Special consideration shall be given to mitigating debris accumulation on substructure units.

Debris clearance criteria are specified in the FDOT ***Drainage Manual***, ***Chapter 4***.

27.6 Widenings

The design for scour described above must be included in the widening of an existing bridge structure classified as a major widening as defined in the FDOT ***Structures Design Guidelines***.

The requirement to include scour potential in the design of the widening of an existing structure classified as a minor widening will be considered by the Department on an individual basis.

Hydraulic design procedures are specified in the FDOT ***Drainage Manual***, ***Chapter 4***.

27.7 Scour Elevations

The 100-year and 500-year scour elevations are required for the design of all bridges over watercourses. In addition, the Long-Term Scour Elevation shall be established for bridge structures required to meet the extreme event vessel collision load. For more information on these scour elevations see the FDOT ***Drainage Manual***.

Exhibit 27-A Structural Plans Development
Sheet 1 of 2

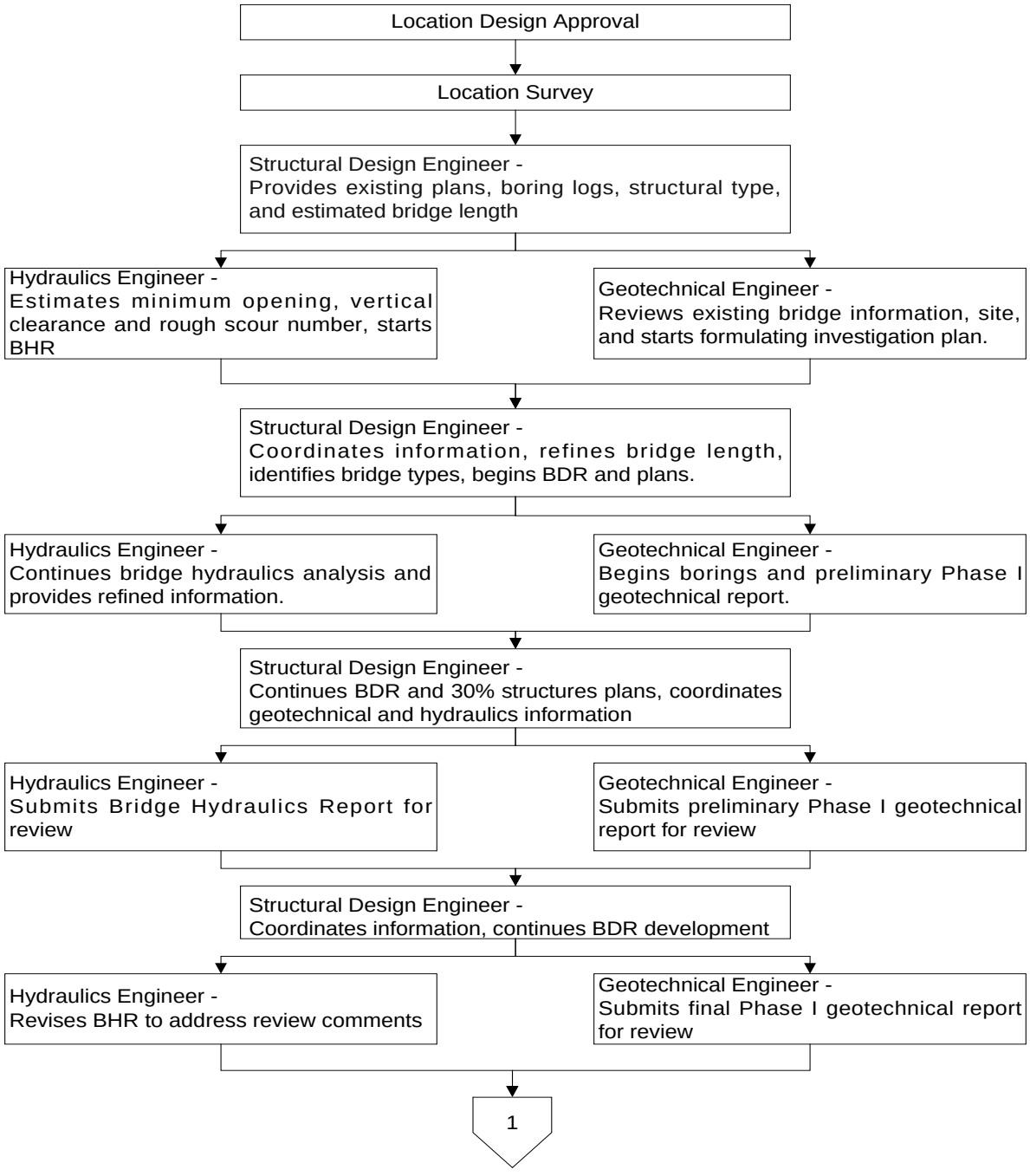
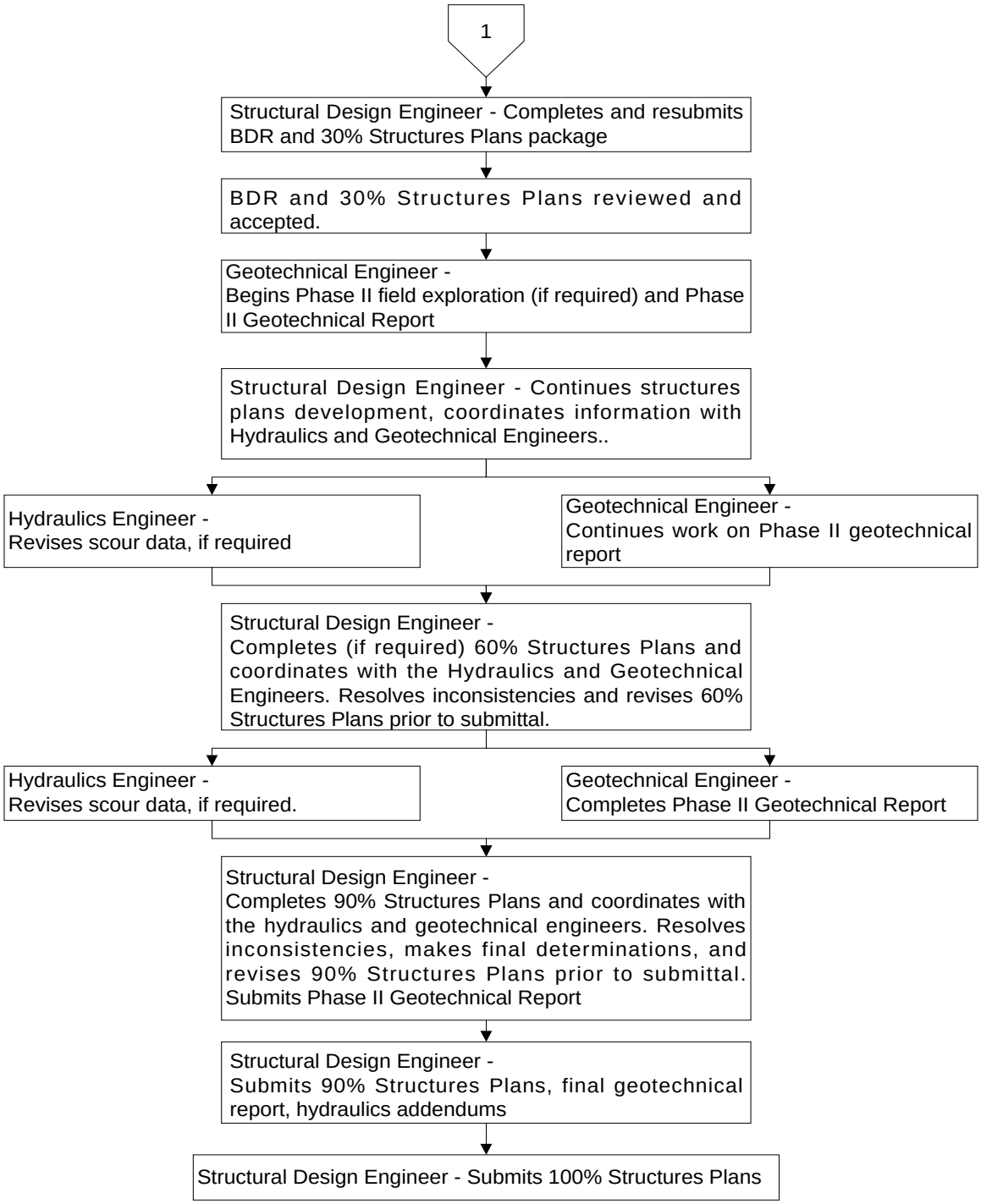


Exhibit 27-A Structural Plans Development
Sheet 2 of 2



THIS PAGE LEFT BLANK INTENTIONALLY