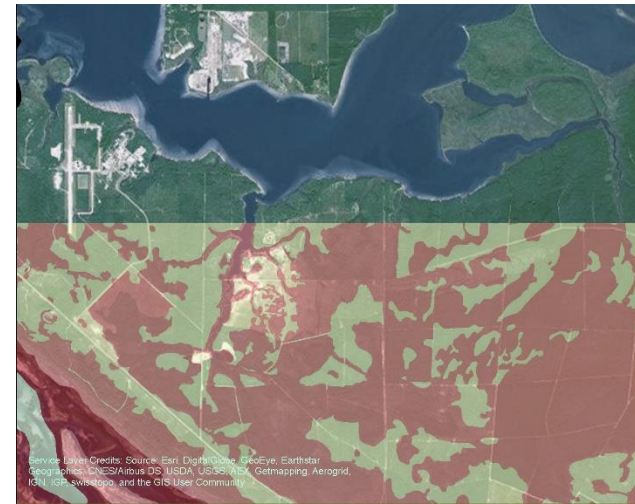




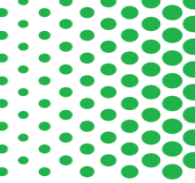
Floodplains



The environmental review, consultation, and other actions required by applicable federal environmental laws described in this training are carried out by FDOT pursuant to 23 U.S.C. § 327 and a Memorandum of Understanding dated December 14, 2016 executed by FHWA and FDOT.

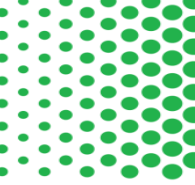


FDOT PD&E Manual, Part 2, Chapter 13 Floodplains

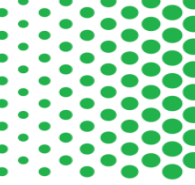


- Primary resource for guidance on FDOT projects
- Outlines the procedure for evaluating project impacts on 100-year (base) floodplains
- Provides guidance on how to document floodplain analysis in the Location Hydraulics Report and/or Environmental Document
- Instructions are based on Code of Federal Regulations, Title 23, Chapter 1, Subchapter G, Part 650, Subpart A (23 CFR 650A)

What is a Floodplain?



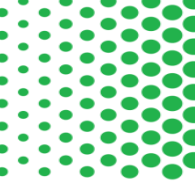
- A **floodplain** is any land area susceptible to being inundated by floodwaters from any source.
- The **base flood** (100-year flood) is the flood or tidal event having a 1% chance of being equaled or exceeded in any given year
- The **base floodplain** is the area subject to flooding by the base flood.
- A **Flood Insurance Rate Map (FIRM)** is the official map of a community on which FEMA has delineated base floodplains.
- All cross drains have an associated base floodplain.



What is an Encroachment?

- Activities or construction within the floodplain including fill, new construction, improvements, and other development.
- Encroachment examples:
 - Extending existing cross drain
 - Embankment fill
 - Proposed cross drains and bridges

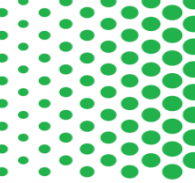
Significant Encroachments



Rare on FDOT projects due to Section 4.4 of the Drainage Manual:

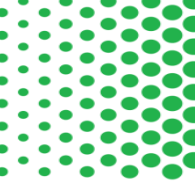
- Cross drain design shall meet local community requirements.
- Any increase in backwater shall not significantly change offsite land use values, unless flood rights are acquired.

Location Hydraulics Report...



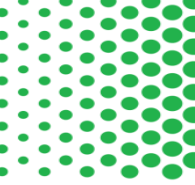
- describes the types of construction activities near floodplains and includes a description of the measures to avoid or minimize floodplain impacts associated with the project.
- must be reviewed by the District Drainage Engineer to verify that all base floodplains are identified and it is consistent with existing basin and floodplain management program.
- results are summarized (along with other technical reports) in the Preliminary Engineering Report.

Project Floodplain Impacts...



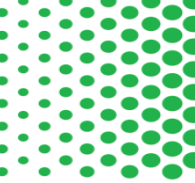
- shall be assessed for all FDOT projects which involve activities or construction near or within the floodplains. (23 CFR 650A)
 - However, not all projects near or within floodplains require a Location Hydraulics Report.
- still must be documented in the Environmental Document and/or Standard Checklist, even for projects not requiring an LHR.
 - Documentation requirements depend on:
 - Encroachment Type
 - Environmental Document Type

Encroachment Types



- An LHR is not required for the following encroachment types:
 - No Involvement
 - No
- An LHR may be required for Minimal Encroachment, depending on the type of Environmental Document.
- An LHR is always required for Significant Encroachment.

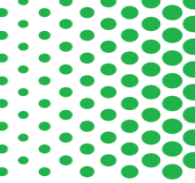
Environmental Document Type



- An LHR is not required for the following types of Environmental Documents:
 - Type 1 Categorical Exclusion (CE)
 - Non-Major State Action (NMSA)
- An LHR is required for:
 - Type 2 CE and EA with Minimal Encroachments
 - DEIS and SEIR with Minimal or Significant Encroachments

(Refer to PD&E Manual, Part 1, Chapter 2 for more information on types of Environmental Documents)

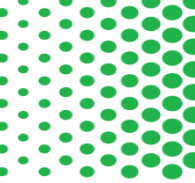
LHR Documentation



Chapter 13 provides a detailed list of items to be discussed in an LHR. A few of those items are summarized here:

- Drainage basins/cross drains
- History of flooding to the existing facilities
- Locations of floodplain encroachments
- Practicability of avoidance alternatives and/or measures to minimize impacts
- Determination of the impact on regulatory floodways
- Consistency with local floodplain development plan
- Results of any risk assessments
- Statement final drainage design will be done in accordance with FDOT Drainage Manual and Design Standards.

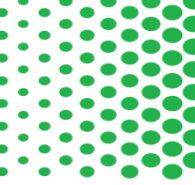
LHR Documentation



The LHR should also include discussion of the following:

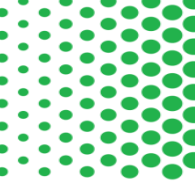
- The risks associated with implementation of the action.
- The impacts on natural and beneficial floodplain values.
- The support of incompatible floodplain development.
- The measures to minimize floodplain impacts associated with the project.
- The measures to restore and preserve the natural and beneficial floodplain values by the project.

LHR – Level of Drainage Analysis



- Detailed calculations for every cross drain associated with a project generally should be avoided.
 - Impacts to flood elevations and limits are minimized by designing cross drain facilities in accordance with the FDOT Drainage Manual.
- Examples of when calculations are warranted:
 - Long extension of existing cross drain
 - To determine preferred alternative for new alignment
- For alternatives with similar floodplain impacts, a single analysis for all alternatives may be appropriate.

LHR Documentation – Significant Encroachments



Chapter 13 also lists additional documentation required for Significant Encroachments. Some of those are summarized here:

- Measures to minimize floodplain impacts associated with the project
- Practicability of avoidance alternatives to significant encroachments or support of incompatible floodplain development
- Estimate both the existing floodplain volume (capacity) and the volume of the encroachment
- Flooding impacts to private property both upstream and downstream

Projects Involving a Bridge Structure

If a separate Bridge Hydraulic Report (BHR) is not prepared during PD&E, the following items must be addressed in the LHR:

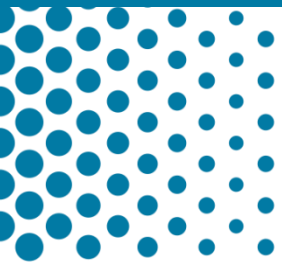
- Conceptual bridge length
- Conceptual scour considerations
- Preliminary clearances both vertically and horizontally

Summary Statements

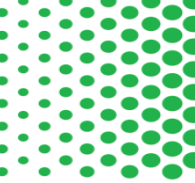
The report shall include a statement that affirms the type and impact of the encroachment and addresses consistency with local floodplain ordinances.

- There are six sample summary statements in Chapter 13.
- If appropriate for the project, use of one of the sample statements as is.
- Otherwise, modify the sample statement as necessary to adequately affirm the impact of the encroachment.

Lesson 5: Risk Evaluation: Assessment or Analysis

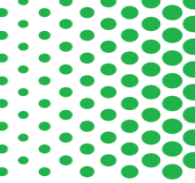


Risk Evaluation



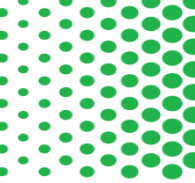
- *Risk* means “the consequences associated with the probability of flooding attributable to an encroachment. It shall include the potential for property loss and hazard to life during the service life of the highway.” *[as defined in 23 CFR 650.105 (o)]*
- A risk evaluation must be included in the LHR.
- Evaluation of risk should include the following:
 - Risks to transportation infrastructure – road closure, repair costs
 - Risks to highway users – loss of life, service disruption
 - Risks to residents – damages, property loss

Risk Evaluation



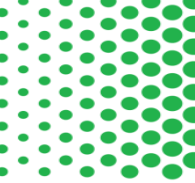
- The FDOT recognizes two types of risk evaluations:
 - A risk **assessment** is typically appropriate for:
 - Minimal encroachments
 - Small structures
 - Structures whose size is not influenced by hydraulic constraints
 - A risk **analysis** is typically appropriate for:
 - Significant encroachments anticipated to increase or substantially change floodplain elevations and/or limits
- The District Drainage Engineer, in consultation with the PD&E Project Manager, will determine if the floodplain encroachment is significant and what type of risk evaluation is warranted.

Risk Assessment



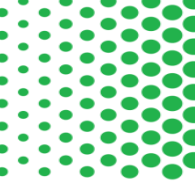
- *Risk assessment* is a subjective analysis of the risks resulting from various design alternatives, without detailed quantification of flood risks and losses.
- It may consist of developing the construction costs for each alternative, and subjectively comparing the risks associated with each alternative.
 - For example, where alternative alignments are compared, a rating scale of 1-5 (low to high potential) could be used to evaluate the following factors:
 - Risks to infrastructure
 - Risks to users
 - Risks to residents

Risk Analysis



- *Risk analysis* encompasses an economic comparison of alternatives using expected total costs (construction costs plus risk costs) to determine the alternative with the least total expected cost to the public.
- Risk analysis is rarely needed for FDOT projects because complying with FDOT and WMD design requirements results in minimal changes to flood stages.
- See Chapter 4 of the FDOT Drainage Design Guide or FHWA Hydraulic Engineering Circular 17 (HEC-17) for more guidance on this evaluation.

Points to Remember



- For most FDOT projects with floodplain encroachments, the encroachments will be minimal due to abiding by FDOT and WMD criteria.
- Documentation requirements depend on the Encroachment Type and type of Environmental Document
- Chapter 13 of Part 2 of the FDOT PD&E Manual is the primary guide for how to evaluate and document floodplain impacts.