

Strategies for Success

Wetlands Training Workshop for Consultants

December 6, 2007



Please Note: This presentation is for a training workshop only and is not meant to be a substitute for the Freshwater Wetlands Act or the *Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act*.

Floodplain Impacts

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Definitions

Pertinent Wetland Definitions:

- Flood Plain
- Floodway
- Flowing Body of Water
- River
- Stream/Intermittent Stream
- Area Subject to Flooding
- Area Subject to Storm Flowage

Wetland Edge Requirements

- As per Rule 7.04 A (5), show edge and elevation of 100-year floodplain.
- Option to provide clear and convincing evidence that the project site is above any probable 100-year flood elevation.

Preliminary Considerations

3 Possibilities for work near a river, stream, intermittent stream:

- The 100-year flood hazard area on the FEMA FIRM has elevations of the 100-year flood plain, which should be used for 100-year floodplain limits delineation.

Preliminary Considerations (continued)

- The FEMA FIRM depicts a flood hazard area, but does not provide the elevation or profile of 100-year flood plain level. Then a study must be completed to determine floodplain elevation, or show elevation determination is not needed.

Preliminary Considerations (continued)

- The FEMA FIRM does not show a flood hazard area, but project is adjacent to a river/stream. Then a study must be completed to determine floodplain elevation, or show elevation determination is not needed.

Preliminary Considerations (continued)

For all 3 situations:

- The presence of the floodplain needs to be indicated on the site plan, and,
- The designer needs to determine and indicate whether or not the proposed project is located within the floodplain.
- OR provide “clear and convincing documented evidence that the project site is above any probable 100 year flood elevation”

Determining the Floodplain Elevation through Analysis

- Determination of the 100-year flood discharge rate by hydrologic analysis.
- Performance of a hydraulic analysis to determine a flood profile for the pertinent watercourse reach. (Use HEC-RAS or similar method)

Rules 10.05C (16) &(17)

- Rule 10.05 C (16) relates to impacts of decrease in flood storage capacity, and how this may effect life and/or property.
- Rule 10.05 C (17) relates to reduction in the rate at which flood water is stored in the floodplain.

Address Rule 10.05c (16) & (17).

Options:

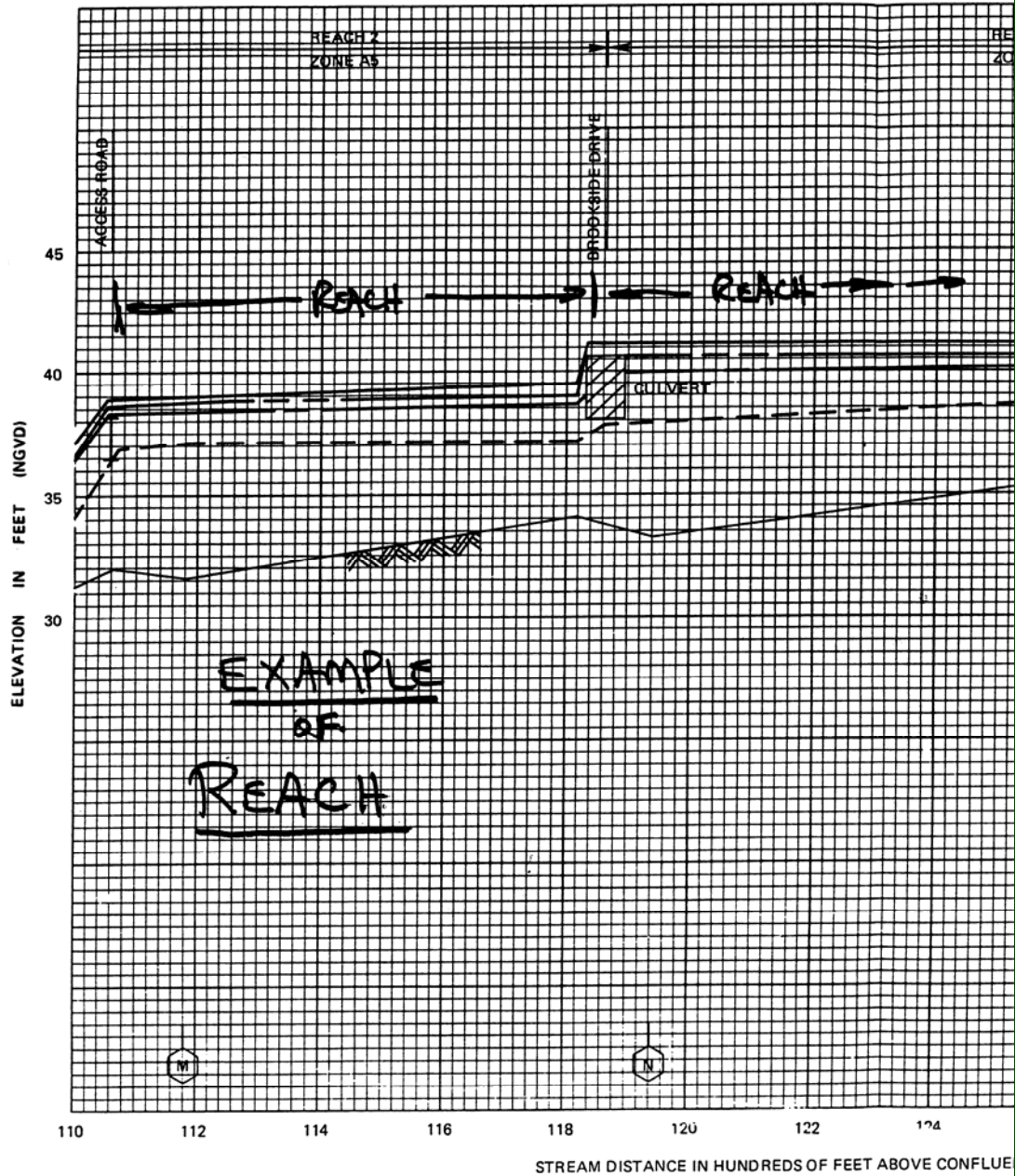
- Negligible levels of impact may be allowed in certain areas, but not all areas. Applicant needs to address this issue in terms of life and/or property impacts.
- Investigate if displacement can be avoided.
- One option is to address level of impact using hydraulic (i.e., HEC-RAS) analysis.
- May be appropriate to provide volumetric floodplain compensation, as per rule 10.02(e)(4)(c) (iv).

Floodplain Compensation Standards, Rule 10.02E4(c)(iv)

- Rule (iv): compensatory storage may not be proposed beneath or within any building or structure.
- ...(aa): Must have more compensation volume than displacement.
- ...(bb): Must have unrestricted hydraulic connection.
- ...(bb): also states that provide same rate of storage capture & release.

Floodplain Compensation Standards, Rule 10.02E4(c)(iv) (cont)

- ...(cc): Compensatory volume must be within same reach of river/stream.
- ...(dd): Compensatory volume construction must precede the displacement.
- ...(ee): If on another property, must provide written agreement.
- ...(ff): Design must include appropriate BMP's. Avoid / minimize impacts to vegetated wetland areas.



Floodplain Compensation: Requirements & Considerations

TO INCLUDE ON PLAN

- Proposed floodplain compensation area > volume of flood storage being displaced - over entire elevation range of floodplain.
- Floodplain compensation volume vs. floodplain displacement volume
- Floodplain compensation volume within the same reach of the river, stream, or intermittent stream.
- Unrestricted hydraulic connection to the river

Floodplain Compensation: Requirements & Considerations (cont)

TO INCLUDE ON PLAN

- Grading & hydraulic structure connection between the floodplain compensation and the river.
- All permanent easements needed for floodplain compensation areas must be permanently maintained.
- Perimeter of all areas for floodplain compensation grading.
- Existing and proposed condition topography.

Floodplain Compensation: Requirements & Considerations (cont)

TO INCLUDE ON PLAN

- Be aware of sensitive areas of wetland vegetation
- Locations of floodplain analysis cross-sections, drawings with elevations.
- Pertinent calculations prepared by a registered professional engineer.

Floodplain Displacement and Compensation Analysis Methods

Average End Area Method Using Stationed Cross-Sections

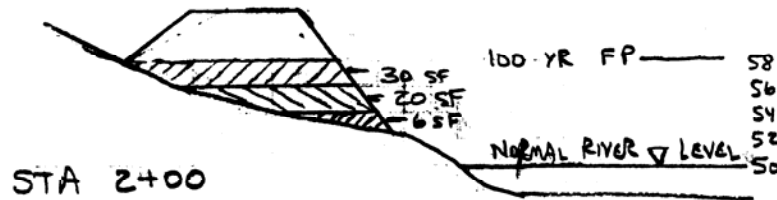
- Typically used for linear projects
- Involves cross-sections taken in the vertical plane
- Variable lengths between cross-sections acceptable
- Separate analysis for each reach of the floodplain
- No volume calculation above 100-yr floodplain elevation, or below normal river/stream level.

Floodplain Displacement and Compensation Analysis Methods (cont)

Average End Area Method Using Stationed Cross-Sections (continued)

- Typical calculation:
- Volume of cut or fill =
- $((\text{XS-area 1} + \text{XS-area 2})/2) \times (\text{distance between XS's})$

AVERAGE END AREA METHOD - STATIONED X-S'S



SCALE 1" = 10'

CALCULATE DISPLACEMENT IN EACH RANGE
OF FLOODPLAIN:

$$52' \text{ TO } 54' : \frac{11 + 6}{2} \times 50 \rightarrow 425 \text{ CF} \rightarrow 15.7 \text{ CY}$$

$$54' \text{ TO } 56' : \frac{22 + 20}{2} \times 50 \rightarrow 1050 \text{ CF} \rightarrow 38.9 \text{ CY}$$

$$56' \text{ TO } 58' : \frac{24 + 30}{2} \times 50 \rightarrow 1350 \text{ CF} \rightarrow 50.0 \text{ CY}$$

FLOODPLAIN COMPENSATION VOLUMES WOULD BE
CALCULATED IN THE SAME MANNER

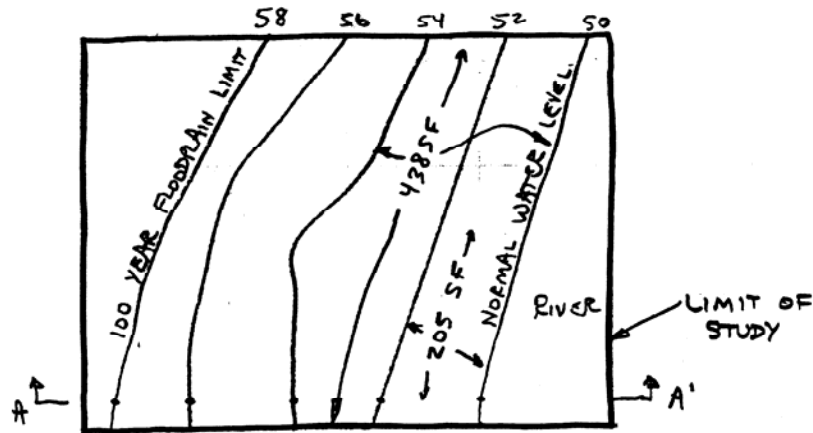
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Floodplain Displacement and Compensation Analysis Methods (cont)

Average End Area Method Using Sections Taken in a Horizontal Plane

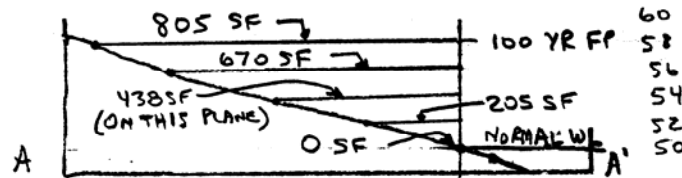
- Used for most project sites, especially where floodplain displacement and compensation sites can be readily enclosed.
- Involves cross-sections taken in a horizontal plane for areas of floodplain displacement and compensation.

AVERAGE END AREA METHOD - SECTIONS IN HORIZ. PLANE



PLAN VIEW

SCALE 1" = 10'



SECTION VIEW

CALCULATE FLOODPLAIN VOLUME IN LIMIT OF STUDY FOR EACH INTERVAL.

$$50' \text{ TO } 52' \quad \left(\frac{0 + 205}{2} \right) \times 2' \rightarrow 205 \text{ CF}$$

$$52' \text{ TO } 54' \quad \left(\frac{205 + 438}{2} \right) \times 2' \rightarrow 643 \text{ CF}$$

$$54' \text{ TO } 56' \quad \left(\frac{438 + 670}{2} \right) \times 2' \rightarrow 1108 \text{ CF}$$

$$56' \text{ TO } 58' \quad \left(\frac{670 + 805}{2} \right) \times 2' \rightarrow 1475 \text{ CF}$$

FLOODPLAIN DISPLACEMENT & COMPENSATION DONE SIMILARLY

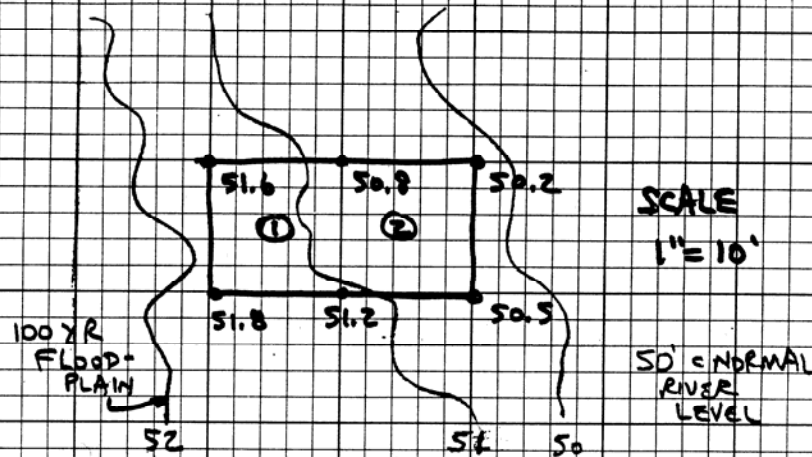
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Floodplain Displacement and Compensation Analysis Methods (cont)

Grid Method

- Used in intricate and/or irregular topographic detail areas.
- Involves creation of a grid of corner points over the area of study.

GRID METHOD



CALCULATE AVAILABLE FLOODPLAIN
STORAGE VOLUME WITHIN THE
INDICATED AREA

$$\text{GRID 1: } \frac{(51.6 - 50) + (50.8 - 50) + (51.8 - 50) + (51.2 - 50)}{4} \times 10^2$$

$$= 1.35 \times 10^2 = 135 \text{ CF}$$

$$\text{GRID 2: } \frac{.8 + 1.2 + .2 + .5}{4} \times 10^2 = 67.5 \text{ CF}$$

$$\text{E VOLUME} = 202.5 \text{ CF}$$

FLOODPLAIN DISPLACEMENT & COMPENSATION
CALCULATIONS ARE DONE SIMILARLY

11/9/01 THP