

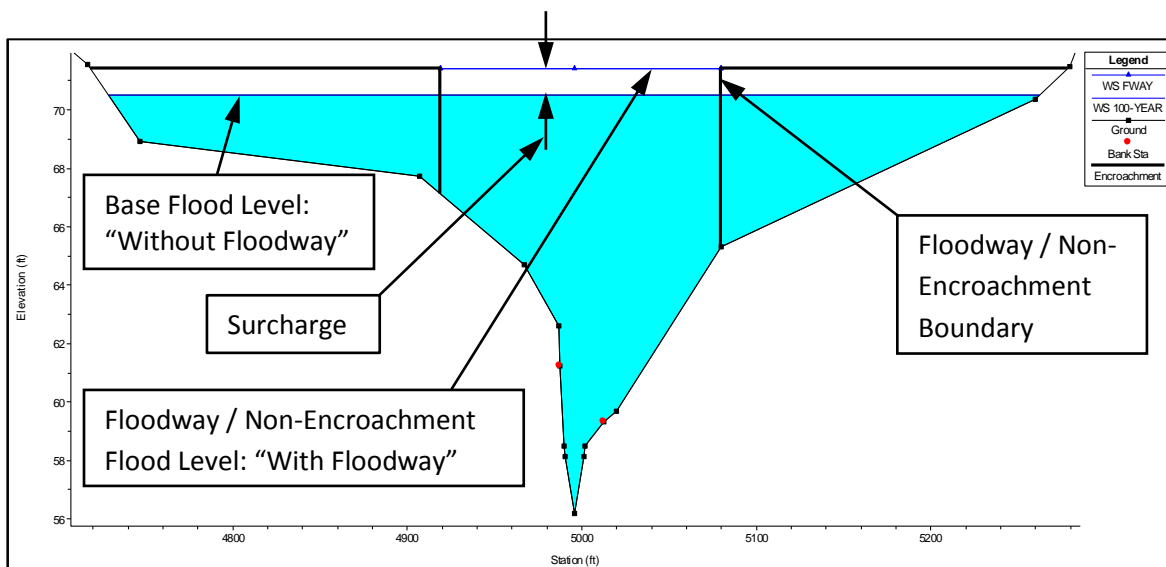
**NC NFIP Guidance Document #1: NC NFIP Review of No-Rise Submittals**

**Background**

44 CFR Section 60.3(d)(3) states that a community shall “prohibit encroachments, including fill, new construction, substantial improvements, and other development within the adopted regulatory floodway unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachment would not result in any increase in flood levels within the community during the occurrence of the base flood discharge.” In order to comply with this regulation, local communities must obtain, review, and approve a certification to that effect prepared by a professional engineer and supported by hydraulic modeling. This is commonly referred to as a “No-Rise” or “No-Impact” certification, although these terms are not interchangeable.

**Floodway and Non-Encroachment Area Definition**

A floodway or a non-encroachment area is the area of a watercourse that must be reserved to convey the base flood discharge without raising the water surface elevation more than a designated height. This height, also known as the surcharge, is usually 1.00’, but it can be less. A cross-section from the HEC-RAS computer model showing the floodway is shown below:



### Issue

The North Carolina Department of Public Safety National Flood Insurance Program (NC NFIP) will, upon request from a North Carolina community, review No-Rise certifications for projects within their jurisdictions. The *Procedures for "No-Impact" Certification for Proposed Developments in Regulatory Floodways* prepared by FEMA Region IV provides a basic outline of the submittal requirements, but further explanation, based on experience and precedent, is needed.

The FEMA Region IV guidance also specifically addresses "No-Impact" certifications. In a "No-Impact" certification, there is no *change* to flood elevations in any of the prepared hydraulic models. Because this would only apply when very minimal floodway encroachment occurs, specific guidance for the more common "No-Rise" certification is needed. A "No-Rise" certification simply states that the proposed project meets the requirements of 44 CFR Section 60.3(d)(3) and will not *increase* flood levels.

### Final Guidelines

The following submittal requirements and guidance provides a description of the items needed to review a hydraulic model in order to confirm it complies with the requirements of 44 CFR Section 60.3(d)(3).

### Submittal Requirements

A community should review a "No-Rise" submittal for completeness prior to forwarding it to NC NFIP for review. A complete "No-Rise" submittal shall include the following:

- Engineering models in a currently approved FEMA hydraulic model, including:
  - Effective Model (may be older than a currently approved hydraulic model);
  - Duplicate Effective Model (Effective Model run on the modeler's software and hardware in an approved hydraulic model)
  - Corrected Effective Model (if needed to correct errors in the model);
  - Existing Conditions Model (model the existing project area and man-made changes since the Effective Model);
  - Proposed Conditions Model (model the proposed project area);

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- Project narrative;
- Topographic work map;
- Cross-section plots;
- Property survey;
- Preliminary or Recorded Plat (if applicable)
- No-Rise Certification;
- Cover letter from the Community requesting review.

The Hydraulic models shall be in their computer program format. Other documentation can be either hard-copy or electronic format. PDF format is preferred.

In order to establish a “No-Rise”, an engineer will perform hydraulic modeling in accordance with standard engineering practice to determine the impacts on the flood levels. The majority of these models are performed in HEC-RAS, since that is the original modeling software for most streams in North Carolina. Hydraulic models in FEMA’s list of Numerical Models Meeting the Minimum Requirement of the NFIP are also acceptable. See:

<https://www.fema.gov/hydraulic-numerical-models-meeting-minimum-requirement-national-flood-insurance-program>

An electronic copy of the hydraulic modeling must be provided. It is preferred that each geometry file is contained within a single HEC-RAS project, but this is not required. A paper copy is not needed for review by NC NFIP. All models should have a precision equal to or greater than the internal quality-assurance review by the North Carolina Floodplain Mapping Program (NCFMP), which is normally 0.01’ for NCFMP produced studies.

### **Hydraulic Models**

The EFFECTIVE model is simply the model used to develop the Flood Insurance Study. Recent studies, and some older studies, are available for no fee from NC NFIP. If NC NFIP does not have the study on file, the requestor should contact the FEMA Engineering Library. If the model is not available, the requestor will need to create an effective model that duplicates the results in the Flood Insurance Study.

The DUPLICATE EFFECTIVE model is the Effective model run using the modeler’s hardware and software. For HEC-RAS models, the software is

preferably the current version of HEC-RAS (currently HEC-RAS 5.0.3), although any version 3.1.1 or later is currently acceptable. The Duplicate version should not be an earlier version than the Effective version. Occasionally floodway or NEA widths are set using Method 4 in the Effective model. The Duplicate Effective floodway limits should always be set using Method 1 to match the Effective model. Also, starting water surface elevations should always be set using a fixed water surface elevation to match the Effective model.

The CORRECTED EFFECTIVE model may or may not be required, depending on whether or not there are errors in the Effective model. These errors should be fixed in Corrected Effective model. Some of the errors may include:

- Inappropriate expansion and contraction coefficients;
- Datum adjustments;
- Bridge modeling errors (appropriate loss calculations, weir coefficients, pier coefficients, bridge rails);
- Culvert modeling errors (size, materials, entrance and exit losses);
- Incorrect ineffective flow locations and elevations;
- Incorrect or unreasonable Manning's roughness coefficients (supporting documentation is required);
- Gross errors in topography at existing sections;
- Negative surcharges and surcharges over 1.00'.
- Man-made changes prior to the Effective Model that are not captured in the model.

The EXISTING CONDITIONS model inserts cross-sections and/or modifies effective cross-sections to accurately portray the existing conditions at the project site. These cross-sections should not be duplicated or interpolated, but should be based on field surveys at the project site and field surveys and/or other available topographic data away from the project site. Enough sections should to be added in order to accurately model the proposed changes. Encroachment stations shall be added to new cross-sections, based on the FIRM or interpolated from the NEA tables. The encroachment stations should then be adjusted so that the floodway water surface elevations match the Corrected Effective (or Duplicate Effective, if the Corrected Effective is not required) and do not exceed 1.00' surcharge. The Existing Conditions model should also incorporate any man-made changes since the Effective Model. Non-permitted floodway encroachments associated

with the project (current violations) should not be included in the Existing Conditions model. The non-permitted encroachments should be included in the Proposed Conditions model or removed prior to permitting.

The Existing Conditions model may also need to include additional cross-sections upstream or downstream of the existing model. This will be necessary if the boundary water surface elevations do not match between the Existing Conditions model and the Proposed Conditions model. Sometimes, this may not be possible, or the effect is so large that the models simply will not match at the upstream limit. In these cases, run the model a minimum of one mile past the project limits. When the effect of a project extends upstream through a different model, either that model or the information contained in the model should be used to analyze the hydraulics upstream.

The PROPOSED CONDITIONS model is a modification of the Existing Conditions model. FEMA has provided NC NFIP guidance that all elements of a proposed project must be modeled, so all revisions associated with the project should be included, even if those revisions are not within the floodway itself. For example, changes outside of the floodway that are integral to the project should be included, such as approach fill for bridges or "conveyance easements." There should be no increase in the water surface elevations for both the base flood and the floodway / NEA runs. There should be no change in the floodway widths on either side of the stream compared to the Existing Conditions model.

### **Documentation**

The submittal shall include a detailed NARRATIVE of the project and the modeling methodology. Document all modifications to the Effective model integrated into the Corrected Effective and Existing Conditions models. Provide the source of additional cross-section topographic data. Provide copies of the floodway data tables and flood profiles or LDS tables, the current FIRM, supporting calculations and documentation, and photographs. Also, include any special conditions of the No-Rise, including establishing "conveyance easements" or specific landscaping allowances or restrictions.

Include a TOPOGRAPHIC WORK MAP of the project site, to include:

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- Floodplain and Floodway Limits;
- Topography;
- Locations and labels on effective and new cross-sections;
- Vicinity map;
- Existing and proposed features and structures;
- Building corridors and conveyance easements.

Provide CROSS-SECTION PLOTS of all cross-sections within the project boundary. Features, structures, and changes should be labeled. Grid squares or elevations should also be noted on the cross-sections.

A certified PROPERTY SURVEY is also required. A scaled plat is acceptable, provided the local floodplain administrator considers it current and accurate for the purposes of the No-Rise Certification.

A PRELIMINARY or RECORDED PLAT SURVEY is required if a building corridor (an area set aside for construction) and/or a conveyance easement (an area of increased conveyance set aside to mitigate obstructions) are conditions of the certification. The plat should indicate that the property owners agree and acknowledge that they have granted permission for the mitigation areas to be placed on their property in perpetuity. The maintenance specifications for the conveyance easement should be included. The location, dimensions, and duration of the building corridors and conveyance easements should be specified on the plat. Conveyance easements will be checked during Community Assistance Visits (CAVs), and failure to maintain an easement may be considered a violation of the community's flood damage prevention ordinance.

A template for the NO-RISE CERTIFICATION is provided at the end of this document. It should be sealed by the design engineer. For work in North Carolina, the certification shall be sealed by an engineer registered in North Carolina. The certification shall address base flood elevations, floodway or NEA elevations, and floodway widths. The community may sign off on the form itself, or provide other written response (approval or denial) following the review.

When NC NFIP is asked to review the No-Rise, a COVER LETTER (or a completed No-Rise Review Request and Checklist at the end of this document) should be included with the No-Rise Certification from the local floodplain administrator formally requesting a technical review of the submittal.

### **Additional Considerations**

It is the interpretation of NC NFIP that the term FLOOD LEVELS as contained in 44 CFR 60.3(d)(3) refers to both base flood elevations and the surcharge elevations associated with the base flood discharge. The base flood is normally considered the 1% annual-chance, or 100-year flood. In communities that enforce a higher base flood, such as future conditions or 0.2% annual-chance (500-year), the standard enforced by the community should be reflected in the No-Rise hydraulic model.

In North Carolina, Limited Detail Study streams include a NON-ENCROACHMENT AREA (NEA), which, at the local level, is generally regulated the same as a floodway. Projects affecting streams modeled using limited detailed methods shall meet the same criteria as detailed streams. The non-encroachment limits and the surcharge water surface elevation established in the original hydraulic model for the Limited Detail Study shall be used as the effective model limits.

No-Rise submissions should not OPTIMIZE floodway and non-encroachment widths. Because the purpose of the No-Rise is to determine the *impact* on the flood levels, the parameters (including encroachment stations) should remain as unchanged as possible from the effective model. Changes in encroachment stations require a Letter of Map Revision (LOMR).

Some projects, due to their nature or the size of the project, MAY NOT REQUIRE A HYDRAULIC ANALYSIS to comply with 44 CFR 60.3(d)(3). However, these projects still require an engineer's certification that the project will not cause an increase in flood elevations in accordance with 44 CFR 60.3(d)(3). Even though a hydraulic analysis may not be needed, a Floodplain Development Permit will still be required for all development within the Special Flood Hazard Area. A hydraulic analysis may not be needed for:

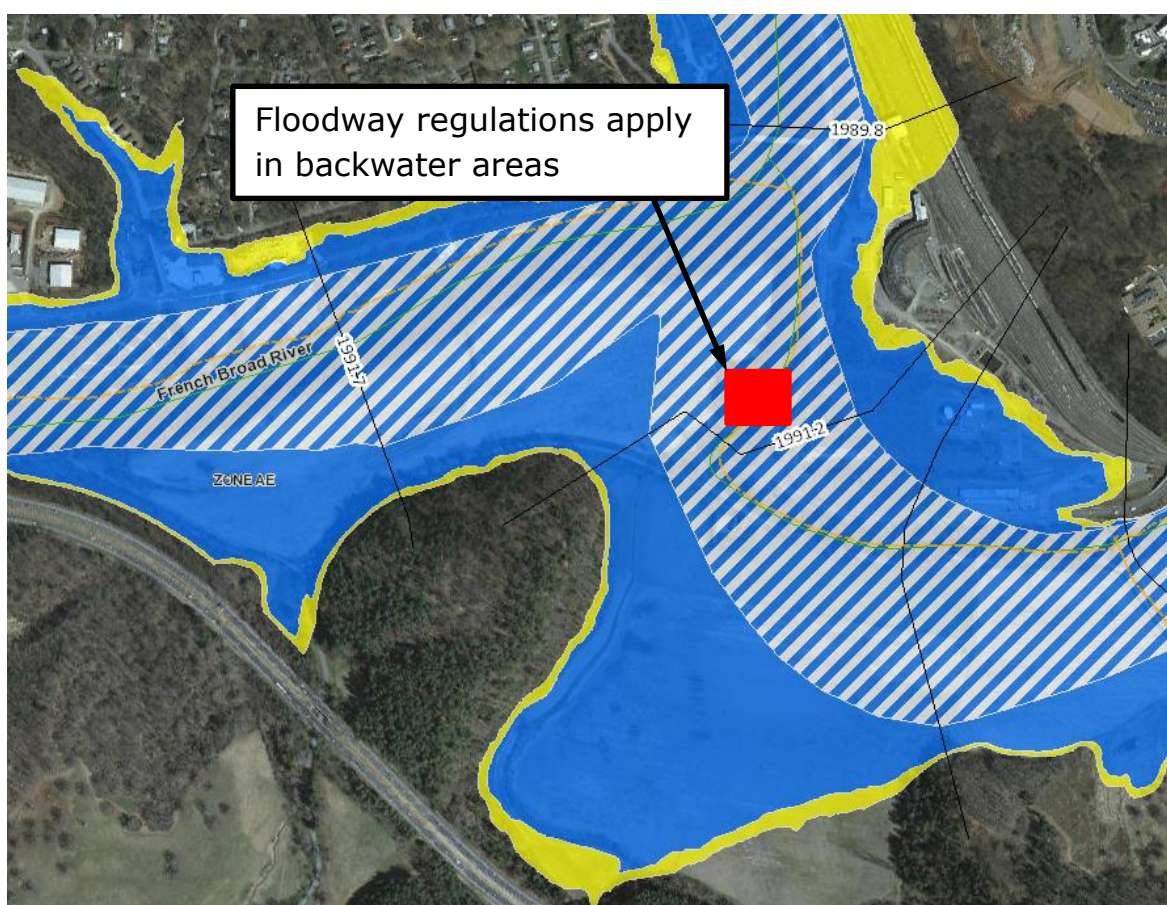
- Permanent removal of an existing building;
- Replacement of a building within the same footprint, as long as there is no new vertical obstruction to flow;
- Projects that do not increase existing grade, such as driveways;
- Small, isolated obstructions, such as a mailbox, a park bench set parallel to flow, or single utility pole;

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- Light-duty fences that will likely collapse or not provide obstruction in a flood event;
- Development in the conveyance shadow of an existing structure;
- Greenway trails placed at grade with minimal clearing (not including structures);
- Structures that span the entire floodway above the surcharge elevation, with no encroachments (piers, piles, trusses, etc.) within the floodway;
- Maintenance of existing uses, such as bridges, rights-of-way, and easements.

No-Rise reviews are applicable in all floodways and non-encroachment areas even if the base flood elevation is driven by BACKWATER or coastal flooding effects from a downstream waterbody.



NC NFIP does not "APPROVE" a No-Rise. NC NFIP will determine: A) Does the No-Rise Certification meet FEMA's guidelines for a No-Rise, and B) Does the documentation meet the requirements of 44 CFR



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60.3(d)(3)? The community is responsible for final approval and permitting of all projects within the Special Flood Hazard Area.

All communities, including counties, municipalities, and Native American Tribes, should insure compliance with the ENDANGERED SPECIES ACT (ESA) as it relates to all projects within their jurisdiction, including projects within the Special Flood Hazard Area. FEMA requires ESA compliance documentation with CLOMRs and CLOMR-Fs. However, FEMA and NC NFIP do not require ESA compliance documentation for a No-Rise review.

NC NFIP REVIEW TIME for a No-Rise submittal is generally less than four weeks. NC NFIP will coordinate with the local floodplain administrator if the review time is anticipated to be longer. The submitter is encouraged to contact the NC NFIP several days after submittal to ensure the documents were received.

NC NFIP does not charge a FEE to North Carolina municipalities for reviewing a "No-Rise" certification.

A rise within an INTERNAL BRIDGE SECTION does not necessarily invalidate a No-Rise. For example, if the rise is due to an increase in the low chord height of the bridge, but there is a reduction in flood elevation upstream of the bridge, the "No-Rise" may still be valid.

Changes in ROUGHNESS COEFFICIENT from the Existing Conditions Model to the Proposed Conditions Model should be documented and justified.

Due to the availability of LiDAR topographic data and the ability for GIS and CAD systems to import topographic data into RAS, the use of cross-section INTERPOLATION is discouraged. Interpolated cross-sections may be allowed outside of the project area where increased precision is needed. Interpolated cross-sections shall be identical in the Existing Conditions and Proposed Conditions models.

Hydraulic models generally should not be TRUNCATED. Even modest modern computers can currently process large model runs in seconds, so there is no appreciable gain to be made by truncating a model. The model shall never be truncated if the water surface elevations and velocities do not match between the Existing and Proposed models at the upstream cross-section to the nearest 0.01'.

When the effects of a project extend past the end of the effective model into an area analyzed by a DIFFERENT MODEL, the modeler may adjust the boundary conditions accordingly in the upstream model. Alternatively, the modeler may use the effective information from the upstream model inserted into the Corrected, Existing, and Proposed models to analyze the effects of the project.

NC NFIP will review hydraulic model submittals from communities where the ORDINANCE DIFFERS from the requirements of 44 CFR provided those criteria are outlined in the written request from the community.

There should be no changes to the HYDROLOGY in the model unless there is an obvious and significant error in the original model. Changes to hydrology based just on the methodology should not be considered, but should be only based on gross errors in drainage area or land cover. Changes in hydrology will be rare, and should be coordinated with the NC NFIP in advance.

Just because a project does not cause a rise does not mean that a follow-up LETTER OF MAP REVISION (LOMR) is not required. 44 CFR 65.3 states "A community's base flood elevations may increase or decrease resulting from physical changes affecting flooding conditions. As soon as practicable, but not later than six months after the date such information becomes available, a community shall notify the Administrator of the changes by submitting technical or scientific data in accordance with this part. Such a submission is necessary so that upon confirmation of those physical changes affecting flooding conditions, risk premium rates and flood plain management requirements will be based upon current data." FEMA's guidance has generally been that a decrease of less than 0.10' does not require a map change, but reductions greater than 0.10' or changes in the floodway or non-encroachment width on either side of the stream, or changes in the location of the stream as shown on the Flood Insurance Rate Maps, will require a LOMR from the community within six months of completion of the project. Changes in hydrology also require a LOMR.

For streams that do not have a floodway or non-encroachment area, 44 CFR 60.3(c)(10) regulations apply. This allows for a 1' cumulative rise in the base flood elevation due to all existing and proposed development along the stream. NC NFIP will also assist communities with their permitting review of projects along these streams.

### **Stream Restoration Projects**

44 CFR 60.3.d.3 requires a hydraulic analysis performed in accordance with standard engineering practice. However, "standard engineering practice" can be considered different for a rural stream with no potential for impacted structures. Documentation in accordance with the criteria outlined below would be sufficient to support a No-Rise Certification:

- The project is located in a rural area with no potential impact to structures, culverts, or bridges (any potential impacts will require a detailed analysis);
- The project covers a relatively short reach of stream (500' and/or no more than one model cross-section);
- There are no new structures associated with the project (weirs, root wads, etc) or obstructions;
- There will be a net reduction in obstructions (by laying back the banks and/or removing fallen trees or other structures);
- The project will maintain the effective modeling parameters (including channel dimensions and roughness values).

In no case would an exception be made if there is a potential impact to structures or risk to life and property. An Engineer's certification will still be required.

### **References**

- 44 CFR 60.3(d)(3)
- 44 CFR 60.3(c)(10)
- FEMA Region IV Procedures for "No-Impact" Certification for Proposed Developments in Regulatory Floodways, September 2004

### **Discussion Summary**

- North Carolina Association of Floodplain Managers Spring 2012 *Flash Flood News*
- North Carolina Association of Floodplain Managers Spring 2012 Conference, May 9, 2012, New Bern, NC
- North Carolina Association of Floodplain Managers Fall 2012 Conference, October 26, 2012, Asheville, NC

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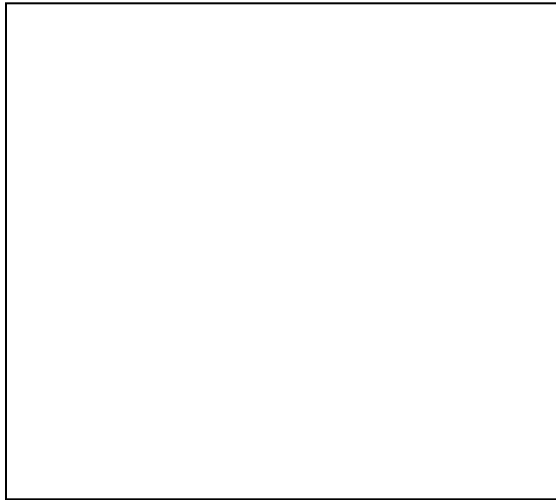
- Association of State Floodplain Managers National Conference, June 4, 2015, Atlanta, GA
- North Carolina Association of Floodplain Managers Spring 2016 Conference, May 12, 2016, Myrtle Beach, SC

### **Points of Contact**

- John Gerber, PE, CFM, North Carolina Risk Management
- Dan Brubaker, PE, CFM, North Carolina NFIP Coordinator

**NO-RISE CERTIFICATION**

This document is to certify that I am duly qualified engineer licensed to practice in the State of North Carolina. It is to further certify that the attached technical data supports the fact that the proposed \_\_\_\_\_[Project]\_\_\_\_\_ will not increase the base flood elevations or floodway elevations, or impact the floodway widths, on \_\_\_\_\_[Stream]\_\_\_\_\_ at published cross-sections in the Flood Insurance Study for \_\_\_\_\_[Community]\_\_\_\_\_, dated \_\_\_\_\_[Date]\_\_\_\_\_ and will not increase the base flood elevations or floodway elevations, or impact the floodway widths at unpublished cross-sections in the area of the proposed development.



\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Address

\_\_\_\_\_  
Date

Seal and Signature

**FOR COMMUNITY USE ONLY**

Approved

Disapproved

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

## NO-RISE REVIEW REQUEST AND CHECKLIST

\_\_\_\_\_ (*community*) \_\_\_\_\_ requests that the North Carolina National Flood Insurance Program (NCFIP) reviews the attached No-Rise Study for \_\_\_\_\_ (*name of project*). We have reviewed the submittal package. All of the required items for review are included as noted below. The project as shown on the Topographic Work Map matches the elements of the permit application. The project otherwise will meet all requirements for permitting under our local ordinance.

\_\_\_\_\_ Community Official \_\_\_\_\_ Date

All of the items noted below are included:

- \_\_\_\_\_ Digital copy of hydraulic models used in the study;
- \_\_\_\_\_ Copy (digital or otherwise) of the effective hydraulic model;
- \_\_\_\_\_ Is the Preliminary Hydraulic Model used as the Effective Model for the analysis (Yes or No)?
- \_\_\_\_\_ Project narrative;
- \_\_\_\_\_ Topographic work map showing existing and proposed conditions;
- \_\_\_\_\_ Cross-sections showing existing and proposed conditions;
- \_\_\_\_\_ Map or plat of the property;
- \_\_\_\_\_ Preliminary plat of the mitigation area (if applicable; see below);
- \_\_\_\_\_ No-Rise Certification from a North Carolina Professional Engineer.

If a mitigation area or other space will be set aside to mitigate the effect of the encroachment, then a preliminary plat of the mitigation area, or a description of how the mitigation area will be preserved in perpetuity, will be needed.

The community should ensure compliance with the Endangered Species Act as it relates to all projects within its jurisdiction.