



CHAPTER 5

REPORT SUBMITTAL REQUIREMENTS

SECTION 1

REVISION OF EXISTING FLOODPLAINS

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1.1 INTRODUCTION

Many watercourses in the State of Colorado have been analyzed through various engineering studies sponsored by local, state, or federal agencies. The 100-year floodplain information generated and/or published by FEMA can be found on the Flood Insurance Rate Maps (FIRM) and Flood Insurance Studies (FIS). All other floodplain data generated by various engineering studies should be available at the local Floodplain Administrator's office or the CWCB.

The existing floodplain studies and delineations should be evaluated to determine if the information is still valid. When determined appropriate, the existing studies should be used to minimize duplication of work and to maintain continuity of the analysis.

If a modification to the existing floodplain information is deemed necessary, a Floodplain Modification study should be prepared and submitted for review and approval by the local government agencies and the Colorado Water Conservation Board (CWCB). If the proposed floodplain modification pertains to a FEMA-designated Special Flood Hazard Area (SFHA), the revision request should also be reviewed and approved by FEMA. For modification of a FEMA designated floodplain, an appropriate FEMA map revision request (i.e., LOMR, CLOMR, etc.) report may be submitted in place of a Floodplain Modification Study to the local government agencies, CWCB, and FEMA.

This section is intended to provide practical guidelines to help local agencies and engineers in selecting an appropriate floodplain and floodway revision process for a given situation.

1.2 FLOODPLAIN MODIFICATION STUDY

In order to revise or update existing floodplains designated by local and state agencies, a Floodplain Modification Study should be prepared and submitted for review and approval by the affected local government agencies and the Colorado Water Conservation Board. The study should be prepared following the guidelines outlined in this section and should be certified by a registered Civil Engineer licensed to practice in the State of Colorado.

In general, existing floodplain information should be revised or updated for the following conditions.

1. The floodplain has been changed substantially by either naturally occurring or man-induced activities



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2. The computed flow rates are substantially higher or lower than the flow rates used to delineate the existing floodplains
3. Errors in the original floodplain delineation study
4. More detailed floodplain information is needed
5. Modifications to the existing floodplains are proposed by new developments or other construction activities

The amount of effort necessary for preparation of a Floodplain Modification Study is dependent upon many factors including the following:

- Amount of information previously generated
- Hydrologic and hydraulic analysis methods
- Complexity of the drainageway hydraulics
- Potential for any adverse impacts on adjacent properties
- Magnitude of flow
- Size of the area affected
- Need for channel stabilization
- Sediment transport and fluvial morphological aspects of the stream.

If a Floodplain Modification Study is prepared and submitted to demonstrate that the proposed floodplain improvements meet the Floodplain Development Permit requirements (Section 1, Chapter 3), the study should be updated and resubmitted based on the "as-built" conditions of the project, when the construction is completed. The study based on the proposed floodplain modifications should be labeled Initial Floodplain Modification Study to differentiate from the final study. The submittal requirement for an initial Floodplain Modification Study is same as the final study except that an initial study can be prepared using preliminary floodplain modification design plans. The following is a list of general requirements for a Floodplain Modification Study:

1. Hydrologic analyses should be performed to determine the required flow rates at selected concentration points and to determine the potential impacts cause by the proposed development, if applicable. Please refer to Chapter 9 for detailed discussions on the hydrologic analysis procedures and methods.
2. Hydraulic analyses should be performed to determine the required floodplain information based on the existing drainageway conditions. At the discretion of the local Floodplain Administrator or the CWCB, floodway delineation for the drainageway may be required. Detailed discussions on the hydraulic analysis methods and floodplain delineation procedures are provided in Chapters 10 and 11, respectively.
3. If modifications to the existing conditions floodplains are proposed by new developments or other construction activities, additional hydraulic analysis should be performed to delineate the proposed conditions floodplain boundaries. The potential impacts or benefits of the proposed floodplain modifications should be clearly identified.

The study should demonstrate that no new structures are added to the floodplains within and adjacent to the project as a result of the proposed floodplain modifications. For subdivisions, the proposed 100-year floodplain should not encroach onto the residential lots. Also, the study should

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demonstrate how other properties that share frontage along the floodplain will not be adversely impacted. If other properties are impacted, the submittal should include proofs that the impacts can be mitigated or appropriate floodplain agreements can be obtained in the form of a letter from the impacted property owners.

4. If new developments are proposed within the 100-year floodplains, the analysis should show that sufficient flow conveyance capacity will be maintained in the drainageway. The analysis should demonstrate that the existing and/or proposed channel alignment (horizontal and vertical) will be stable and will not be subject to erosion, which may threaten property or public improvements. For more detailed discussions on this subject, refer to Section 5, Chapter 12.

1.2.1 FLOODPLAIN MODIFICATION STUDY OUTLINE

A Floodplain Modification Study should address the following items through new analyses or through reference to previously adopted studies:

1. A description of the project site.
2. A description of the drainage basins and waterways impacting the project site.
3. Identification of all applicable existing Floodplain Modification Studies, FEMA Flood Insurance Studies (FIS), and drainage master plans with the analysis of the applicability of the existing data to the project site.
4. Hydrologic analysis: This section should include a narrative of the hydrologic analysis methods and results, the source of flow rates used for the existing and/or proposed project conditions floodplain analysis, and the proposed flow conveyance system. Watershed maps should be provided for both existing and proposed conditions.
5. Characteristics of the existing and/or proposed drainageway including slope, roughness, depth, velocity, Froude Number, centerline alignment and stationing, and cross sections.
6. A description of the hydraulic analysis method and its application in the study.
7. Identification and discussion of all analysis input parameters and the basis for the input parameters.
8. Discussions of the results and conclusions from the hydrologic and hydraulic analyses. This should include a narrative summary of the results as well as comprehensive output printouts, free of modeling errors.
9. Delineation of the existing and/or proposed project conditions floodplain and floodway boundaries. Floodplain delineation maps and profile sheets should be included in the report. Detailed discussions



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on the preparation of floodplain delineation maps and profile sheets are provided in Chapter 11.

10. A description of potential impacts, if any, on other property owners along the floodplain.
11. If applicable, a conceptual design of the proposed drainage system including embankment protections, drop structures, culverts, bridges, and hardened trickle or low flow channel.
12. If appropriate, an analysis of sediment transport and fluvial morphology.

1.2.2 SUBMITTAL AND REVIEW PROCESS

A request to modify the existing floodplain and/or floodway should be reviewed and approved by the affected local government agencies and the Colorado Water Conservation Board (CWCB). The applicant should prepare a Floodplain Modification Study based on the guidelines outlined in this section. The following list summarizes the submittal and review process.

- a. An Initial Floodplain Modification Study or a Floodplain Modification Study should be submitted to the affected local agencies for their review and comments. The applicant should submit a copy of the report to all local agencies affected by the proposed floodplain modifications. The review comments should be addressed prior to submitting the report to the CWCB.
- b. Once the study has been reviewed and approved by the local agencies, the applicant should submit the revised study to CWCB for their review and approval.

If an Initial Floodplain Modification Study was submitted and approved, the applicant should update and resubmit the study based on the "as-built" conditions of the project, when the construction of proposed modifications is completed.

1.3 FEMA DESIGNATED FLOODPLAINS

The Federal Emergency Management Agency (FEMA) has been conducting Flood Insurance Studies (FISs) and restudies to identify and delineate flood hazard areas for the National Flood Insurance Program (NFIP) participating communities. Many drainageways within the State of Colorado have been studied by FEMA, and the FEMA designated floodplains are shown on the Flood Insurance Rate Maps (FIRMs).

The FIRM maps are used by local governmental agencies in regulating the floodplain developments and by insurance agents in determining flood insurance rates for properties located within the FEMA flood hazard zones. The floodplain development regulation criteria and the insurance rates are determined based on the flood hazard zone designation on the subject property. Therefore, it is important to create and maintain accurate floodplain information on the FIRM maps.



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The designated FEMA floodplains and floodways can be modified by submitting appropriate map revision requests for the following general cases:

- Errors in the original floodplain delineation study
- Substantial change in the drainageway hydrology and hydraulics
- Physical modifications that change the flooding conditions
- Floodplain restudy using detailed modeling methods

For detailed discussions on the FEMA map revision submittal requirements, readers are referred to the following publications:

- Federal Emergency Management Agency, Appeals, Revisions and Amendments to Flood Insurance Maps, A guidebook for Local Officials (FIA-12)
- Federal Emergency Management Agency, NFIP Regulations, Title 44, Chapter 1, Parts 60, 65, 70, and 72, revised October 1999.

1.4 **FEMA FLOODPLAIN REVISION REQUEST SUMMITTALS**

NFIP participating communities are required to make map revision request submittals to FEMA for projects and developments that modify the FEMA designated floodplains and floodways. Depending on the type and extent of proposed modifications, the applicant can submit a request for one or more of the following FEMA map revisions:

- Conditional Letter of Map Amendment (CLOMA) – “A letter from FEMA stating that a proposed structure that is not to be elevated by fill would not be inundated by the base (100-year) flood if built as proposed” (FEMA Form MT-1).
- Letter of Map Amendment (LOMA) – “A letter from FEMA stating that an existing structure or parcel of land that has not been elevated by fill would not be inundated by the base (100-year) flood” (FEMA Form MT-1).
- Conditional Letter of Map Revision based on Fill (CLOMR-F) – “A letter from FEMA stating that a parcel of land or proposed structure that is to be elevated by fill would not be inundated by the base (100-year) flood if fill is placed on the parcel as proposed or the structure is built as proposed” (FEMA Form MT-1).
- Letter of Map Revision based on Fill (LOMR-F) – “A letter from FEMA stating that an existing structure or parcel of land that has been elevated by fill would not be inundated by the base (100-year) flood” (FEMA Form MT-1).

Issuance of a conditional approval by FEMA does not remove structures and/or properties from the FEMA flood hazard zone. After the completion of construction, the applicant should submit an additional request for LOMA or LOMR following the issuance of CLOMA or CLOMR to officially remove the subject lot and/or structure from the FEMA SFHA.

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- Conditional Letter of Map Revision (CLOMR) – “ A letter from FEMA commenting on whether a proposed project, if built as proposed, would justify a map revision or proposed hydrology changes” (FEMA Form MT-2).
- Letter of Map Revision (LOMR) – “ A letter from FEMA officially revising the current NFIP map to show changes to floodplains, floodways, or flood elevations” (FEMA form MT-2).

The applicant submitting a map revision request is required to fill out and include appropriate FEMA forms. FEMA utilizes these standard forms to guide the applicant in preparing the necessary information and technical data for the revision request submittal. The applicant and affected communities are required to sign the appropriate FEMA forms. FEMA form “MT-1” should be used for CLOMA, LOMA, CLOMR based on Fill, and LOMR based on Fill request submittals and form “MT-2” should be used for CLOMR and LOMR submittals. The applicant is often required to submit a review/processing fee associated with the revision request. The current FEMA forms and fee schedule can be obtained from the local floodplain administrator or directly from the FEMA’s website (see Chapter 7).

Issuance of a conditional approval (CLOMA, CLOMR based on fill, or CLOMR) by FEMA does not remove structures and/or properties from the FEMA flood hazard zone. After the completion of construction, the applicant should submit an additional request for LOMA or LOMR following the issuance of CLOMA or CLOMR to officially remove the subject lot and/or structure from the FEMA SFHA. However, by submitting for a CLOMA or CLOMR, the applicant can get a written assessment from FEMA on the proposed project plan. This process allows the applicant to modify the project design if required to do so by local agencies, CWCB, or FEMA, prior to construction. Local agencies and CWCB may request or the applicant may choose to obtain a CLOMA or CLOMR, if the site-specific issues and conditions warrant the additional submittal. The applicant should coordinate with the local floodplain administrator in determining whether or not a conditional revision request should be submitted for the subject property. The following factors should be considered:

- Size and complexity of the proposed improvements
- Change in the drainageway hydrology and/or hydraulics
- Modification of the regulatory floodway boundary
- Potential adverse impacts to adjacent properties
- New development in FEMA Zone A (BFEs not defined)
- Alluvial fan flooding

1.4.1 **SUBMITTAL AND REVIEW PROCESS**

A request to modify the FEMA floodplain and/or floodway should be reviewed by the affected local government agencies and the Colorado Water Conservation Board (CWCB) before submitting to FEMA. The applicant should prepare a complete revision request report, including FEMA forms, based on the submittal requirements outlined in the FEMA publications previously referenced in Section 1.3. The following list summarizes the FEMA map revision submittal process.

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- a. If required as a condition of approval or desired by the applicant, a request for CLOMA, CLOMR-F, or CLOMR report should be prepared and submitted to the affected local agencies for their review and comments. The applicant should submit a copy of the report to all local agencies affected by the proposed floodplain modifications. The review comments should be addressed prior to submitting the report to CWCB. Community Acknowledgement Forms signed by the local agencies should be included in the CWCB and FEMA submittals.
- c. Once the application has been reviewed by the local agencies, the applicant should submit the updated revision request report to CWCB. The review comments provided by CWCB should be addressed prior to submitting the report to FEMA.
- c. The applicant should submit the conditional map revision request report to FEMA along with the required FEMA review/processing fee and forms.
- d. Once the application has been reviewed and approved by FEMA, a CLOMA, CLOMR-F, or CLOMR will be issued by FEMA for the proposed project.
- e. The applicant should design and construct the necessary drainage improvement facilities and prepare "as-built" drawings.
- f. Repeat steps "a" through "d" to obtain a LOMA, LOMR-F or LOMR from FEMA to officially remove the property from the FEMA SFHA.

1.5 **FEMA LETTER OF MAP AMENDMENT (LOMA)**

The regulatory Special Flood Hazard Areas (SFHAs) designated by FEMA are determined as a result of engineering studies utilizing FEMA approved floodplain analysis methods and topographic maps. Depending on the accuracy of physical features and elevations shown on the topographic maps used in their studies, some properties that are naturally (or by fill placed prior to the FEMA original study) at or above the 100-year flood elevation might be incorrectly shown within the SFHA. In such a case, the property owner can request FEMA to issue a LOMA to remove his or her property from the SFHA.

The applicant should prepare a request for LOMA submittal including the required property and elevation information and FEMA forms MT-1 or MT-EZ. Detailed LOMA submittal requirements are outlined in the FEMA publications previously referenced in Section 1.3 and the FEMA forms. A request for LOMA can be submitted for a single lot/structure using Form MT-EZ or multiple lots/structures using Form MT-1. Since a LOMA essentially is a correction of previous mapping errors, there is no FEMA review fee for a LOMA request. The following is a list of general LOMA submittal requirements:

- FEMA forms – MT-1 or MT-EZ
- Property information – a copy of recorded Plat Map or recorded deed and other map that shows the property boundary and physical features (streets, buildings, drainageways, etc.) surrounding the property



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- Lot and/or structure elevations certified by a licensed Professional Engineer or Land Surveyor

An Elevation Information or Elevation Certificate Form for the property should be filled out and certified by a Professional Civil Engineer or a Land Surveyor licensed to practice in the State of Colorado. FEMA compares the certified elevations provided in the form with the effective 100-year flood elevation to determine if the subject property can be removed from the SFHA. For a lot to be removed from the SFHA, the lowest lot ground elevation should be at or above the 100-year flood elevation. For a structure to be removed, the lowest floor elevation (including basement and/or crawl space) and the lowest adjacent ground touching the structure should be at or above the 100-year flood elevation.

The issuance of a LOMA officially removes the subject lot and/or structure from the FEMA SFHA, eliminating the FEMA's flood insurance requirement. However, it should be noted that some lending institutions might still require purchase of flood insurance regardless of the FEMA flood hazard zone designation. Unless the entire lot is elevated at least one (1) foot above the 100-year base flood elevation (BFE) or the lowest floor (including basement and/or crawl space) is elevated at least 1 foot above the BFE, it is strongly recommended that the property be insured with the flood insurance.

For a lot to be removed from the SFHA, the lowest lot ground elevation should be at or above the 100-year flood elevation. For a structure to be removed, the lowest floor elevation (including basement and/or crawl space) and the lowest adjacent ground touching the structure should be at or above the 100-year flood elevation.

If the revision request is based on fill placed after FEMA's original floodplain study, the applicant should submit a request for LOMR based on fill. If the amendment request involves regulatory floodway boundaries, alluvial fan floodplains, flood conveyance improvements, and changes in the base flood elevations (BFE), a request for LOMR using FEMA forms MT-2 should be submitted.

1.6 **FEMA LETTER OF MAP REVISION BASED ON FILL (LOMR-F)**

Placement of fill to elevate areas above the 100-year flood elevation within the flood fringe may be allowed by the local agency. Flood fringe is the area between the adopted 100-year floodway and floodplain boundaries. Placement of fill within a 100-year floodplain without an established floodway should only be allowed based on the floodplain management guidelines outlined in Chapter 3, Section 1. Construction of new building structures in the floodway is strongly discouraged.

A request for LOMR-F should be submitted to remove the property that has been elevated sufficiently above the 100-year flood elevation by fill, from the SFHA. Detailed LOMR-F submittal requirements are outlined in the FEMA publications previously referenced in Section 1.3 and the FEMA forms. A request for LOMR-F can be submitted for a single lot/structure using Form MT-EZ or multiple lots/structures using Form MT-1. The following is a list of general LOMR-F submittal requirements:

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- FEMA forms – MT-1 or MT-EZ
- Property information – a copy of recorded Plat Map or recorded deed and other map that shows the property boundary and physical features (streets, buildings, drainageways, & etc.) surrounding the property
- Lot and/or structure elevations certified by a licensed Professional Civil Engineer or a Professional Land Surveyor
- A signed Community Acknowledgment.

An Elevation Information or Elevation Certificate Form for the property should be filled out and certified by a Professional Engineer or a Land Surveyor licensed to practice in the State of Colorado. FEMA compares the certified elevations provided in the form with the effective 100-year flood elevation to determine if the subject property can be removed from the SFHA.

In the State of Colorado, to remove the entire lot from the SFHA, fill should be placed to elevate the entire lot, so that the lowest point of the lot is above the 100-year flood elevation. For just a structure to be removed from the SFHA, fill should be placed to elevate the lowest floor (including basement and/or crawl space) of the structure to meet the requirements specified in Chapter 3, Section 1.9. Also, the lowest adjacent ground touching the structure should be above the 100-year flood elevation. It is strongly recommended that basements should not be constructed on fill. If the entire lot is elevated at least one (1) foot above the 100-year flood elevation, but the structure is within 50 feet from the SFHA, the lowest floor of the structure should meet the requirements specified in Chapter 3, Section 1.9.

To remove the entire lot from the SFHA, fill should be placed to elevate the entire lot, so that the lowest point of the lot is at least one (1) foot above the 100-year flood elevation. It is strongly recommended that basements should not be constructed on fill.

If the revision request involves regulatory floodway boundaries, alluvial fan floodplains, flood conveyance improvements, and changes in the base flood elevations (BFE), a request for LOMR using FEMA forms MT-2 should be submitted.

If desired by the applicant or required by the local agency, a request for Conditional Letter of Map Revision based on Fill (CLOMR-F) should be submitted based on the conceptual project site design. The submittal requirement for a request for CLOMR-F is same as LOMR-F. A request for LOMR-F should be submitted following the CLOMR-F using the "as-built" project information.

1.7 **FEMA LETTER OF MAP REVISION (LOMR)**

FEMA map revision requests that involve new hydrologic and hydraulic analyses, regulatory floodway boundaries, alluvial fan floodplains, flood conveyance improvements, and changes in the base flood elevations (BFE), a request for LOMR using MT-2 FEMA forms should be submitted. Unless a CLOMR submittal is required, the applicant has the option to submit a request for CLOMR before the project is built and then follow the CLOMR with a LOMR request, or wait until the project is completed and submit a request for LOMR without a CLOMR. The main



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difference between CLOMR and LOMR request submittals is that a CLOMR request can be submitted based on preliminary project design plans but a LOMR request should be based on "as-built" drawings. For projects that involve a considerable amount of drainageway modifications or complex drainageway hydraulics, it is recommended that the applicant choose the request for CLOMR option, since that process will allow the requester to modify the project design, if required to do so by the reviewing agencies prior to construction.

1.7.1 **REQUEST FOR A CONDITIONAL LETTER OF MAP REVISION CLOMR**

For projects that involve a considerable amount of drainageway modifications or complex drainageway hydraulics, it is recommended that the applicant choose the request for CLOMR option, since that process will allow the requester to modify the project design, if required to do so by FEMA prior to construction.

The CLOMR process is intended to allow local, state, and FEMA review of a project before construction to assure that the proposed project will be consistent with the local, state, and FEMA floodplain management standards. A CLOMR may be required by the local community prior to formal project approval if the project has unusual or complex floodplain mapping conditions. In this instance, it will be necessary to obtain concurrence from FEMA before the final design and construction in order to assure that FEMA will accept the method of analysis and/or proposed improvements for a map revision and change in flood insurance requirements.

A CLOMR request should be prepared in accordance with the adopted FEMA guidelines and should be accompanied by the standard FEMA certification

forms MT-2 and a Community Acknowledgment Form. Copies of these forms can be obtained from the local Floodplain Administrator or directly from the FEMA's website (see Chapter 7).

1.7.1.1 **CLOMR REVIEW PROCEDURES**

The submittal requirements for a request for CLOMR are outlined in the FEMA publications previously referenced in Section 1.3 and the MT-2 FEMA forms. The analyses, maps, plans, and drawings should reflect the conditions after the proposed activity takes place. Consequently, the required information cannot be certified "as-built". A request for a CLOMR should clearly demonstrate how the proposed model will tie into existing FEMA models at both upstream and downstream of the proposed activity.

The affected local government agencies should review the CLOMR submittal first. The applicant should address the review comments to the satisfaction of the local agencies and submit a revised CLOMR submittal to CWCB for their review and approval as well. Local and CWCB comments should be resolved prior to submittal to FEMA. If the required supporting forms, data, or fee/fee waiver have not been provided, FEMA will send a letter to the party that submitted the request. This letter will identify any forms, supporting data, or fee that the requester has not submitted. Until the requested forms, data, and fee are submitted, FEMA will not undertake a detailed review of the request and will not take any further action concerning the request.



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If FEMA determines from its preliminary review that the basic supporting data has been provided and that either the required initial fee has been provided or the fee requirement has been waived, FEMA will then inform the requester of the amount of time that FEMA will need to complete a detailed review of the request and supporting data. After completing its detailed review, FEMA will inform the requester by letter of any additional supporting data that should be submitted as appropriate.

Once all required data has been provided, FEMA will complete its review and make a determination concerning the effects of the proposed modifications. FEMA will issue either a CLOMR, which describes the changes that could be made to the FIRM and/or FBFM after the proposed modifications are completed, or a letter that explains why FEMA could not recognize the effects of the proposed modifications if those modifications were completed as planned.

Before issuing the determination, FEMA will determine if all fees needed to cover review costs have been received. If additional fees are needed, FEMA will send an invoice letter to the requester. In such cases, the determination will not be issued until the required fees have been received by FEMA. All FEMA review fees should be paid by the applicant.

A CLOMR approval by FEMA is only a conceptual approval of the project concept and does not modify the floodplain delineation shown on the FEMA Flood Insurance Rate Map or the flood insurance requirements.

1.7.2 **REQUEST FOR LETTER OF MAP REVISION (LOMR)**

After the proposed drainage system for the project has been constructed, the "as-built" plans of the facilities should be submitted to FEMA as a Letter of Map Revision (LOMR) request with the supporting hydrologic, hydraulic, geomorphologic, and other data necessary to reflect effects of the floodplain modifications. The request for LOMR is submitted based on the effects of physical changes that have occurred in the floodplain or on the use of alternative methodologies that are technically superior.

The request for LOMR is submitted based on the effects of physical changes that have occurred in the floodplain or on the use of alternative methodologies that are technically superior.

The procedures for a LOMR review are similar to those for a CLOMR review. The specific requirements are outlined in the FEMA certification forms MT-2 and the FEMA publications previously referenced in Section 1.3. A copy of these procedures can be obtained from the local Floodplain Administrator or the FEMA website (see Chapter 7).

The LOMR request can be submitted to FEMA without obtaining a CLOMR in advance for the project. However, for complex projects, it is recommended



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that the applicant submit and obtain a CLOMR prior to construction since that process will allow FEMA to review the proposed floodplain modifications and make comments to the requester, if necessary.

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CHAPTER 5

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SECTION 2

DELINEATION OF NEW FLOODPLAINS

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SECTION 2

DELINEATION OF NEW FLOODPLAINS

2.1 INTRODUCTION

In spite of the ongoing floodplain mapping efforts by local, state, and federal agencies, many waterways in the State of Colorado that are subject to severe flooding problems have not yet been studied and/or designated as flood hazard areas. As new developments occur and cities and towns expand into new watersheds and drainageways, local jurisdictions and developers are faced with dealing with waterways that have not been studied.

In order to regulate and guide new developments within or near drainageways that have not been studied, new detailed hydrologic and hydraulic analyses should be performed for the drainageways to define the flood hazard areas.

2.2 REPORT SUBMITTAL REQUIREMENTS

To delineate and designate a new flood hazard area, the applicant should prepare and submit a Floodplain Modification Study to the local government agencies and the Colorado Water Conservation Board (CWCB) for their review and approval. If it is required or preferred to show the new floodplain delineations on the FEMA Flood Insurance Rate Maps (FIRM), a LOMR request report should be prepared and submitted to FEMA for their review and approval. A LOMR request report may be submitted in place of a Floodplain Modification Study to the local agencies and the CWCB.

2.2.1 FLOODPLAIN MODIFICATION STUDY

Detailed discussions on the Floodplain Modification Study submittal requirements are provided in Section 1, Chapter 5. All new hydrologic and hydraulic analyses results, flood hazard area delineations, and other required information should be documented following the guidelines and be submitted to all affected local agencies for their review and approval. Once the study has been reviewed and approved by the local agencies, the applicant should submit the study to CWCB for their review and approval.

2.2.2 FEMA LETTER OF MAP REVISION (LOMR)

A request for LOMR report should be prepared and submitted to FEMA in order to show the new floodplain delineations on the FEMA Flood Insurance Rate Maps. Detailed discussions on the LOMR report submittal requirements are provided in Section 1, Chapter 5.

If a LOMR request is being submitted for the purpose of designating new floodplains based on the existing conditions, additional submittal for a Conditional Letter of Map Revision (CLOMR) request is not necessary.



2.3 FLOODPLAIN ANALYSIS REQUIREMENTS

Detailed discussions on the hydrology, hydraulics, and floodplain delineation methods and criteria are provided in Chapters 9, 10, and 11, respectively. Unless permitted by the local jurisdictions and the CWCB, all new floodplains should be determined utilizing the detailed hydraulic analysis method (Section 3, Chapter 10). The procedures for delineating new floodplain boundaries are provided in Chapter 11.

New approximate floodplain boundaries may be delineated for some drainageways using the approximate hydraulic analysis method (Section 2, Chapter 10) only if no developments are proposed in the vicinity of the drainageway in the foreseeable future. When new developments are proposed to encroach into or located adjacent to a previously delineated approximate 100-year floodplain, the previously delineated approximate floodplain limits should be restudied by using the detailed hydraulic analysis approach before the development can occur.



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3.1 INTRODUCTION

The main purpose of a subdivision drainage report submittal is to present conceptual and/or detailed technical information to demonstrate that the proposed drainage facilities will adequately mitigate the increased flows caused by the development and safely convey design storm runoffs in accordance with the policies and standards set forth by the governing agencies.

Many local agencies have already established and adopted their own development drainage submittal standards. However, there are still a number of local entities without adopted drainage submittal standards that are adequate to effectively guide their developments and drainage practices. The establishment of drainage report submittal standards is necessary in order to obtain consistency in design and analysis of drainage facilities and to minimize time and effort needed to prepare and review the proposed drainage design.

This section provides recommended subdivision drainage report submittal standards and guidelines. If the proposed development site is located within the 100-year floodplain, refer to Section 1, Chapter 3 of this Statewide Manual for the floodplain development guidelines. Each entity adopting the contents of the statewide manual is responsible for enforcement of the manual within its jurisdictional boundaries.



This section provides recommended subdivision drainage report submittal standards and guidelines. The CWCB encourages that the local government entities (without established drainage report submittal standards) adopt the standards provided herein, wholly or in part, depending on the needs of the adopting agency. If the proposed development site is located

within the 100-year floodplain, refer to Section 1, Chapter 3 of this Statewide Manual for the floodplain development guidelines. Each entity adopting the contents of the statewide manual is responsible for enforcement of the manual within its jurisdictional boundaries.



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By reviewing and accepting drainage designs and reports for a given development, the local jurisdiction should not assume liability for improper drainage design nor guarantee that drainage design reviews will absolve the developer or designer of future liability for improper design. The design engineer is ultimately responsible for the drainage facilities design and determining if drainage facilities, which exceed the standards established herein, are necessary to fully protect the proposed project and citizens from drainage and flood hazards.

3.2 DRAINAGE REPORT SUBMITTALS

All subdivisions, re-subdivisions, planned unit developments or other developments (except PUD amendments and administrative amendments) should submit appropriate drainage reports in accordance with the requirements outlined in this manual. The drainage report submittal requirements for land development processes, land disturbance projects, and drainage improvement projects are summarized in [Table CH5-T301](#). Depending on the type and status of the proposed development, the following three types of drainage reports should be submitted for review and approval by the local governing entity:

- Phase I Drainage Report
- Phase II Drainage Report
- Phase III Drainage Report

Detailed outlines of the report submittal requirements are provided in Sections 3.3, 3.4 and 3.5.

3.2.1 EXEMPTIONS

Exemptions to the outlined drainage report submittal requirements could be granted by the local jurisdiction for just causes. Those processes/projects which can clearly demonstrate, without detailed analysis, that no adverse impacts will result to the onsite and downstream drainage systems may be exempt from submitting a Phase II Drainage Report. Certain items of the submittal requirements could be waived if it is clearly demonstrated to and agreed by the local jurisdiction, prior to submittal of the report for review, that the subject information is not needed to fulfill the intent of the report. For an exemption or waiver request, the project developer should be required to submit a statement by a Colorado Registered Civil Engineer stating that the proposed project fully meets the policy, analysis and design requirements of this manual. For an approved request, the local jurisdiction should provide to the requesting party a written confirmation of the exemption or waiver granted.

3.2.2 DRAINAGE MASTER PLANS

Drainage Master Plans should be required when a property is to be developed in phases (master planned communities, planned unit developments, etc.). It is recommended that a meeting be held during the project planning process between the developer(s), the local jurisdiction and regional agencies, if any, to identify the needs for and any major drainage issues that may affect proposed master planned drainage facilities.



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Depending on the type of development and purpose of the Master Plan, the Drainage Master Plan should be prepared based on the Phase 1 report outlines (Section 3.3), Phase 2 report outlines (Section 3.4), or both.

Discussions with the local jurisdiction should be held to determine what level of analysis would be appropriate for the proposed Drainage Master Plan.

Discussions with the local jurisdiction should be held to determine what level of analyses and documentations would be appropriate for the project drainage master plan.

Particular attention should be given to project phasing, compatibility with adjacent existing or proposed local and regional drainage systems and compatibility with existing master plan analyses. The Drainage Master Plan report submittal should provide a

comprehensive discussion of all relevant issues that affect the design and implementation of the subject local and regional drainage facilities.

3.3 PHASE I DRAINAGE REPORT

The Phase I Drainage Report should be one of the first steps in the development approval process. A Phase I Drainage Report should be submitted as part of the zoning for the subdivision process. The Phase I report provides reviewing agencies a conceptual level of the feasibility and design characteristics of the proposed development. The report should include a cover letter presenting the preliminary design for review and should be prepared by or supervised by a professional civil engineer licensed in Colorado. The Phase I Drainage Report should be prepared in accordance with this manual.

The Phase I report provides reviewing agencies a conceptual level of the feasibility and design characteristics of the proposed development.

3.3.1 REPORT CONTENTS

- General Location and Description
 - Location
 - City, County, state Highway and local streets within and adjacent to the site or the area to be served by the drainage improvements
 - Township, Range, Section, ¼ Section
 - Major drainageways and facilities
 - Names of surrounding developments
 - Description of Property
 - Area in acres
 - Ground cover (type of ground cover and vegetation)
 - Major drainageways
 - Existing major irrigation facilities such as ditches and canals
 - Proposed land use
- Drainage Basins and Sub-Basins
 - Major Basin Description



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- If any, reference to major drainageway planning studies such as flood hazard delineation report, major drainageway planning reports and flood insurance rate maps
 - Major basin drainage characteristics, existing and planned land uses within the basin, as defined by the local jurisdiction
 - Identification of all nearby irrigation facilities within 100 feet of the property boundary, which will influence or be influenced by the local drainage
 - Sub-Basin Description
 - Discussion of historic drainage patterns of the subject property
 - Discussion of offsite drainage flow patterns and impact on development under existing and fully developed basin conditions
 - Drainage Facility Design
 - General Concept
 - Discussion of concept and typical drainage patterns
 - Discussion of compliance with offsite runoff considerations
 - Discussion of anticipated and proposed drainage patterns
 - Discussion of the content of tables, charts, figures, plates or drawings presented in the report
 - Discussion of the need to provide offsite public improvements for conveyance of minor or major flows to the major drainageway
 - Specific Details (Optional Information)
 - Discussions of drainage problems encountered and solutions at specific design points
 - Discussion of detention storage and outlet design
 - Discussion of maintenance and access aspects of the design
 - Discussion of impacts of concentrating the flow on the downstream properties
- Note: Should the Preliminary Development Plan provide significantly more detail and description than the minimum required information, the local jurisdiction may require all or part of the above Optional Information.
- References
 - Reference all criteria, master plans, and technical information used in support of concept.

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3.3.2 **DRAINAGE PLAN CONTENTS**

Legible drainage plans that cover the development area should be submitted with the Phase I Drainage Report. The plans should show the following information:



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- General Location Map: All drawings should be 24" x 36" in size. A map should be provided in sufficient detail to identify drainage flows entering and leaving the development and general drainage patterns. The map should be of a sufficient scale to show the path of all drainage from the upper end of any offsite basins to the defined major drainageways. The map should identify any major facilities from the property (i.e., development, irrigation ditches, existing detention facilities, culverts, storm sewers) along the flow path to the nearest major drainageway. Basins and divides should be identified and topographic contours should be included.
- Floodplain Information: All major drainageways should have the flow path defined and shown on the report drawings.
- Drainage Plans: Map(s) of the proposed development should be shown at a scale of 1" = 20' to 1" = 200' on a 24" x 36" drawing. The plan should show the following:
 - Existing topographic contours at 5-foot maximum intervals. In terrain where the slope exceeds 15%, the maximum interval is 20 feet. The contours should extend a minimum of 100 feet beyond the property lines.
 - All existing drainage facilities.
 - Approximate flooding limits based on available information.
 - Conceptual major drainage facilities including detention basins, storm sewers, culverts, channels, swales, riprap and hydraulic structures in the detail consistent with the proposed development.
 - Major drainage boundaries and sub-boundaries.
 - Any offsite feature influencing development.
 - Proposed flow directions and, if available, proposed contours
 - Legend to define map symbols.
 - Title block in lower right corner.

3.4 **PHASE II DRAINAGE REPORT**

The Phase II Drainage Report should be submitted for the subdivision process with the Preliminary Plat or the Overall Development Plan application for a development. The Phase II report should identify and refine conceptual solutions to the problems that may occur onsite and offsite as a result of the proposed development. All reports should be typed on 8 1/2" x 11" paper and bound. The drawings, figures, plates and tables should be bound with the report or included in a pocket attached to the report.

The Phase II report should identify and refine conceptual solutions to the problems that may occur onsite and offsite as a result of the proposed development.

The report should include a cover letter presenting the preliminary design for review and should be prepared by or supervised by an engineer licensed in Colorado. The report should contain a certification sheet per the following example:

"I hereby affirm that this report (plan) for the (type or phase design) of (Name of Development) was prepared by me (or under my direct supervision) for the owners thereof in accordance with the provision of (local jurisdiction) Storm Drainage Design

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and Technical Criteria Manual and approved variances are exceptions thereto. I understand that it is the policy of (local jurisdiction) does not and will not assume liability for drainage facilities designed by others”

Registered Professional Engineer
State of Colorado No. _____
(Affix Seal)

3.4.1 REPORT CONTENTS

The Phase II report should be prepared in accordance with the following outline and contain the applicable information listed:

- General Location and Description
 - Location
 - Township, Range, Section, ¼ Section
 - Local streets within and adjacent to the subdivision with ROW width shown
 - Major drainageways, facilities and easements within and adjacent to the site
 - Names of surrounding developments
 - Description of Property
 - Area in acres
 - Ground cover (type of trees, shrubs, vegetation, general soil conditions, topography and slope)
 - Major drainageways
 - General project description
 - Irrigation facilities
 - Proposed land use
- Drainage Basins and Sub-Basins
 - Major Basin Description
 - If any, reference to major drainageway planning studies such as flood hazard delineation reports, major drainageway planning reports and flood insurance rate maps
 - Major basin drainage characteristics, existing and planned land uses
 - Identification of all irrigation facilities within the basin which will influence or be influenced by the local drainage
 - Sub-Basin Description
 - Discussion of historic drainage patterns of the property in question
 - Discussion of offsite drainage flow patterns and impact on development under existing and fully developed basin conditions, as defined by the local jurisdiction
 - Soils information of the site should be presented. The discussion on soils shall include rainfall and wind erodibility problems, limiting characteristics,

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groundwater depths and suitability of the soils for development. Information should be presented concerning conceptual plans for controlling wind and rainfall erosion and the effectiveness of establishing vegetation.

- Drainage Design Criteria
 - Regulations
 - Discussion of the optional provisions selected or the deviation from the Criteria, if any, and its justification
 - Development Criteria Reference and Constraints
 - Discussion of previous drainage studies (i.e., project master plans) for the site in question that influence or are influenced by the drainage design and how the plan will affect drainage design for the site
 - Discussion of the effects of adjacent drainage studies
 - Discussion of the drainage impact of site constraints such as streets, utilities, existing structures and development or site plan
 - Hydrological Criteria
 - Identify design rainfall
 - Identify runoff calculation method
 - Identify detention discharge and storage calculation method
 - Identify design storm recurrence intervals
 - Discussion and justification of other criteria or calculation methods used that are not presented in or referenced by the Criteria
 - Hydraulic Criteria
 - Identify various capacity references
 - Discussion of other drainage facility design criteria used that are not presented in the Criteria
 - Variances from Criteria
 - Identify provisions by section number for which a variance is requested
 - Provide justification for each variance requested
- Drainage Facilities Design
 - General Concept
 - Discussion of concept and typical drainage patterns
 - Discussion of compliance with offsite runoff considerations
 - Discussion of the content of tables, charts, figures, plates or drawings presented in the report
 - Discussion of anticipated and proposed drainage patterns
 - Specific Details
 - Discussion of drainage problems encountered and solutions at specific design points
 - Discussion of detention storage and outlet design
 - Discussion of maintenance access and aspects of the design

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- Discussion of easements and tracts for drainage purposes, including the conditions and limitations for use
- Discussion of the facilities needed offsite for the conveyance of minor and major flows to the major drainageway
- Conclusions
 - Compliance with Standards
 - "Criteria"
 - "Major Drainageway Planning Studies"
 - "Manual"
 - Drainage Concept
 - Effectiveness of drainage design to control damage from storm runoff
 - Influence of proposed development on the Major Drainageway Planning Studies recommendation(s)
- References
 - Reference all criteria and technical information used
- Appendices
 - Hydrologic Computations
 - Land use assumptions regarding adjacent properties
 - Initial and major storm runoff at specific design points
 - Historic and fully developed runoff computations at specific design points
 - Hydrographs at critical design points
 - Time of concentration and runoff coefficients for each basin
 - Hydraulic Computations
 - Culvert capacities
 - Storm sewer capacity
 - Gutter capacity as compared to allowable (refer to Chapter 14, Section 2)
 - Storm inlet capacity including inlet control rating at connection to storm sewer
 - Open channel design
 - Check and/or channel drop design
 - Detention area/volume capacity and out capacity
 - Downstream/outfall system capacity to the Major Drainageway System
 - Design of riprap protection for culverts and storm sewer outlets

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3.4.2 DRAINAGE PLAN CONTENTS

Legible drainage plans that cover the development area should be submitted with the Phase II Drainage Report. The plans should show the following information:



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- General Location Map: All drawings should be 24" x 36" in size. A map should be provided in sufficient detail to identify drainage flows entering and leaving the development and general drainage patterns. The map should be at a scale of 1" = 1000' to 1" = 8000' and show the path of all drainage from the upper end of any offsite basins to the defined major drainageways. The map should identify any major construction (i.e., development, irrigation ditches, existing detention facilities, culverts, storm sewers, canals) along the entire path of drainage. Basins and divides should be identified and topographic contours should be included.
- Floodplain Information: All major drainageways should have the flow path defined and shown on the report drawings.
- Drainage Plan: Map(s) of the proposed development at a scale of 1" = 20' to 1" = 200' on a 24" x 36" drawing should be included. The plan should show the following:
 - Existing and proposed contours at 2-foot maximum intervals. The contours should extend a minimum of 100 feet beyond the property lines.
 - Property lines and easements with purposes noted.
 - Streets, indicating ROW width, flowline width, curb type, sidewalk and approximate slopes.
 - Existing drainage facilities and structures, including irrigation ditches, roadside ditches, drainageways, gutter flow directions and culverts. All pertinent information such as material, size, shape, slope and location should also be included.
 - Overall drainage area boundary and drainage sub-area boundaries.
 - Proposed type of street flow (i.e., vertical or combination curb and gutter), roadside ditch, gutter, slope and flow directions and cross-pans.
 - Proposed storm sewers and open drainageways, including inlets, manholes, culverts and other appurtenances (i.e., riprap protection).
 - Proposed outfall point for runoff from the developed area and facilities to convey flows to the final outfall point without damage to downstream properties.
 - Routing and accumulation of flows at various critical points for the initial storm runoff listed on the drawing using the format shown in Table CH5-T302.
 - Routing and accumulation of flows at various critical points for the major storm runoff listed on the drawing using the format shown in Table CH5-T302.
 - Volumes and release rates for detention storage facilities and information on outlet works.
 - Location and elevations of all existing floodplains affecting the property.
 - Location and (if known) elevations of all existing and proposed utilities affected by or affecting the drainage design.
 - Routing of offsite drainage flow through the development.
 - Definition of flow path leaving the development through the downstream properties ending at a major drainageway.

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- Legend to define map symbols.
- Summary Runoff Table (refer to [Table CH5-T302](#)).
- Title block in lower right hand corner.

3.4.3 **EXEMPTIONS**

The report requirements for Phase II Drainage Report may be reduced at the request of the applicant if there is uncertainty over the final characteristics within the proposed development. There is frequently uncertainty with commercial developments at the preliminary plat stage on the placement of buildings, the slope of the site, the paved area and the location of onsite detention facilities. Under the Phase II Drainage Report Exemption, the Phase II Drainage Report requirements should be met with the following modifications:

- Assumptions may be made for areas where there is uncertainty on drainage factors related to the development of the site.
- The level of detail may be reduced in the hydraulic and hydrology analysis in areas where uncertainty exists.
- Areas where assumptions are made and where the level of detail is limited should be identified so that they can be completed in full detail with the Phase III Drainage Report.
- Storm water flow routing calculations should be completed using assumed conditions. The drainage plan should show flow paths and the method of conveyance (open channel, street or street and storm sewer).
- The percent of slope on streets may not be established. The direction of the slope and the location of the high points and the sumps in the streets should be determined.
- The location of detention facilities should be shown on the plan. The volume and land area should be estimated: and the type of detention (underground, parking lot or open space) should be described. The detailed outlet design calculations are not required.

It is important that all other requirements of a Phase II Drainage Report are addressed in detail. Specifically, attention needs to be given to the following points.

- Full detail should be provided on the analysis of offsite flows onto the site.
- Full detail should be provided on the analysis of the conveyance of flow from the site to the major drainageway.

3.5 **PHASE III DRAINAGE REPORT**

The Phase III Drainage Report should be submitted during the final plat application for the development in the subdivision process. If the preliminary and final plat applications are submitted concurrently, the submittal requirements of Section 3.4 (Phase II Drainage Report) should apply. The Phase III report should update the concepts and present the design details for the drainage facilities discussed in the Phase II Drainage Report. Also, any change in the Phase II concept should be presented. If irreconcilable differences arise between the local jurisdiction and the



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applicant regarding the drainage improvements to be provided, the applicant's rights of due process are maintained by variance and appeals procedures identified in the Subdivision Regulations.

The Phase III report should update the concepts and present the design details for the drainage facilities discussed in the Phase II Drainage Report.

All reports should be typed on 8 1/2" x 11" paper and bound. The drawings, figures, charts, plates and/or tables should be bound with the report or included in a folder/packet attached at the back of the report.

The report should include a cover letter presenting the final design for review and should be prepared by or under the direction of an engineer licensed in Colorado, certified as shown in Section 3.4. The report should also contain a developer certification sheet per the following example:

"(Name of Developer) hereby certifies that the drainage facilities for (Name of Development) shall be constructed according to the design presented in this report. I understand that (local jurisdiction) does not and will not assume liability for the drainage facilities designed and/or certified by my engineer. I understand that (local jurisdiction) reviews drainage plans pursuant to Colorado Revised Statutes Title 30, Article 28; but cannot, on behalf of (Name of Development), guarantee that final drainage design review will absolve (Name of Developer) and/or their assigns of future liability for improper design. I further understand that approval of the Final Plat and/or Final Development Plan does not imply approval of my engineer's drainage design."

Name of Developer

Authorized Signature

3.5.1 **REPORT CONTENTS**

The Phase III Drainage Report should be prepared in accordance with the outline shown in Section 3.4.1 above.

3.5.2 **DRAINAGE PLAN CONTENTS**

The Phase III Drainage Report drawings should follow the requirements presented in Section 3.4.2 above.

3.5.3 **IMPROVEMENT PLANS**

Improvement plans are desired but not required to be submitted with the Phase III Drainage Report. However, profiles of storm sewer with HGL's and EGL's may be required for adequate review if required by the local jurisdiction. For improvement plan criteria refer to Section 3.7.



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3.5.4 EROSION/SEDIMENTATION CONTROL REPORT AND PLANS

An Erosion and Sedimentation Control report and plans should be prepared for all land disturbing activity within the State of Colorado. Said report and plans should be prepared in accordance with the Erosion and Sediment Control standards (refer to Chapter 15 of this Statewide Manual).

3.6 DRAINAGE REPORT ADDENDUM

A Phase II Drainage Report Addendum may be required when design changes have occurred on a portion of the site (or exceptions per Section 3.4.3 have been applied) subsequent to the submittal and approval of a Phase II Drainage Report and the development has not progressed to the final design phase. The local jurisdiction may defer this addendum and allow the development to proceed to the Phase III Drainage Report submittal if the revisions are of a minor nature.

A Phase III Drainage Report Addendum may be required to present analysis and design changes made subsequent to the submittal and approval of a Phase III Drainage Report. Typical cases that may require a Phase III Drainage Report Addendum are:

- Addition/removal of drop structures in a channel.
- Addition/removal of roadside ditches, curb and gutter, and storm sewers on a portion of the development.
- A minor re-plat of a portion of the development.
- Revisions to drainage facilities caused by an increase in the imperviousness of a portion of the development.

The purpose of the Drainage Report Addendum is to provide all detailed hydrologic and hydraulic calculations, which were not provided in the approved Drainage Reports. The addendums should be prepared in accordance with the following outline and contain the applicable information listed:

- Title page:
 - Project Name, Type of Study, Study Date
 - Preparer's Name, Firm and Date
 - Engineer's Statement, Seal and Signature
- Introduction: Discussion of the reason for submitting the Addendum and overview of the Addendum contents
- Hydrologic and Hydraulic Analysis: Provide revised or additional analysis per the drainage report requirements.
- Conclusion: Present a summary of the information or modifications presented in this Addendum.
- References: Provide a list of all references used for the Addendum.
- Appendices:
 - Include all relevant calculations.
 - Include a revised Drainage Plan per the requirements of the drainage report. The revised plan should contain all needed information to provide a replacement for the plan submitted with the original drainage report.



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3.7 IMPROVEMENT PLANS

Where drainage improvements are to be constructed, preliminary construction plans should be submitted with the Phase III Drainage Report. Final construction plans should be submitted at least four weeks prior to the issuance of construction permits for the public improvements covered by the plans. Approval of the final construction plans by the local jurisdiction is a condition of issuing the construction permits. The plans for the drainage improvements should include:

- Storm sewers, inlets, outlets and manholes with pertinent elevations, dimensions, and type and horizontal control indicated.
- Culverts, end sections and inlet/outlet protection with dimensions, type, elevations and horizontal control indicated.
- Channels, ditches and swales (including side/rear yard swales) with lengths, widths, cross-sections and erosion control (i.e., riprap, concrete, grout) indicated.
- Checks, channel drops, erosion control facilities.
- Detention pond grading, trickle channels, outlets and landscaping.
- Other drainage related structures and facilities (including under drains and sump pump lines).
- Maintenance access considerations.
- Overlot grading.
- Erosion and sedimentation control plan.

The information required for the plans should be in accordance with sound engineering principles, this manual and the governing review agencies requirements for subdivision designs. Construction documents should include geometric, dimensional, structural, foundation, bedding, hydraulic, landscaping and other details as needed to construct the storm drainage facility. The approved Phase III Drainage Plan should be included as part of the construction documents for all facilities affected by the drainage plan. A registered professional engineer should sign construction plans as being in accordance with the local jurisdiction approved drainage report/drawings.



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STORM DRAINAGE ANALYSIS SUBMITTALS

TYPE OF APPLICATION	REQUIRED DRAINAGE SUBMITTAL	CRITERIA SECTION
ZONING/REZONING	PHASE I	3.3
SKETCH PLAN	PHASE I	3.3
PRELIMINARY SUBDIVISION	PHASE II	3.4
OVERALL DEVELOPMENT PLAN	PHASE II	3.4
FINAL SUBDIVISION	PHASE III	3.5
FINAL DEVELOPMENT PLAN	PHASE III	3.5
PLANNED BUILDING GROUP	PHASE III	3.5
PERMITTED, CONDITIONAL AND SPECIAL USE PERMITS	PHASE III	3.5
MINOR SUBDIVISION	PHASE III	3.5
PLANNED UNIT DEVELOPMENT (PUD)	PHASE III	3.5
PUD AMMENDMENT	PHASE III	3.5

VERSION: JANUARY 2006

REFERENCE:

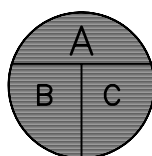
TABLE CH5-T301
STORM DRAINAGE ANALYSIS
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DRAWING SYMBOL CRITERIA AND HYDROLOGY REVIEW TABLE



A=BASIN DESIGNATION

B=AREA IN ACRES

C=COMPOSTIE RUNOFF COEFFICIENTS



D=DESIGN POINT DESIGNATION

SUMMARY RUNOFF TABLE (TO BE PLACED ON DRAINAGE PLAN)

DESIGN POINT	CONTRIBUTING AREA (ACRES)	RUNOFF 5-YEAR (CFS)	PEAK 100-YEAR (CFS)
XX	XX.XX	XX.X	XX.X

VERSION: JANUARY 2006

REFERENCE:

TABLE CH5-T302
DRAWING SYMBOL CRITERIA AND
HYDROLOGY REVIEW TABLE