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U.S. Department of Homeland Security  
1111 Broadway,  
Suite 1200  
Oakland, CA. 94607-4052



**FEMA**

August 31, 2007

CERTIFIED MAIL  
RETURN RECEIPT REQUESTED

Jeff Pratt  
Ventura County Department of Public Works  
800 South Victoria Avenue  
Ventura, CA 93009  
(805) 654-2040

RECEIVED  
SEP 05 2007  
WATERSHED PROTECTION DIST.

Dear Mr. Pratt:

This letter is in regard to the levees that are accredited on the effective Flood Insurance Rate Map (FIRM) and in the effective Flood Insurance Study (FIS) report for the Ventura County Watershed Protection District. These levees are identified on an enclosure to this letter. The U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA), is in the process of producing a countywide FIS report and Digital Flood Insurance Rate Map (DFIRM) for Ventura County, California. This effort is being undertaken as part of FEMA's Flood Map Modernization Program.

Flood hazard information presented on the effective FIRM and in the FIS report is based, in some areas, on flood protection provided by the levees identified on the enclosure. Based on the information available and on the mapping standards of the National Flood Insurance Program (NFIP) at the time that the FIS was performed, FEMA accredited the levees with providing protection from the flood that has a 1-percent-chance of being equaled or exceeded in any given year. The 1-percent-annual-chance flood also is referred to as the base flood.

For FEMA to continue to accredit the identified levees with providing protection from the base flood, the levees must meet the criteria of the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10), titled "Mapping of Areas Protected by Levee Systems" (copy enclosed). In accordance with 44 CFR 65.10(a), it is the responsibility of the community or other party seeking recognition of a levee system, to provide the data defined and outlined within the regulation. Specifically, the design and construction data provided must be certified by a registered professional engineer or by a Federal agency with responsibility for levee design.

FEMA understands that it may take time to acquire and/or assemble the documentation necessary to fully comply with 44 CFR 65.10. Therefore, FEMA has incorporated a process into the schedule of Flood Map Modernization that, if needed, will provide the Ventura County Watershed Protection District with additional time to submit all the necessary documentation. Initiation of this process can take place only if the levee owner and a representative of each impacted community sign and return the enclosed agreement to the FEMA Region IX office within 90 days of the date of this letter (before November 30, 2007).

In addition, the following must be provided:

- A copy of the adopted operation and maintenance plan for the levee; and
- Records of levee maintenance and operation, as well as tests of the mechanized interior drainage systems, if applicable.

Completion and submittal of the agreement, as well as the operation and maintenance plan and records, will serve as an official request that FEMA label the levee as a Provisionally Accredited Levee (PAL) on the DFIRM and will serve as agreement that, to the best of your knowledge, the levee meets the criteria of 44 CFR 65.10. It is the responsibility of the levee owner to submit the data required by 44 CFR 65.10 before FEMA can accredit the levee as providing protection from the base flood. The completed package must be submitted to the FEMA Region IX office before November 30, 2007 for the levee to receive the PAL designation. Please note that a levee that has maintenance deficiencies is not eligible for PAL consideration.

By endorsing the enclosed agreement, you state that all the necessary documentation will be provided within 2-years to comply with 44 CFR 65.10; that is before September 1, 2009. If you are unable to submit all the documentation necessary to meet the criteria of 44 CFR 65.10 before this date, FEMA will initiate a map revision to redesignate certain areas on the landward side of the levee as floodprone.

Levees will be labeled as PALs during the 24-month period to convey to map users that levee certification verification is underway. FEMA recommends that the levee owner and the impacted communities implement outreach efforts to inform affected property owners that an assessment of the levee is underway. FEMA also encourages the purchase of flood insurance, even though coverage is not federally required for the areas landward of the accredited levee.

If the documentation necessary to fully comply with 44 CFR 65.10, including an existing operation and maintenance plan and record of on-site inspection, is readily available, please submit the data to this office. Upon receipt of your submittal, FEMA will review the data and determine whether the levee will continue to be accredited with providing protection from the base flood.

If the only grounds for the levee in question not currently meeting the 44 CFR 65.10 criteria or PAL requirements are **maintenance issues**, then the FEMA Region IX office must be contacted by letter to bring attention to the matter before the end of this 90-day period to submit the enclosed PAL agreement. If you notify FEMA that the levee has known maintenance deficiencies, then a 1-year correction period can be provided to remedy these deficiencies. This 1-year correction period would begin on November 30, 2007, if you notify FEMA within 90 days of the date of this letter. During the 1-year correction period, FEMA will move forward with the current flood hazard mapping project as if the areas landward of the levee is to be located in a Special Flood Hazard Area (SFHA); the mapped area subject to inundation by the base flood. However, FEMA will delay issuance of the Letter of Final Determination (LFD) and effective DFIRM until the 1-year correction period has elapsed.

For FEMA to remove the SFHA landward of the levee, the following requirements must be met within the 1-year correction period:

- All the criteria contained in 44 CFR 65.10 submitted to FEMA, **or**
- Submittal of the entire PAL application, including the following documentation:
  - An agreement signed by the community and/or levee owner stating that the PAL

- designation is warranted because the levee meets the requirements of 44 CFR 65.10;
- A copy of the adopted operation and maintenance plan for the levee; and
  - Records of levee maintenance and operation, as well as tests of the mechanized interior drainage systems, if applicable.

Once the 1-year correction period has expired, FEMA will assess any submitted data and determine whether any mapping revisions are necessary. If no data have been submitted within the 1-year correction period, or if the submitted data are determined inadequate, FEMA will issue the LFD and effective DFIRM to show the areas landward of a maintenance deficient levee as located in a SFHA. However, if all of the criteria of 44 CFR 65.10 or the entire PAL application is submitted before the 1-year correction period has elapsed, then FEMA will show the levee on the newly effective DFIRM as accredited or provisionally accredited, as applicable.

If you have additional questions regarding the specific submittal requirements, please contact Raymond T. Lenaburg, Senior Engineer, of my staff, either by telephone at (510) 627-7181 or by facsimile at (510) 627-7147 or by facsimile at (510) 627-7147. We look forward to working with you and community officials to address this important matter. If there is anything we can do to facilitate the submittal process, please let us know.

Sincerely,



Feb: Sally Ziolkowski, Director  
Mitigation Division  
FEMA Region IX

**Enclosures:**

- Title 44 of the Code of Federal Regulations (CFR), Section 65.10 (44 CFR 65.10)
- Requirements of 44 CFR Section 65.10: Mapping of Areas Protected by Levee Systems
- Letter of Agreement and Request for Provisionally Accredited Levee (PAL) Designation and Agreement to Provide Adequate Compliance With the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10)
- Levee Status Map
- Levee Status Table

**Copies Furnished**

Senator Feinstein State Office

Senator Boxer State Office

Representative Gallegly District Office

Ricardo Pineda, CA DWR  
NFIP State Coordinator

Colonel Thomas H. Magness, USACE, LA District  
Commander

Mr. Gerard Kapuscik, Special Projects Project Manager  
Ventura County Watershed Protection District

**Letter of Agreement and Request for Provisionally Accredited Levee (PAL) Designation and Agreement to Provide Adequate Compliance with the Code of Federal Regulations, Title 44, Section 65.10 (44 CFR 65.10)**

**PAL Agreement Form**

We, the undersigned, have received a letter from FEMA dated August 31, 2007 with an enclosed "Levee Status Table" and two enclosed documents titled "Title 44 of the Code of Federal Regulations (CFR), Section 65.10 (44 CFR 65.10)" and "Requirements of 44 CFR Section 65.10: Mapping of Areas Protected by Levee Systems." We understand that FEMA is in the process of providing an updated Flood Insurance Rate Map for Ventura County, California and that the flood hazards around levee(s) identified on the Map and Levee Status Table with ID numbers \_\_\_\_, \_\_\_\_, \_\_\_\_, will be remapped to reflect that these levees have been designated a PAL. This/these levee(s) or levee system(s) is/are also known as \_\_\_\_\_

To the best of our knowledge, the levee(s) identified above meet the criteria of 44 CFR 65.10 and has/have been maintained in accordance with an adopted operation and maintenance plan. For Scenario A (non-USACE Program) levees, this must be evidenced by an attached Operation and Maintenance Plan and records of levee maintenance and operation, as well as Test Records of Mechanized Interior Drainage System. We hereby submit to FEMA within 90 days (before November 30, 2007) our agreement to provide FEMA with all the necessary information to show that the levee(s) identified above comply with 44 CFR 65.10. We understand that this documentation will be provided before September 1, 2009. Providing the information described in 44 CFR 65.10 will allow FEMA to move forward with the flood mapping for Ventura County, California. We fully understand that if complete documentation of compliance with 44 CFR 65.10 is not provided within the designated timeframe of 24 months, FEMA will initiate a revision to the Flood Insurance Rate Map for Ventura County, California to redesignate the area as floodprone.

Levee Owner Representative (signature): \_\_\_\_\_ Date: \_\_\_\_\_

Levee Owner Representative (print name): \_\_\_\_\_

Community CEO (signature): \_\_\_\_\_ Date: \_\_\_\_\_

Community CEO (print name): \_\_\_\_\_

Other, if applicable (signature): \_\_\_\_\_ Date: \_\_\_\_\_

Other, if applicable (print name): \_\_\_\_\_

**Required Attachments for Scenario A (non-USACE Program) Levees only:**

- Operation and Maintenance Plan and Records
- Test Records of Mechanized Interior Drainage System

**Instructions for Completing this Form:**

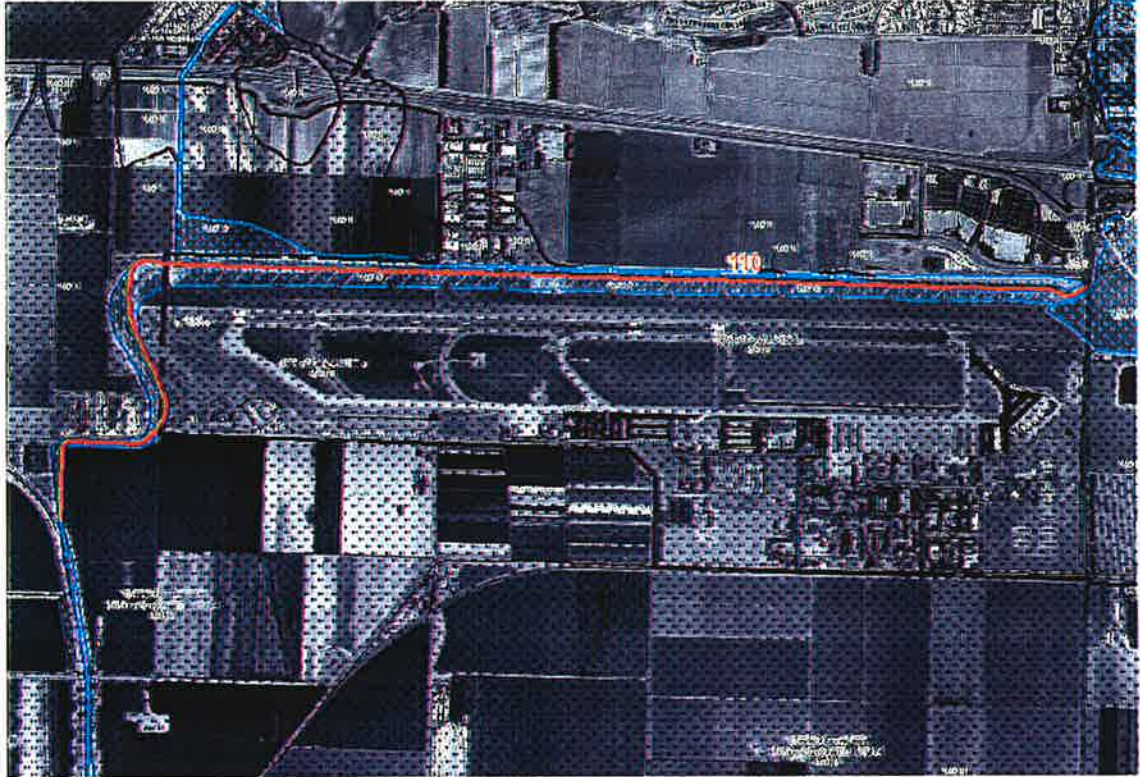
- On this PAL Agreement Form, fill-in the levee ID numbers and levee(s) name/description for which the Provisionally Accredited Levee (PAL) designation is requested. A separate PAL Agreement Form is recommended for each unique levee owner/levee system. Make copies of this blank form to request PAL designation for multiple levee systems, as necessary.
- This document is available on-line (in a PDF format that can be filled-in electronically) via the link named "Generic PAL Agreement Form for Region IX" at [http://rnc.mapmodteam.com/rnc9/Fact\\_Sheets.htm](http://rnc.mapmodteam.com/rnc9/Fact_Sheets.htm)

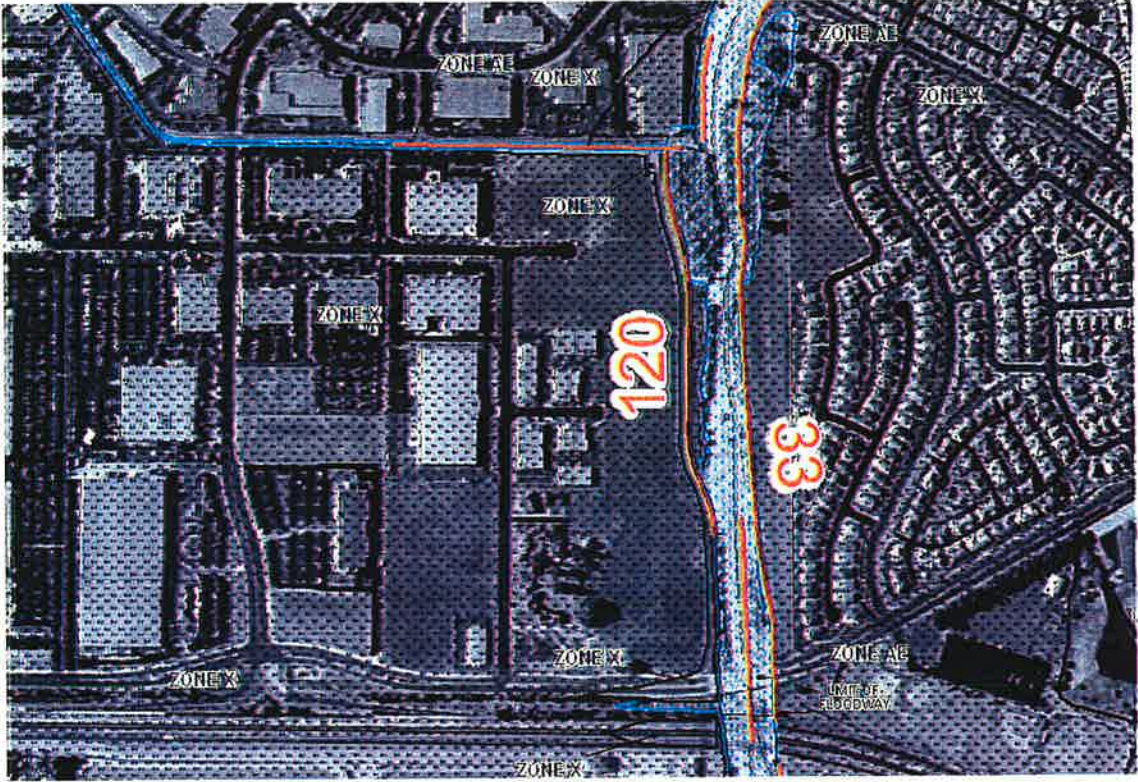
**City of Santa Paula Levee Status Map**



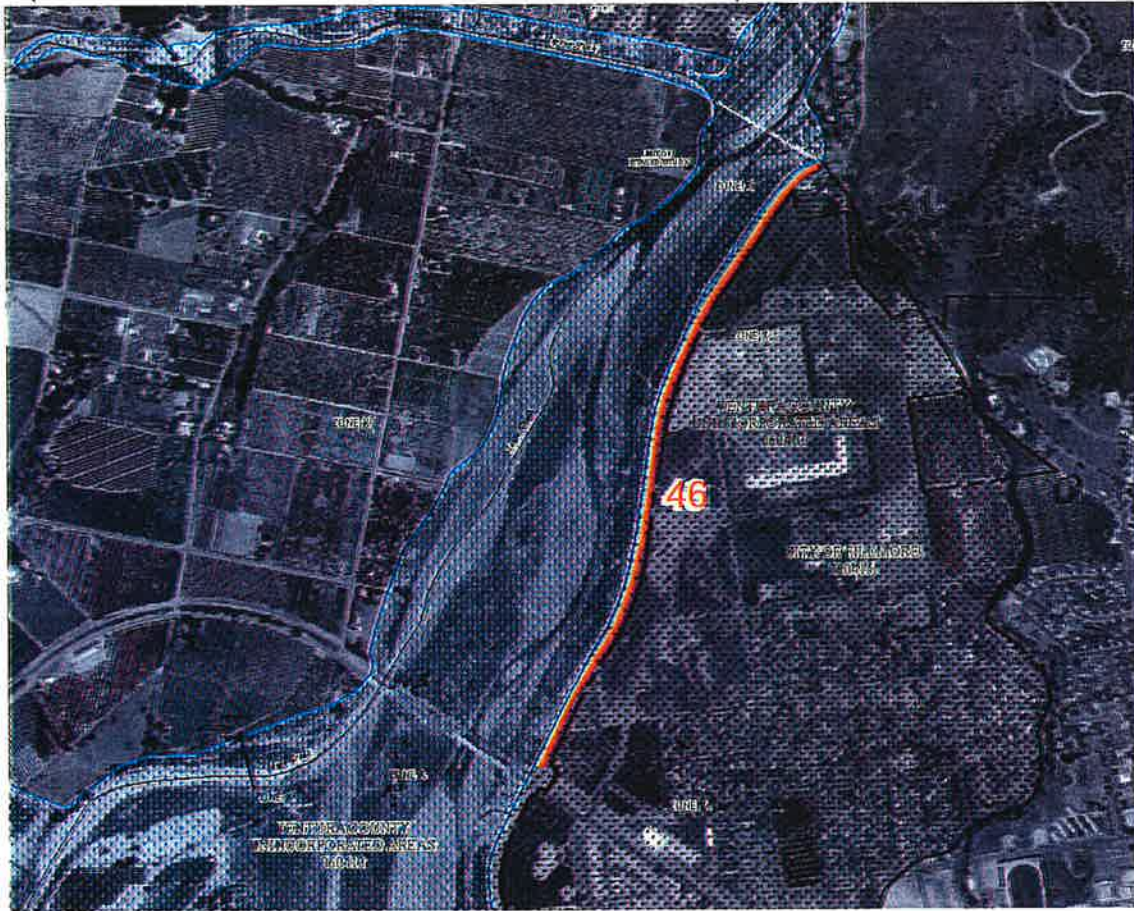
# City of Camarillo Levee Status Map



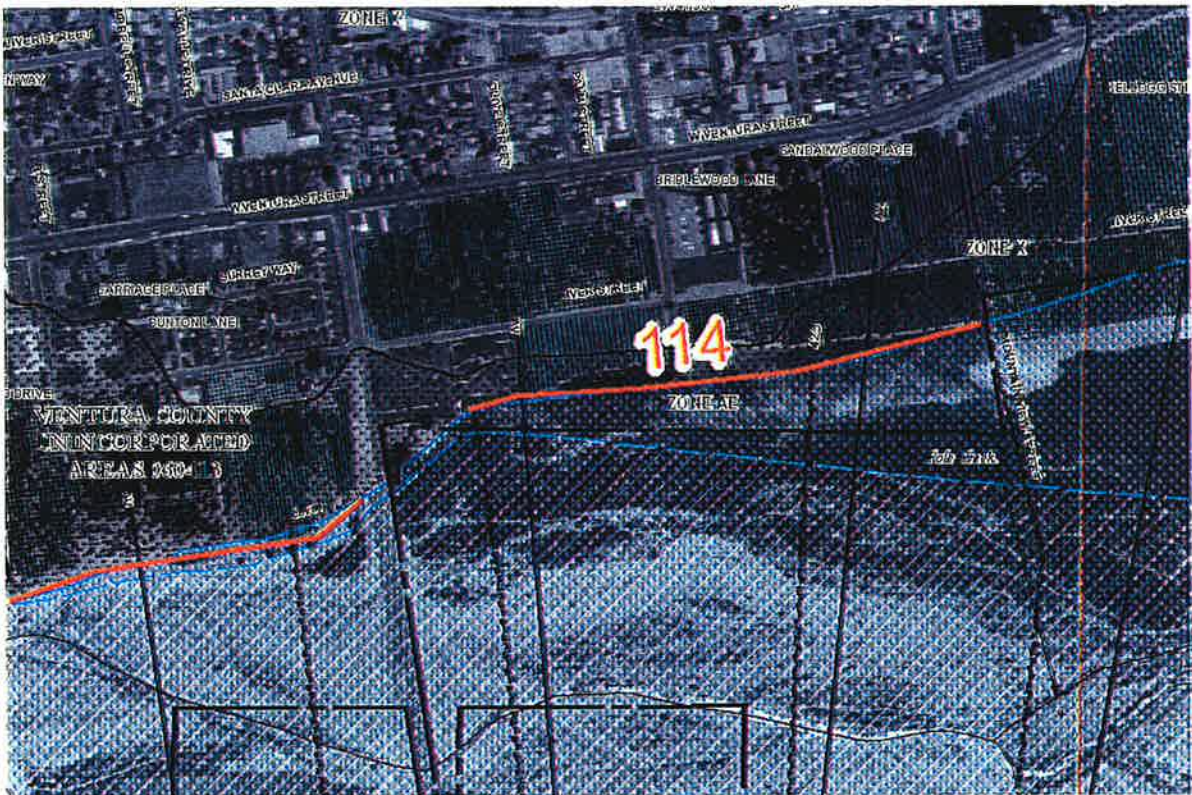
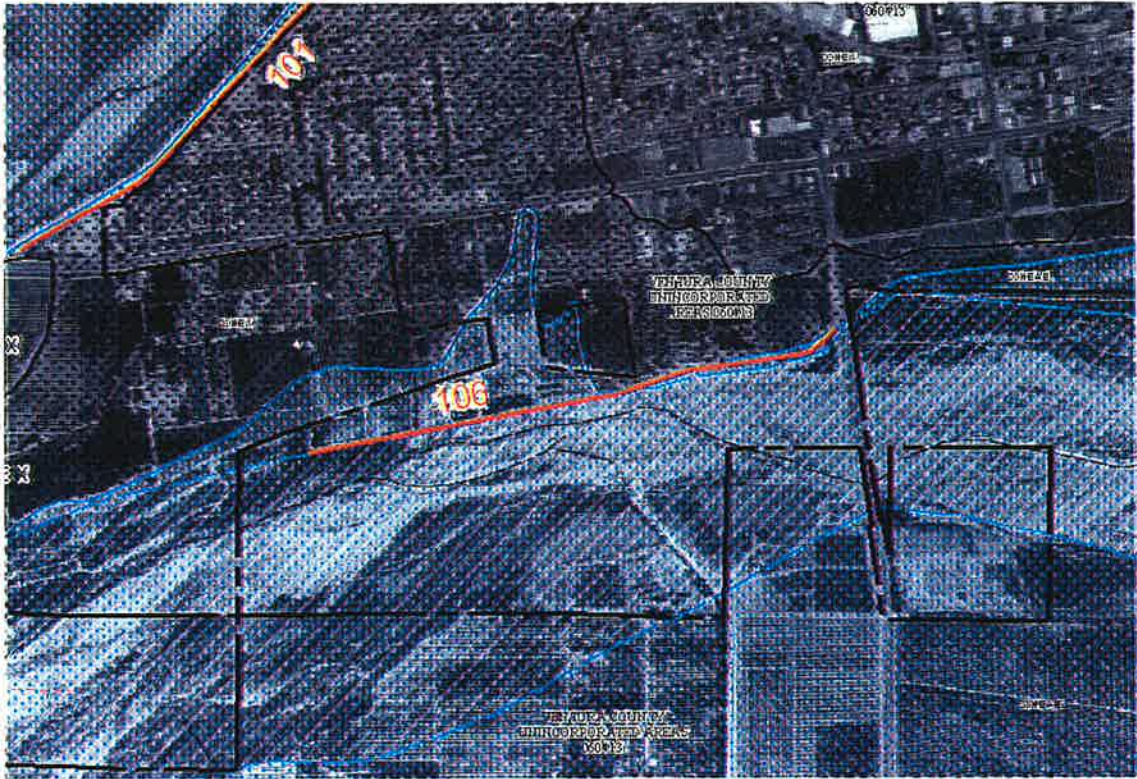




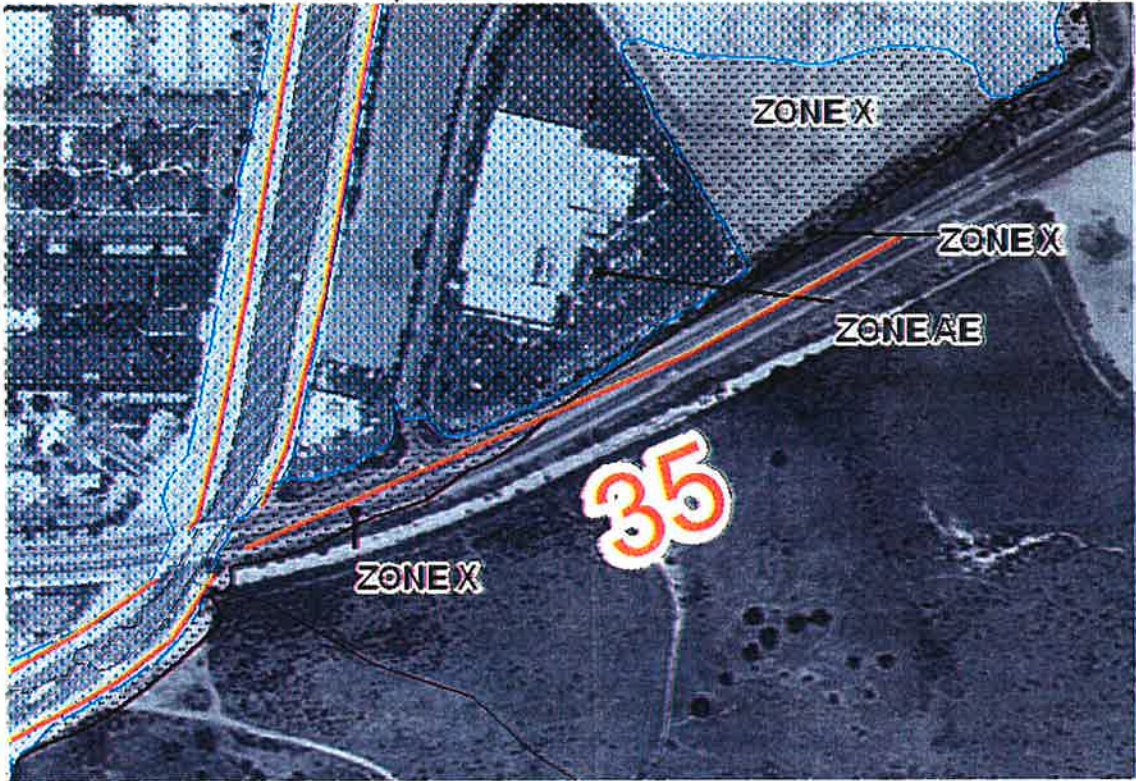
# City of Fillmore Levee Status Map

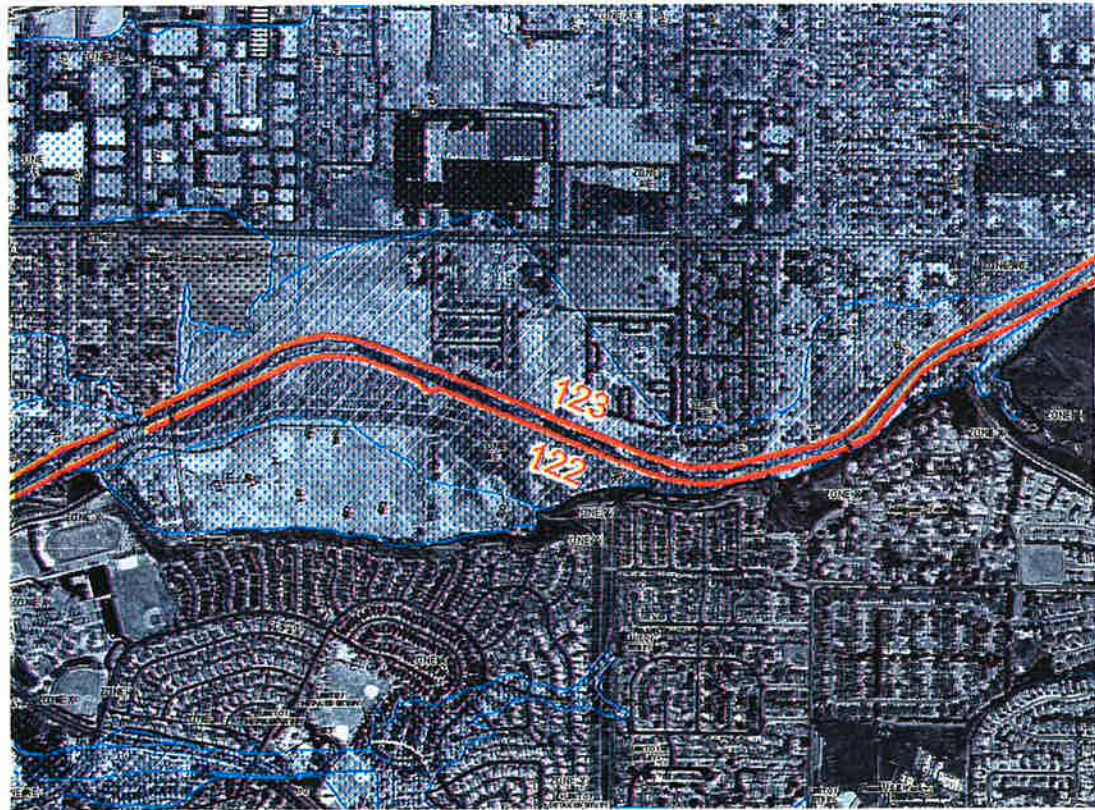






City of Moorpark Levee Status Map







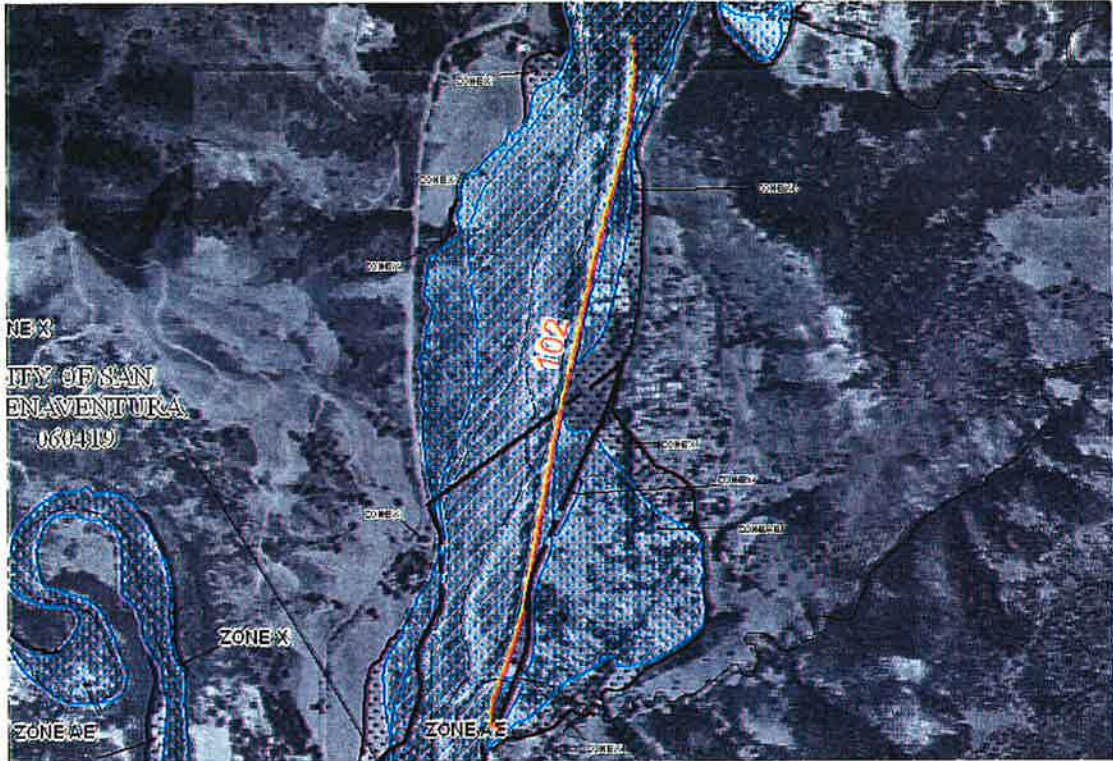
# City of Oxnard Levee Status Map





# City of San Buenaventura Levee Status Map







# City of Simi Valley Levee Status Map





# Requirements of 44 CFR Section 65.10: Mapping of Areas Protected by Levee Systems

As part of a mapping project, it is the levee owner's or community's responsibility to provide data and documentation to show that a levee meets the requirements of Section 65.10 of the National Flood Insurance Program (NFIP) regulations. Links to Section 65.10 and many other documents are available on FEMA's Web site at [www.fema.gov/plan/prevent/fhm/lv\\_fpm.shtm](http://www.fema.gov/plan/prevent/fhm/lv_fpm.shtm).

The FEMA requirements in Section 65.10 are separated into five categories:

1. General criteria;
2. Design criteria;
3. Operations plans and criteria;
4. Maintenance plans and criteria; and
5. Certification requirements.

The requirements for each of these areas are summarized below.

## **(A) GENERAL CRITERIA**

For purposes of the NFIP, FEMA will only recognize in its flood hazard and risk mapping effort those levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with the level of protection sought through the comprehensive floodplain management criteria established by Section 60.3 of the NFIP regulations. Section 65.10 of the NFIP regulations describes the types of information FEMA needs to recognize, on NFIP maps, that a levee system provides protection from the flood that has a 1-percent chance of being equaled or exceeded in any give year (base flood). This information must be supplied to FEMA by the community or other party seeking recognition of a levee system at the time a study or restudy is conducted, when a map revision under the provisions of Part 65 of the NFIP regulations is sought based on a levee system, and upon request by the Administrator during the review of previously recognized structures. The FEMA review is for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and does not constitute a determination by FEMA as to how a structure or system will perform in a flood event.

## **(B) DESIGN CRITERIA**

For the purposes of the NFIP, FEMA has established levee design criteria for freeboard, closures, embankment protection, embankment and foundation stability, settlement, interior drainage, and other design criteria. These criteria are summarized in subsections below.

### **(B)(1) FREEBOARD**

For riverine levees:

- A minimum freeboard of 3 feet above the water-surface level of the base flood must be provided.
- An additional 1 foot above the minimum is required within 100 feet on either side of structures (e.g., bridges) riverward of the levee or wherever the flow is constricted.

- An additional 0.5 foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required.

Exceptions to the minimum riverine freeboard requirements above may be approved if the following criteria are met:

- Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted.
- The material presented must evaluate the uncertainty in the estimated base flood elevation profile and include, but not necessarily be limited to:
  - An assessment of statistical confidence limits of the 1-percent-annual-chance discharge;
  - Changes in stage-discharge relationships; and
  - Sources, potential, and magnitude of debris, sediment, and ice accumulation.
- It must be also shown that the levee will remain structurally stable during the base flood when such additional loading considerations are imposed.

Under no circumstances will freeboard of less than 2 feet be accepted.

For coastal levees, the freeboard must be established at 1 foot above the height of the 1-percent-annual-chance wave or the maximum wave runup (whichever is greater) associated with the 1-percent-annual-chance stillwater surge elevation at the site.

Exceptions to the minimum coastal freeboard requirements above may be approved if the following criteria are met:

- Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted.
- The material presented must evaluate the uncertainty in the estimated base flood loading conditions. Particular emphasis must be placed on the effects of wave attack and overtopping on the stability of the levee.

Under no circumstances will a freeboard of less than 2 feet above the 1-percent-annual-chance stillwater surge elevation be accepted.

## **(B)(2) CLOSURES**

The levee closure requirement is that all openings must be provided with closure devices that are structural parts of the system during operation and design according to sound engineering practice.

## **(B)(3) EMBANKMENT PROTECTION**

Engineering analyses must be submitted to demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability.

The factors to be addressed in such analyses include, but are not limited to:

- Expected flow velocities (especially in constricted areas);
- Expected wind and wave action;

- Ice loading;
- Impact of debris;
- Slope protection techniques;
- Duration of flooding at various stages and velocities;
- Embankment and foundation materials;
- Levee alignment, bends, and transitions; and
- Levee side slopes.

#### **(B)(4) EMBANKMENT AND FOUNDATION STABILITY**

Engineering analyses that evaluate levee embankment stability must be submitted.

The analyses provided shall evaluate expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability.

An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in U.S. Army Corps of Engineers (USACE) Engineering Manual 1110-2-1913, Chapter 6, Section II, may be used.

The factors that shall be addressed in the analyses include:

- Depth of flooding;
- Duration of flooding;
- Embankment geometry and length of seepage path at critical locations;
- Embankment and foundation materials;
- Embankment compaction;
- Penetrations;
- Other design factors affecting seepage (e.g., drainage layers); and
- Other design factors affecting embankment and foundation stability (e.g., berms).

#### **(B)(5) SETTLEMENT**

Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum freeboard standards set forth in B(1).

This analysis must address:

- Embankment loads,
- Compressibility of embankment soils,
- Compressibility of foundation soils,

- Age of the levee system, and
- Construction compaction methods.

A detailed settlement analysis using procedures such as those described in USACE Engineering Manual EM 1100-2-1904 must be submitted.

#### **(B)(6) INTERIOR DRAINAGE**

An analysis must be submitted that identifies the source(s) of such flooding; the extent of the flooded area; and, if the average depth is greater than 1 foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters. Interior drainage systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof.

For areas of interior drainage that have average depths greater than 1 foot, mapping must be provided depicting the extents of the interior flooding, along with supporting documentation.

#### **(B)(7) OTHER DESIGN CRITERIA**

In unique situations, such as those where the levee system has relatively high vulnerability, FEMA may require that other design criteria and analyses be submitted to show that the levees provide adequate protection. In such situations, sound engineering practice will be the standard on which FEMA will base its determinations. FEMA also will provide the rationale for requiring this additional information.

#### **(C) OPERATIONS PLANS AND CRITERIA**

For a levee system to be recognized, the operational criteria must be as described below. All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operation manual, a copy of which must be provided to FEMA by the operator when levee or drainage system recognition is being sought or when the manual for a previously recognized system is revised in any manner. All operations must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP.

##### **(C)(1) CLOSURES**

Operation plans for closures must include the following:

- Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before floodwaters reach the base of the closure;
- A formal plan of operation, including specific actions and assignments of responsibility by individual name or title; and
- Provisions for periodic operation, at not less than 1-year intervals, of the closure structure(s) for testing and training purposes.

## **(C)(2) INTERIOR DRAINAGE SYSTEMS**

Interior drainage systems associated with levee systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof. FEMA will recognize these drainage systems on NFIP maps for flood protection purposes only if the following minimum criteria are included in the operation plan:

- Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system;
- A formal plan of operation, including specific actions and assignments of responsibility by individual name or title;
- Provision for manual backup for the activation of automatic systems; and
- Provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes; no more than 1 year shall elapse between either the inspections or the operations.

## **(C)(3) OTHER OPERATION PLANS AND CRITERIA**

FEMA may require other operating plans and criteria to ensure that adequate protection is provided in specific situations. In such cases, sound emergency management practice will be the standard upon which FEMA determinations will be based.

## **(D) MAINTENANCE PLANS AND CRITERIA**

For levee systems to be recognized as providing protection from the base flood, the following maintenance criteria must be met:

- Levee systems must be maintained in accordance with an officially adopted maintenance plan, and a copy of this plan must be provided to FEMA by the owner of the levee system when recognition is being sought or when the plan for a previously recognized system is revised in any manner.
- All maintenance activities must be under the jurisdiction of a(n):
  - Federal or State agency;
  - Agency created by Federal or State law; or
  - Agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance.
- The maintenance plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained.
- At a minimum, the maintenance plan shall specify:
  - Maintenance activities to be performed;
  - Frequency of their performance; and
  - Person by name or title responsible for their performance.



***(E) CERTIFICATION REQUIREMENTS***

Data submitted to support that a given levee system complies with the structural requirements set forth in B(1) through B(7) above must be certified by a Registered Professional Engineer. Also, certified as-built plans of the levee must be submitted. Certifications are subject to the definition given in Section 65.2 of the NFIP regulations. In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection against the base flood.

**Title 44 of the Code of Federal Regulations (CFR), Section 65.10**  
**(44 CFR 65.10)**

§ 65.8

water surface profile of the original hydraulic computer model. The alternate model must be then modified to include all encroachments that have occurred since the existing floodway was developed.

(ii) The floodway analysis must be performed with the modified computer model using the desired floodway limits.

(iii) The floodway limits must be set so that combined effects of the past encroachments and the new floodway limits do not increase the effective base flood elevations by more than the amount specified in §60.3(d)(2). Copies of the input and output data from the original and modified computer models must be submitted.

(3) Delineation of the revised floodway on a copy of the effective NFIP map and a suitable topographic map.

(d) *Certification requirements.* All analyses submitted shall be certified by a registered professional engineer. All topographic data shall be certified by a registered professional engineer or licensed land surveyor. Certifications are subject to the definition given at §65.2 of this subchapter.

(e) *Submission procedures.* All requests that involve changes to floodways shall be submitted to the appropriate FEMA Regional Office servicing the community's geographic area.

[51 FR 30315, Aug. 25, 1986]

§65.8 Review of proposed projects.

A community, or an individual through the community, may request FEMA's comments on whether a proposed project, if built as proposed, would justify a map revision. FEMA's comments will be issued in the form of a letter, termed a Conditional Letter of Map Revision, in accordance with 44 CFR part 72. The data required to support such requests are the same as those required for final revisions under §§ 65.5, 65.6, and 65.7, except as-built certification is not required. All such requests shall be submitted to the FEMA Headquarters Office in Washington, DC, and shall be accompanied by the appropriate payment, in accordance with 44 CFR part 72.

[62 FR 5736, Feb. 6, 1997]

44 CFR Ch. I (10-1-05 Edition)

§65.9 Review and response by the Administrator.

If any questions or problems arise during review, FEMA will consult the Chief Executive Officer of the community (CEO), the community official designated by the CEO, and/or the requester for resolution. Upon receipt of a revision request, the Administrator shall mail an acknowledgment of receipt of such request to the CEO. Within 90 days of receiving the request with all necessary information, the Administrator shall notify the CEO of one or more of the following:

(a) The effective map(s) shall not be modified;

(b) The base flood elevations on the effective FIRM shall be modified and new base flood elevations shall be established under the provisions of part 67 of this subchapter;

(c) The changes requested are approved and the map(s) amended by Letter of Map Revision (LOMR);

(d) The changes requested are approved and a revised map(s) will be printed and distributed;

(e) The changes requested are not of such a significant nature as to warrant a reissuance or revision of the flood insurance study or maps and will be deferred until such time as a significant change occurs;

(f) An additional 90 days is required to evaluate the scientific or technical data submitted; or

(g) Additional data are required to support the revision request.

(h) The required payment has not been submitted in accordance with 44 CFR part 72, no review will be conducted and no determination will be issued until payment is received.

[51 FR 30315, Aug. 25, 1986; 61 FR 46331, Aug. 30, 1996, as amended at 62 FR 5736, Feb. 6, 1997]

§65.10 Mapping of areas protected by levee systems.

(a) *General.* For purposes of the NFIP, FEMA will only recognize in its flood hazard and risk mapping effort those levee systems that meet, and continue to meet, minimum design, operation, and maintenance standards that are consistent with the level of protection sought through the comprehensive

65.10

flood plain management criteria established by §60.3 of this subchapter. Accordingly, this section describes the types of information FEMA needs to recognize, on NFIP maps, that a levee system provides protection from the base flood. This information must be supplied to FEMA by the community or other party seeking recognition of such a levee system at the time a flood risk study or restudy is conducted, when a map revision under the provisions of part 65 of this subchapter is sought based on a levee system, and upon request by the Administrator during the review of previously recognized structures. The FEMA review will be for the sole purpose of establishing appropriate risk zone determinations for NFIP maps and shall not constitute a determination by FEMA as to how a structure or system will perform in a flood event.

(b) *Design criteria.* For levees to be recognized by FEMA, evidence that adequate design and operation and maintenance systems are in place to provide reasonable assurance that protection from the base flood exists must be provided. The following requirements must be met:

(1) *Freeboard.* (i) Riverine levees must provide a minimum freeboard of three feet above the water-surface level of the base flood. An additional one foot above the minimum is required within 100 feet in either side of structures (such as bridges) riverward of the levee or wherever the flow is constricted. An additional one-half foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee, is also required.

(ii) Occasionally, exceptions to the minimum riverine freeboard requirement described in paragraph (b)(1)(i) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood elevation profile and include, but not necessarily be limited to an assessment of statistical confidence limits of the 100-year discharge; changes in stage-discharge relation-

ships; and the sources, potential, and magnitude of debris, sediment, and ice accumulation. It must be also shown that the levee will remain structurally stable during the base flood when such additional loading considerations are imposed. Under no circumstances will freeboard of less than two feet be accepted.

(iii) For coastal levees, the freeboard must be established at one foot above the height of the one percent wave or the maximum wave runup (whichever is greater) associated with the 100-year stillwater surge elevation at the site.

(iv) Occasionally, exceptions to the minimum coastal levee freeboard requirement described in paragraph (b)(1)(iii) of this section, may be approved. Appropriate engineering analyses demonstrating adequate protection with a lesser freeboard must be submitted to support a request for such an exception. The material presented must evaluate the uncertainty in the estimated base flood loading conditions. Particular emphasis must be placed on the effects of wave attack and overtopping on the stability of the levee. Under no circumstances, however, will a freeboard of less than two feet above the 100-year stillwater surge elevation be accepted.

(2) *Closures.* All openings must be provided with closure devices that are structural parts of the system during operation and design according to sound engineering practice.

(3) *Embankment protection.* Engineering analyses must be submitted that demonstrate that no appreciable erosion of the levee embankment can be expected during the base flood, as a result of either currents or waves, and that anticipated erosion will not result in failure of the levee embankment or foundation directly or indirectly through reduction of the seepage path and subsequent instability. The factors to be addressed in such analyses include, but are not limited to: Expected flow velocities (especially in constricted areas); expected wind and wave action; ice loading; impact of debris; slope protection techniques; duration of flooding at various stages and velocities; embankment and foundation materials; levee alignment, bends, and transitions; and levee side slopes.

(4) *Embankment and foundation stability.* Engineering analyses that evaluate levee embankment stability must be submitted. The analyses provided shall evaluate expected seepage during loading conditions associated with the base flood and shall demonstrate that seepage into or through the levee foundation and embankment will not jeopardize embankment or foundation stability. An alternative analysis demonstrating that the levee is designed and constructed for stability against loading conditions for Case IV as defined in the U.S. Army Corps of Engineers (COE) manual, "Design and Construction of Levees" (EM 1110-2-1913, Chapter 6, Section II), may be used. The factors that shall be addressed in the analyses include: Depth of flooding, duration of flooding, embankment geometry and length of seepage path at critical locations, embankment and foundation materials, embankment compaction, penetrations, other design factors affecting seepage (such as drainage layers), and other design factors affecting embankment and foundation stability (such as berms).

(5) *Settlement.* Engineering analyses must be submitted that assess the potential and magnitude of future losses of freeboard as a result of levee settlement and demonstrate that freeboard will be maintained within the minimum standards set forth in paragraph (b)(1) of this section. This analysis must address embankment loads, compressibility of embankment soils, compressibility of foundation soils, age of the levee system, and construction compaction methods. In addition, detailed settlement analysis using procedures such as those described in the COE manual, "Soil Mechanics Design—Settlement Analysis" (EM 1100-2-1904) must be submitted.

(6) *Interior drainage.* An analysis must be submitted that identifies the source(s) of such flooding, the extent of the flooded area, and, if the average depth is greater than one foot, the water-surface elevation(s) of the base flood. This analysis must be based on the joint probability of interior and exterior flooding and the capacity of facilities (such as drainage lines and pumps) for evacuating interior floodwaters.

(7) *Other design criteria.* In unique situations, such as those where the levee system has relatively high vulnerability, FEMA may require that other design criteria and analyses be submitted to show that the levees provide adequate protection. In such situations, sound engineering practice will be the standard on which FEMA will base its determinations. FEMA will also provide the rationale for requiring this additional information.

(c) *Operation plans and criteria.* For a levee system to be recognized, the operational criteria must be as described below. All closure devices or mechanical systems for internal drainage, whether manual or automatic, must be operated in accordance with an officially adopted operation manual, a copy of which must be provided to FEMA by the operator when levee or drainage system recognition is being sought or when the manual for a previously recognized system is revised in any manner. All operations must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP.

(1) *Closures.* Operation plans for closures must include the following:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists for the completed operation of all closure structures, including necessary sealing, before floodwaters reach the base of the closure.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provisions for periodic operation, at not less than one-year intervals, of the closure structure for testing and training purposes.

(2) *Interior drainage systems.* Interior drainage systems associated with levee systems usually include storage areas, gravity outlets, pumping stations, or a combination thereof. These drainage systems will be recognized by FEMA on NFIP maps for flood protection purposes only if the following minimum

criteria are included in the operation plan:

(i) Documentation of the flood warning system, under the jurisdiction of Federal, State, or community officials, that will be used to trigger emergency operation activities and demonstration that sufficient flood warning time exists to permit activation of mechanized portions of the drainage system.

(ii) A formal plan of operation including specific actions and assignments of responsibility by individual name or title.

(iii) Provision for manual backup for the activation of automatic systems.

(iv) Provisions for periodic inspection of interior drainage systems and periodic operation of any mechanized portions for testing and training purposes. No more than one year shall elapse between either the inspections or the operations.

(3) *Other operation plans and criteria.* Other operating plans and criteria may be required by FEMA to ensure that adequate protection is provided in specific situations. In such cases, sound emergency management practice will be the standard upon which FEMA determinations will be based.

(d) *Maintenance plans and criteria.* For levee systems to be recognized as providing protection from the base flood, the maintenance criteria must be as described herein. Levee systems must be maintained in accordance with an officially adopted maintenance plan, and a copy of this plan must be provided to FEMA by the owner of the levee system when recognition is being sought or when the plan for a previously recognized system is revised in any manner. All maintenance activities must be under the jurisdiction of a Federal or State agency, an agency created by Federal or State law, or an agency of a community participating in the NFIP that must assume ultimate responsibility for maintenance. This plan must document the formal procedure that ensures that the stability, height, and overall integrity of the levee and its associated structures and systems are maintained. At a minimum, maintenance plans shall specify the maintenance activities to be performed, the frequency of their perform-

ance, and the person by name or title responsible for their performance.

(e) *Certification requirements.* Data submitted to support that a given levee system complies with the structural requirements set forth in paragraphs (b)(1) through (7) of this section must be certified by a registered professional engineer. Also, certified as-built plans of the levee must be submitted. Certifications are subject to the definition given at § 65.2 of this subchapter. In lieu of these structural requirements, a Federal agency with responsibility for levee design may certify that the levee has been adequately designed and constructed to provide protection against the base flood.

[51 FR 30316, Aug. 25, 1986]

#### § 65.11 Evaluation of sand dunes in mapping coastal flood hazard areas.

(a) *General conditions.* For purposes of the NFIP, FEMA will consider storm-induced dune erosion potential in its determination of coastal flood hazards and risk mapping efforts. The criterion to be used in the evaluation of dune erosion will apply to primary frontal dunes as defined in § 59.1, but does not apply to artificially designed and constructed dunes that are not well-established with long-standing vegetative cover, such as the placement of sand materials in a dune-like formation.

(b) *Evaluation criterion.* Primary frontal dunes will not be considered as effective barriers to base flood storm surges and associated wave action where the cross-sectional area of the primary frontal dune, as measured perpendicular to the shoreline and above the 100-year stillwater flood elevation and seaward of the dune crest, is equal to, or less than, 540 square feet.

(c) *Exceptions.* Exceptions to the evaluation criterion may be granted where it can be demonstrated through authoritative historical documentation that the primary frontal dunes at a specific site withstood previous base flood storm surges and associated wave action.

[53 FR 16279, May 6, 1988]