State of California
Central Valley Flood Protection Board
California Code of Regulations, Title 23. Waters.
Division 1. Central Valley Flood Protection Board
Chapter 1. Organization, Powers, and Standards
Article 2. Definitions

Initial Statement of Reasons

Necessity and Purpose of each Provision

CCR Title 23. Article 2. Section 4. Definitions

The purpose of section 4 is to define terms as they are used in the regulations, primarily in the article 8 Standards of this division. It is necessary to provide definitions because there are many technical and engineering terms related to Levees, floodplains, and Encroachments that need to be defined to provide clear guidance to applicants, Permittees, engineers, inspectors, and the public. There are many other undefined technical and engineering terms used in the regulations for which the definition commonly found in a dictionary was deemed adequate. Defined terms are capitalized in the regulations to identify them as defined terms. Though this provides purpose and necessity for all definitions in section 4, there are select terms below for which further necessity is provided.

(b): It is necessary to define "Adopted Plan of Flood Control" because it is the portion of the Central Valley over which the Board exerts its regulatory authority. The term "Adopted Plan of Flood Control" refers to a flood control or reclamation strategy for a specific area that has been enacted by the Legislature or adopted by the Board and includes the following:

(b)(1) In the case of State Plan of Flood Control (SPFC) flood channels without Levees, it means the natural Stream channel and overbank area at Design Flood levels because Encroachments in this area can change the elevation or location of floodwaters;

(b)(2) In the case of SPFC channels with Levees, it means the area between and including the Levees, and includes:

(b)(2)(A) The Levee Right of Way;

(b)(2)(B) Any flowage areas that are part of the SPFC; and

(b)(2)(C) Areas where there are real property rights for the purpose of operation and maintenance of the Levee and any associated Sacramento-San Joaquin Drainage District (SSJDD) easements or Flowage Easements because Encroachments in these areas could affect Levee integrity and/or change the elevation or location of floodwaters;

(b)(3) In the case of Designated Floodways, it means the area between the Floodway Encroachment Lines;

(b)(4) The Regulated Streams listed in section 112 Table 8.1 of this division;

(b)(5) In the case of Regulated Streams that are neither a SPFC channel nor a Designated Floodway, it means the area within the identified county(s) and associated limits listed in Table 8.1 and between a line thirty (30) feet landward of the top of the left bank and a line thirty (30) feet landward of the top of the right bank because banks can erode and it is necessary to establish a reasonable setback distance from the top of bank for control of Encroachments;

(b)(6) In the case of a non-SPFC Levee outside of a Designated Floodway, it means the extent of the non-SPFC Levee that has bearing upon an SPFC Levee should the non-SPFC Levee fail and allow flood water to rise against the landside slope of the SPFC Levee and the area within the Levee Right of Way because failure of the non-SPFC Levee would impact the integrity of the SPFC Levee;

(b)(7) Where SPFC Levees are involved, the Adopted Plan of Flood Control means the area within the Levee Right of Way;

(b)(8) The Levees, channels, facilities, and right of way of the Lower San Joaquin River Flood Control Project because these features are not specifically identified in the defined State Plan of Flood Control but they are features over which the Board exercises regulatory authority;

(b)(9) The regulations of this division because the plan for operation of the Levees, channels, facilities and right of way over which the Board exercises regulatory authority includes operation pursuant to regulations; and

(b)(10) The Central Valley Flood Protection Plan as most recently adopted by the Board because the Board is required to adopt an update to the Central Valley Flood Protection Plan every five (5) years and the update may have bearing on the Levees, channels, facilities, and right of way over which the Board exercises regulatory authority.

(c): It is necessary to define "Approved Soils Testing Laboratory" to clarify the criteria that must be met to be “Approved” because tests from other soils testing laboratories may not be suitably reliable for construction of Levees and other facilities that provide flood protection for the public.

(j): It is necessary to define “Conforming Existing Encroachment” to distinguish it from Nonconforming Existing Encroachment and a new Encroachment, which may be treated differently pursuant to article 6 of this division.

(k): It is necessary to define “Controlled Low Strength Material (CLSM)” to clarify the required components and properties required for its use under these regulations.

(m): It is necessary to define “Delta” to identify the geographic area which has special rules for Levee design and for some pipelines installed by horizontal directional drilling.

(o): It is necessary to define “Designated Floodway” to clarify the limits of the area over which the Board exercises regulatory authority.

(p): It is necessary to define “Design Flood” to identify the flood flow and/or annual chance of exceedance set by the Board for a particular Stream or reach of a Stream, for which Levees and Encroachments must be designed.

(q): It is necessary to define “Design Water Surface Elevation (DWSE)” to clarify the water surface elevation to be used for design in several different situations, including within and outside of Urban Criteria Areas.

(r): It is necessary to define “Dwelling” to distinguish this type of structure from a “Building” because it may be used for full or part-time Human Habitation and therefore its flooding or collapse could present a life safety risk to inhabitants.

(u): It is necessary to define “Embankment Material” to specify the engineering properties required for soil to be used in Levee construction so as to provide adequate Levee integrity.

(z): It is necessary to define “Floodway” to identify the area required for conveyance of flood flows.

(bb): It is necessary to define “Flood Season” to identify the time of year during which occupation of Seasonal Dwellings and construction of most Encroachments within the Floodway or Levee Right of Way are generally not allowed, unless authorized in writing by the Board.

(cc): It is necessary to define “Flowage Easement” because this term is used in the definition of Adopted Plan of Flood Control.

(ff): It is necessary to define “Hydraulic Impact Evaluation Procedure” to establish rules for evaluating the impact and the significance of the impact of an Encroachment on flood water surface elevations.

(gg): It is necessary to define “Hydraulic Top of Levee” because this term is used in the design of Levees and some Encroachments associated with Urban Criteria Areas.

(hh): It is necessary to define “Levee” to clarify that it may include a floodwall (usually constructed of reinforced concrete) in addition to an embankment constructed of soil to contain, control, or divert the flow of water so as to reduce risk from flooding.

(ii): It is necessary to define “Levee Right of Way” to establish the specific area of the Levee and near the Levee where the regulations require that Encroachments must be Permitted, certain design or setback requirements apply, and certain types of Encroachments are generally not allowed. This area is generally consistent with the right of way acquisition goals set by the USACE and the Urban Levee Design Criteria.

(jj): It is necessary to define “Levee Section” to establish the specific limits of the Levee within the Levee Right of Way where the regulations require that certain design or setback requirements apply, and certain types of Encroachments are generally not allowed.

(oo): It is necessary to define “Maintenance Activities” to clarify the activities that are beneficial for continued performance of flood control facilities and that generally do not require a Permit.

(ww): It is necessary to define “Permit” because it is a term used throughout the regulations and may contain conditions and limitations.

(aaa): It is necessary to define “Projected Levee Section” to establish the area beyond the Levee Toe where the regulations require that certain design or setback requirements apply, and certain types of Encroachments are generally not allowed.

(bbb): It is necessary to define “Project Works” because this term is used in the definitions of Design Flood and SPFC Levee.

(kkk): It is necessary to define “Seasonal Occupancy” to clarify the time of year during which a Dwelling within a Floodway may be occupied, which is outside of Flood Season.

(lll): It is necessary to define “Secondary Levee” because a Levee within the Floodway of an Adopted Plan of Flood Control that provides flood protection for property within the Floodway and does not provide flood protection for property outside of the Adopted Plan of Flood Control may not need to meet all of the requirements of a Levee that provides flood protection for property outside of an Adopted Plan of Flood Control.

(nnn): It is necessary to define “Significant Damage” to establish a threshold, consistent with the threshold set by the Federal Emergency Management Agency’s Community Rating System, for requiring Board approval to repair or reconstruct damaged property.

(rrr): It is necessary to define "State Plan of Flood Control" or “SPFC” to establish that it has the same meaning as defined in subdivision (j) of section 5096.805 of the Public Resources Code.

(sss): It is necessary to define “State Plan of Flood Control Facilities” or “SPFC Facilities” to establish that it has the same meaning as Facilities of the State Plan of Flood Control defined in subdivision (e) of section 5096.805 of the Public Resources Code.

(xxx): It is necessary to define “Tulare Lake Basin” to establish that it has the same meaning as the Tulare Lake Hydrologic Region as defined in the California Water Plan Update 2018, prepared by the California Department of Water Resources (Department) pursuant to Chapter 1 (commencing with section 10004) of Part 1.5 of division 6 of the Water Code.

(yyy): It is necessary to define “Urban Area” to establish that it has the same meaning as defined in Government Code section 65007(l).

(zzz): It is necessary to define “Urban Criteria Area” because the Urban Level of Flood Protection Criteria and Urban Levee Design Criteria apply to a limited set of Urban Areas and Urbanizing Areas identified within this definition.

(aaaa): It is necessary to define “Urban Levee Design Criteria” to establish that it has the same meaning as the Levee and floodwall design criteria developed by the Department for providing the Urban Level of Flood Protection, dated May 2012.

(bbbb): It is necessary to define “Urban Level of Flood Protection” to establish that it has the same meaning as defined California Government Code section 65007(n).

(cccc): It is necessary to define “Urbanizing Area” to establish that it has the same meaning as defined in Government Code section 65007 (m).

State of California

Central Valley Flood Protection Board

California Code of Regulations, Title 23. Waters.

Division 1. Central Valley Flood Protection Board

Chapter 1. Organization, Powers, and Standards

Article 8. Standards

Initial Statement of Reasons

Introduction

Water Code sections 8534, 8571, 8598, 8608, 8609, and 8710 provide authority for the Central Valley Flood Protection Board (Board) to control Encroachments along the Sacramento and San Joaquin Rivers and their tributaries and distributaries to maintain flood carrying capacity and preserve historic flooding patterns. The Board Standards in article 8 provide the rules for Permitted Work, which includes Permitting of Encroachments. The rules are comprised mainly of technical engineering criteria. The Board Standards in article 8 were first promulgated in 1996 and are in need of updating to be more consistent with modern engineering criteria and current guidance developed by the U.S. Army Corps of Engineers (USACE). The Board has provided assurances to the federal government, through the USACE, to control Encroachments along Streams and Levees where a federal project has been constructed and to obtain written concurrence from the USACE District Engineer before allowing such Encroachments, pursuant to Title 33 Code of Federal Regulations section 208.10 or Title 33 United States Code section 408. The USACE District Engineer follows USACE guidance when providing concurrence for proposed Encroachments.

Between October 2015 and May 2019 the Board circulated for informal public review two draft updates to article 8. The Board received 239 written comments on the October 2015 draft update to article 8. After extensive collaboration with USACE and the California Department of Water Resources (Department) to address the public comments and develop other technical updates, the Board posted on its website a new update to article 8 on February 22, 2019. The Board received 57 written comments on the update to article 8 between February 22, 2019 and April 12, 2019. All informal written comments were considered in developing this draft update to article 8.

Problem Statement

The Board must establish and enforce standards for Permitted Work to avoid impacts to the flood carrying capacity of regulated Streams and maintain the integrity of flood control project features. Levees are the most prevalent flood control project feature throughout the Board's jurisdiction and their

failure can result in devastating losses of life and infrastructure. Encroachments also have the potential to interfere with operation, maintenance, and flood fighting capabilities along Stream channels, Levees, and other flood control project features. Standards are needed to avoid such interference. Since the Board Standards were first promulgated in 1996, USACE guidance has been updated and improvements in engineering standards have occurred. An update to the Board Standards in article 8 is needed to reflect these developments.

Overall Purpose

The proposed regulations are necessary to specify information that is required to determine the acceptability of proposed Encroachments, to specify acceptable engineering methods for developing that information, and set engineering standards for proposed Encroachments – consistent with modern engineering requirements and USACE guidance.

The purpose of the proposed regulations is to interpret, clarify, and make specific the provisions of sections 8534, 8571, 8598, 8608, 8609, and 8710 of the Water Code, by making specific the requirements for the following categories of Encroachments:

- Dwellings and Buildings
- Mobilehome Parks and Recreational Vehicle Parks
- Dredged, Spoil, and Waste Material
- Borrow and Excavation Activities
- Dams and Related Structures
- Levees
- Erosion Control
- Irrigation and Drainage Ditches, Detention and Retention Ponds, Tile Drains and Septic Systems
- Pipelines, Conduits, and Utility Lines
- Abandoned Pipelines and Conduits
- Retaining Walls
- Fences and Gates
- Boating Facilities
- Bridges and Low Water Crossings
- Water, Oil, and Gas Wells
- Patrol Roads and Access Ramps
- Vegetation

- Bicycle Trails
- Miscellaneous Encroachments
- Identification of Limits of Flood Control Works
- Pools

In addition, geographically-specific requirements are provided for the following areas:

- Supplemental Borrow Standards for the Yuba River
- Supplemental Borrow Standard for the Lower San Joaquin River Flood Control Project
- Supplemental Standards for Control of Residential Encroachments in Reclamation District 1000
- Supplemental Standards for the Yuba River – Daguerre Point Dam to Confluence with the Feather River
- Supplemental Standards for Butte Basin
- Supplemental Standards for Yolo Bypass and Sutter Bypass

CCR Title 23. Article 8. Section 111. Introduction to Board Standards

(a): The purpose of subdivision (a) is to provide an introduction to the Board Standards and identify the general application of the regulations for Permitted Work that may affect an Adopted Plan of Flood Control. It is necessary to clarify the applicability of the Board Standards and establish the basic principle that any activity that could adversely impact an Adopted Plan of Flood Control is subject to the Board's process for issuance of a Permit.

(b): The purpose of subdivision (b) is to clarify that the Board Standards provide technical information for applicants to use in applying for Permits. It is necessary to advise applicants that the regulations have been developed for their use when submitting applications for Permits.

(c): The purpose of subdivision (c) is to establish that where judgment is required, the Board retains final judgment and the burden of proof lies with the applicant. It is necessary to identify the final decision maker when there are differences in judgment and who has the burden of developing proof for making that decision.

(d): The purpose of subdivision (d) is to clarify that the Hydraulic Impact Evaluation Procedure applies to any Encroachment that has potential to impact Stream stages and that a significant impact may be the basis for the Board to deny a Permit for the proposed Encroachment. It is necessary to establish this regulation in section 111 so as to be applicable for all Encroachments. The Hydraulic Impact Evaluation Procedure is also applied at appropriate locations throughout article 8 to certain specified Encroachments that have significant potential to increase Stream stages.

CCR Title 23. Article 8. Section 112. Regulated Streams and Nonpermissable Work Periods

(a): The purpose of subdivision (a) is to establish that a Permit application is required for any Proposed Work within an Adopted Plan of Flood Control or for any work that may negatively impact an Adopted

Plan of Flood Control. It is necessary to clarify where a Permit is required and that it is required for Proposed Work within an Adopted Plan of Flood Control and for Proposed Work outside an Adopted Plan of Flood Control if that Proposed Work may affect the Adopted Plan of Flood Control. Work located hundreds of feet distant from any feature of the Adopted Plan of Flood Control may be subject to a Board Permit and the Board Standards. This is because some types of work, such as large excavations, can adversely impact performance of Levees even if the work is located several hundred feet landward of the Levee – due to Levee underseepage and the potential for that seepage to transport Levee foundation materials away. However, by applying reasonable discretion and/or requiring a seepage analysis, the Board may exempt certain Encroachments from the formal application/Permit procedure.

(b): The purpose of subdivision (b) is to establish that excavations into the Levee and similar work activities within the Floodway are not allowed during Flood Season. It is necessary to restrict such activities as there may not be sufficient time to restore the area and prepare it before flood waters arrive. The Board realizes that some work within a Floodway during the Flood Season may, at times, be justified. Such work may be authorized, typically for two-week increments, provided weather forecasts do not indicate any approaching storms, Stream stages are relatively low and related reservoir releases are not expected to be increased. The commencement of work within a Floodway during the Flood Season is normally not allowed because of the possibility of obstructing Stream flows, increasing water stages and compromising public safety. In addition, rainfall can occur at any time during Flood Season and prevent equipment from being able to restore the excavated area.

(b)(1): It is necessary to identify the Flood Season that applies to each Board Regulated Stream. There are two Flood Seasons. The Flood Season for Streams subject to high flows or flooding caused by snowmelt runoff is November 1 through July 15. The Flood Season for Streams subject to high flows or flooding caused by rainfall runoff is November 1 through April 15.

(b)(2): The purpose of subdivision (b)(2) is to establish that a Time Variance Request to allow work during the Flood Season may be approved by the Board's Executive Officer or Chief Engineer if certain conditions are met.

(b)(2)(A): It is necessary to restrict work that would be potentially injurious to the Adopted Plan of Flood Control.

(b)(2)(B): It is necessary to restrict work that would constitute a threat to public safety.

(b)(2)(C): It is necessary that weather forecasts and Stream conditions be favorable for the period of work approved by the Time Variance Request.

(b)(2)(D): It is necessary that a detailed emergency action plan be provided to ensure that if weather or Stream conditions become unfavorable during the work period, appropriate personnel, equipment, methods, and materials are secured for completing necessary actions to avoid adverse impacts on the flood project or flood operations.

(b)(3): The purpose of subdivision (b)(3) is to establish the time windows during which Time Variance Requests are submitted, in writing – preferably by email to facilitate prompt processing. It is necessary to establish a time window that allows the Board adequate time to process the requests and have

reasonably reliable weather and Stream forecasts available. This time window is seven (7) to ten (10) days prior to start of work.
(b)(4): The purpose of subdivision (b)(4) is to provide authority for the Board to rescind a Time Variance Request. It is necessary to enable the Board to rescind Time Variance Requests should weather or Stream conditions warrant stoppage of work. Providing this remedy enables the Board to approve more Time Variance Requests without risking danger to public safety.

CCR Title 23. Article 8. Section 113. Dwellings and Buildings Within an Adopted Plan of Flood Control

(a): The purpose of subdivision (a) is to define terms used in section 113. It is necessary to define terms that are used frequently in section 113, but not elsewhere.

(a)(1): It is necessary to define Existing Building to distinguish it from a Building because it may be treated differently pursuant to article 6 of this division.

(a)(2): It is necessary to define Existing Dwelling to distinguish it from a Dwelling because it may be treated differently pursuant to article 6 of this division.

(a)(3): It is necessary to define Existing Mobilehome to distinguish it from a Mobilehome because it may be treated differently pursuant to article 6 of this division.

(b): The purpose of subdivision (b) is to establish regulations applicable to Dwellings, Existing Dwellings, Dwellings for Seasonal Occupancy, Buildings, and Existing Buildings within an Adopted Plan of Flood Control. It is necessary to regulate development within an Adopted Plan of Flood Control to prevent loss of life and destruction of property, and to prevent development from aggravating flood conditions. Dwellings and Buildings within an Adopted Plan of Flood Control cannot only be destroyed or severely damaged, but can also cause additional flooding by obstructing flood flows and causing an increase in water levels. Dwellings and Buildings within the Floodway can also misdirect flows causing severe erosion of channel banks and Levees.

(b)(1): It is necessary to prevent new Dwellings within Adopted Plans of Flood Control, with specific limited exceptions provided in subdivisions (d) and (e) of this section. Dwellings constructed within an Adopted Plan of Flood Control would expose the residents to the potential dangers of flood flows, including loss of life and damage or destruction of the Dwellings, associated structures and personal property. Dwellings on a Levee Section or within the Levee Right of Way are unacceptable because of the irreparable damage that can occur to the Levee during the construction of Dwellings, and also because Dwellings can interfere with Levee maintenance, obscure Levee defects and obstruct flood fight procedures.

(b)(2): The purpose of subdivision (b)(2) is establish conditions under which new Dwellings for Seasonal Occupancy, Existing Dwellings, Buildings, and Existing Buildings are allowed within the Floodway.

(b)(2)(A): It is necessary to require that new Dwellings for Seasonal Occupancy, Existing Dwellings, Buildings, and Existing Buildings constructed in a Floodway are allowed to remain provided they are not abandoned and are maintained in a suitable condition. Well-maintained residences located within a Floodway present fewer flood control problems than residences that are neglected or abandoned. Abandoned property often includes non-operating automobiles, neglected recreational trailers, storage sheds and other floatable structures which add to the problems of accumulated debris during flood

flows. Debris accumulation within a Floodway decreases the channel flow capacity and increases Stream stages.

(b)(2)(B): It is necessary to require that new Dwellings for Seasonal Occupancy, Existing Dwellings, Buildings, and Existing Buildings constructed in a Floodway not impede flood flows or increase bank erosion. Any Dwelling or structure within a Floodway that impedes flood flows may compromise the Adopted Plan of Flood Control. This would not only place the residents at high risk of loss of life or injury, and destruction of the Dwelling and personal property, but also increases flood stages causing increased depth and duration of inundation of adjacent property. Increased bank erosion can threaten nearby infrastructure and Levees.

(b)(2)(C): It is necessary to require that new Dwellings for Seasonal Occupancy, Existing Dwellings, Buildings, and Existing Buildings constructed in a Floodway are properly anchored to prevent flotation during periods of high water. A Dwelling that is located within a Floodway and is not properly anchored to its foundation not only increases the residents' risk of loss of life or personal property, but also creates a hazard to the flood control project and downstream structures. A floating Building could damage bridges, weir structures, control gates, river forecast gaging stations and other flood control facilities. The Building could also lodge in the channel in a position that directs the stream flow against the Levee causing erosion and sloughing of the Levee slope, leading to possible Levee failure.

(b)(2)(D): It is necessary to require that new Dwellings for Seasonal Occupancy, Existing Dwellings, Buildings, and Existing Buildings constructed in a Floodway may not impact Levee integrity, such as seepage through or under the Levee, decrease Levee slope stability, or increase erosion potential of a Levee. Any such impacts to a Levee would jeopardize the safety of the public and property protected by the Levee.

(b)(2)(E): It is necessary to require that new Dwellings for Seasonal Occupancy in Floodways shall be properly elevated above the DWSE to prevent damage to the structure. Placement of the finished floor at least two (2) feet above the DWSE is considered prudent practice for minimizing damage, considering the uncertainty in the actual elevation of flood stages and the potential for wind waves.

(b)(2)(F): It is necessary to specify that new Dwellings for Seasonal Occupancy must not be constructed within the Levee Right of Way. Dwellings in the Levee Right of Way are unacceptable because of the irreparable damage that can occur to the Levee during construction of a Dwelling, and also because such Dwellings can interfere with Levee maintenance, obscure Levee defects such as boils near the Levee Toe, and obstruct flood fight procedures.

(b)(3): The purpose of subdivision (b)(3) is to establish conditions under which any new exterior remodeling or repairs to a Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, Building, or Existing Building which modifies the footprint or consists of replacement of over fifty (50) percent of its market value, as calculated with a generally accepted method approved by the Board shall have prior approval by the Board. Prior approval by the Board is required before the start of any exterior remodeling, modifications, additions or repairs to ensure that the structure would in no way impede flood flows or cause flows to be directed toward a channel bank or Levee. It is necessary to regulate repairs which replace structures damaged by more than fifty (50) percent of market value. When

replacement of more than fifty (50) percent of the market value of a structure occurs, an opportunity arises to address removal of the structure if it is unsafe, or to make sure that replacement is done in a way that is not an unacceptable risk to public safety or operation and maintenance of the flood control project.

(b)(3)(A): It is necessary to require that a Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, Building, or Existing Building which is being modified or repaired not be expanded to be closer to the Low Water Channel or within the Levee Right of Way. Any Encroachment in the Floodway that extends towards the Low Water Channel would have the adverse effect of diminishing the flood flow capacity and increasing the risk of flood damage to the Encroachment. Maximum flood channel capacity must be retained to ensure optimum flood control. Placing the structure within the Levee Right of Way is unacceptable because of the irreparable damage that can occur to the Levee during the construction, and also because the structure can interfere with Levee maintenance, obscure Levee defects and obstruct flood fight procedures.

(b)(3)(B): It is necessary to require that a Dwelling, Existing Dwelling, or Dwelling for Seasonal Occupancy which is being modified or repaired shall be properly elevated above the DWSE to prevent risk to life and damage to the structure. Placement of the finished floor at least two (2) feet above the DWSE is considered prudent practice for protecting life and minimizing damage, considering the uncertainty in the actual elevation of flood stages and the potential for wind waves. This requirement ensures flood protection for the newly constructed portion of a Dwelling, Existing Dwelling, or Dwelling for Seasonal Occupancy and safety for the residents. The modification or addition would be available as temporary safe quarters for the residents and storage of valuables during high water.

(b)(4): The purpose of subdivision (b)(4) is to require approval by the Board before a Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, Building, or Existing Building that has experienced Significant Damage may be reconstructed or replaced. It is necessary to require Board approval before the start of reconstruction or replacement of a structure that sustains damage in excess of fifty (50) percent of its market value because it may be in such a precarious location as to be susceptible to recurring, extensive damage. A Dwelling that sustains recurring flood damage is a potential hazard in which the residents are at unacceptable risk of loss of life and property.

(b)(5): The purpose of subdivision (b)(5) is to require that if a damaged Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, Building, or Existing Building is not repaired or replaced, the entire dwelling or structure shall be completely removed from the Adopted Plan of Flood Control within a reasonable period of time, as determined by the Board, and the area restored to not interfere with the Adopted Plan of Flood Control. It is necessary to require that damaged structures that are not repaired or replaced do not continue to deteriorate and add to the debris that is carried downstream by flood flows. Debris within a floodway could accumulate within flood control channels, on bridge piers and weir structures causing structural damage, excessive high water stages and increased flood flow velocities.

(b)(6): The purpose of subdivision (b)(6) is to establish conditions for construction of Buildings within an Adopted Plan of Flood Control.

(b)(6)(A): It is necessary to require that Buildings may not be constructed within the Levee Right of Way. Placing the Building within the Levee Right of Way is unacceptable because of the irreparable damage that can occur to the levee during the construction of a Building, and also because Buildings can prevent adequate Levee maintenance, obscure Levee defects such as boils near the Levee Toe, and obstruct flood fight procedures.

(b)(6)(B): It is necessary to require that a Building shall be anchored and adequately floodproofed (elevation is one form of floodproofing) at least two (2) feet above the DWSE to prevent damage to the structure. Two (2) feet above the DWSE is considered prudent practice for minimizing damage, considering the uncertainty in the actual elevation of flood stages and the potential for wind waves. A Building that is not securely anchored to its foundation can become a potential hazard to the flood .control project and downstream structures. A floating Building could damage bridges, overflow weirs, control gates, river forecast gauging stations and other flood control facilities. Buildings must be floodproofed to prevent their deterioration or destruction by flood flows. Buildings damaged or destroyed by flood flows add to the problem of debris accumulation within a Floodway, causing a backwater effect and increasing depths of flood flows.

(b)(6)(C): It is necessary to require that a Building shall be located and oriented to have a minimal impact on flood flows. Buildings within a floodway must be located on elevated ground when practical, and must be oriented, such as placing the longitudinal axis parallel to the stream channel, to preclude an excessive backwater effect. In locations where the effect of the proposed Building on flood stages is uncertain, the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(b)(6)(D): It is necessary to require that the number of Buildings allowed are limited to the minimum necessary to accomplish an appropriate land use activity. The construction of Buildings within a Floodway must be numerically controlled to prevent the loss of an unreasonable amount of Floodway. The number of Buildings allowed within a Floodway will vary depending upon individual stream factors such as streamflow hydraulics, existing flood control facilities and current land use within the Floodway. The number of Buildings allowed within a Floodway must be controlled in order to remain compatible with flood operations.

(c): The purpose of subdivision (c) is to establish conditions for allowing Mobilehomes within an Adopted Plan of Flood Control.

(c)(1): It is necessary to require that new Mobilehomes will not be allowed within an Adopted Plan of Flood Control unless the Mobilehomes are located within an Existing Mobilehome Park, or as provided in subdivisions (d) and (e) of this section. Mobilehomes within an Adopted Plan of Flood Control present the same problems, in regard to flood control, as conventional Dwellings. See subdivision (b)(1) of this section.

(c)(2): It is necessary to clarify that Existing Mobilehomes, not located within a Mobilehome Park, may remain within an Adopted Plan of Flood Control and the restrictions that apply are the same as those for

Existing Dwellings. Mobilehomes within an Adopted Plan of Flood Control present the same problems as Dwellings.

(c)(3): It is necessary to require that owners of Existing Mobilehomes, not located within a Mobilehome Park and not anchored in place, shall have an evacuation plan on record with the Board to ensure that the evacuation of these units can be achieved before flood flows reach the area. Non-anchored mobile homes could be transported downstream by flood flows, impeding the flood channel and creating the possibility of directing flows against the Levees causing severe erosion that could lead to Levee failure.

(c)(4): It is necessary to clarify that if flood damage occurs to a Mobilehome due to failure of the evacuation plan or its execution, the Mobilehome will not be allowed to remain or to be replaced within an Adopted Plan of Flood Control without the approval of the Board. An effectual evacuation plan is necessary to ensure the safety of residents of Mobilehomes located within an Adopted Plan of Flood Control, and also to protect flood control structures and bridges from damage caused by Mobilehomes or parts of Mobilehomes carried downstream by flood flows. The potential for the recurrence of damage or destruction of a Mobilehome because of an ineffectual evacuation plan will not be allowed by the Board.

(d): The purpose of subdivision (d) is to establish conditions for allowing a Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, Building, Existing Building, or a Mobilehome within Floodway areas designated as "Zone B". When flood stages reach the DWSE within an Adopted Plan of Flood Control, only shallow, low velocity flooding occurs in Zone B areas. This type of flooding would have little impact on public safety and would cause only minor property damage.

(d)(1): It is necessary to require that Dwellings, Buildings, and Mobilehomes shall not be placed within the Levee Right of Way. Placing these within the Levee Right of Way is unacceptable because of the irreparable damage that can occur to the Levee during construction, and also because they can prevent adequate Levee maintenance, obscure Levee defects such as boils near the Levee Toe, and obstruct flood fight procedures.

(d)(2): It is necessary to require that new Dwellings, new Dwellings for Seasonal Occupancy, new Buildings, and Mobilehomes shall not be allowed within twenty (20) feet landward from the furthest upward surface projection of a 3h:1v slope tangent to any point on the riverbank profile (and a reference to Figure 8.01 is provided for clarification) to avoid placement too close to the riverbank and potentially subject to damage or complete loss due to bank erosion. Also, such placement would potentially interfere with the ability to perform emergency flood fights to address bank erosion. This regulation applies even if any Revetment is to be considered because Revetment is not always reliable for preventing bank erosion and occasionally needs to be replaced. A structure placed too close to the bank would interfere with the ability to perform maintenance on the Revetment. An erosion analysis is required to evaluate integrity of the streambank because additional setback may be appropriate where the bank is particularly susceptible to erosion.

(d)(3): It is necessary to require that the finished floor of any remodeling, modification, addition, or repair to a Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, or Mobilehome shall be properly elevated above the DWSE to prevent risk to life and damage to the structure. Generally,

Dwellings are not allowed within an Adopted Plan of Flood Control. However, where inundation is shallow, one (1) foot or less, as in a designated Zone B, Dwelling, Existing Dwellings, Dwellings for Seasonal Occupancy and Mobilehomes are allowed provided they are elevated to prevent structural damage during high water. Placement of the finished floor at least two (2) feet above the DWSE is considered prudent practice for protecting life and minimizing damage, considering the uncertainty in the actual elevation of flood stages and the potential for wind waves. This requirement ensures flood protection for the newly constructed portion of a Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, or Mobilehome and safety for the residents. The modification or addition would be available as temporary safe quarters for the residents and storage of valuables during high water.

(d)(4): It is necessary to specify that the minimum Floodway area necessary for the placement of a Dwelling, Dwelling for Seasonal Occupancy, Building, or Mobilehome must be used in order to retain maximum Floodway capacity and to prevent increased water levels that could cause inundation of adjacent property.

(d)(5): It is necessary to specify that sufficient area of the Floodway must remain clear of the Dwelling, Dwelling for Seasonal Occupancy, Building, or Mobilehome to preserve the historical orientation of the floodway and to prevent an increase in stream flow stages and velocities. This restriction prevents the flood channel from possibly meandering and routing flood flows in an undesirable direction, and causing severe erosion to channel banks or Levees.

(d)(6): It is necessary to require approval by the Board before a Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, Building, Existing Building, or Mobilehome that has experienced Significant Damage may be reconstructed or replaced. Reconstruction or replacement of a structure that sustains damage in excess of fifty (50) percent of its market value must be evaluated because it may be in such a precarious location as to be susceptible to recurring, extensive damage. A Dwelling that sustains recurring flood damage is a potential hazard in which the residents are at unacceptable risk of loss of life and property.

(d)(7): It is necessary to specify that, except for approved mining activities, excavating or grading that would increase the depth of flooding within a Zone B area and potentially interfere with safe evacuation of the area during flooding is not allowed. Flooding in Zone B areas would be shallow and the residents could be safely evacuated with reasonable care. Excavating or grading activities that increase the depth of flooding would increase the hazard to lives and property.

(e): The purpose of subdivision (e) is to specify that new Dwellings, Dwellings for Seasonal Occupancy, Buildings, and Mobilehomes along a Stream without a Levee shall be allowed no closer to the Stream than twenty (20) feet landward from the furthest upward surface projection of a 3h:1v slope tangent to any point on the riverbank profile (and a reference to Figure 8.01 is provided for clarification). It is necessary to avoid placement of such structures too close to the riverbank which may subject them to damage or to complete loss due to bank erosion. Also such placement would potentially interfere with the ability to perform emergency flood fights to address bank erosion. This regulation applies even if any Revetment is present because Revetment is not always reliable for preventing erosion and occasionally needs to be replaced. A structure placed too close to the bank would interfere with the ability to perform maintenance on the Revetment. An erosion analysis is required to evaluate integrity of the

streambank because additional setback may be appropriate where the bank is particularly susceptible to erosion. In locations where the effect of the proposed structure or Revetment on flood stages is uncertain, the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(f): The purpose of subdivision (f) is to establish that the Board Permit approving the construction, reconstruction, improvement, or repair of a Dwelling, Dwelling for Seasonal Occupancy, Building, or Mobilehome shall run with the land, pursuant to a recorded document executed pursuant to section 16(f) and that upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner's name and address. It is necessary to establish for certain Encroachments that present an exceptional risk to public safety and for which ownership of the Encroachment may change in the future, that when ownership changes the new owner is notified of the Permit and its conditions and the Board is notified that ownership has changed as has contact information to follow up with the new owner. Dwellings, Dwellings for Seasonal Occupancy, Buildings, and Mobilehomes within an Adopted Plan of Flood Control are Encroachments that warrant this requirement to inform the new property owner of the Permit and associated responsibilities.

(g): The purpose of subdivision (g) is to require that notification is provided to the Board prior to abandoning a Dwelling, Existing Dwelling, Dwelling for Seasonal Occupancy, Building, Existing Building, or Mobilehome and require the Permittee or property owner to be responsible for its removal along with all appurtenances, vehicles, equipment, stockpiles of materials, and debris as directed by the Board. It is necessary to require removal of abandoned structures and appurtenances, vehicles, equipment, stockpiles of materials, and debris to prevent accumulated debris during flood flows. Abandoned property often includes non-operating automobiles, neglected recreational trailers, storage sheds and other floatable structures which add to the problems of accumulated debris during flood flows. Debris accumulation within a Floodway decreases the channel flow capacity and increases Stream stages. Debris within a Floodway could accumulate within flood control channels, on bridge piers and weir structures causing structural damage, excessive high water stages and increased flood flow velocities.

CCR Title 23. Article 8. Section 114. Mobilehome Parks and Recreational Vehicle Parks

The purpose of section 114 is to establish requirements for Mobilehome Parks and Recreational Vehicle Parks within an Adopted Plan of Flood Control. Any habitable structure within an Adopted Plan of Flood Control, and more specifically the Floodway, poses a potential danger to the safety of the occupants. Mobilehomes and Recreational Vehicles often become more like permanent residences. These residences in the floodplain are susceptible to damage during floods and can become Obstructions to flood flows. The ability to remove these structures when flooding is eminent is not totally adequate in most cases.

Mobilehomes and Recreational Vehicles pose the same problems as Dwellings in the floodplain. Existing Mobilehome Parks which meet certain requirements and standards are allowed to remain within the

Floodway. However, new Mobilehome Parks are prohibited. Recreational Vehicle Parks, if adequately managed, can be an acceptable land use activity within an Adopted Plan of Flood Control. Complete removal of all Mobilehomes and Recreational Vehicles prior to any flooding potential is the main requirement for Permitting this public use.

(a): The purpose of subdivision (a) is to define the terms used in section 114. It is necessary to define terms that are frequently in section 114, but not elsewhere.

(a)(1): It is necessary to define Existing Mobilehome Park to distinguish it from Mobilehome Park because it may be treated differently in this section and pursuant to article 6 of this division.

(a)(2): It is necessary to define Existing Recreational Vehicle Park to distinguish it from Recreational Vehicle Park because it may be treated differently in this section and pursuant to article 6 of this division.

(a)(3): It is necessary to define Mobilehome Park to distinguish it from Existing Mobilehome Park because it may be treated differently pursuant to article 6 of this division.

(a)(4): It is necessary to define Recreational Vehicle Park to distinguish it from Existing Recreational Vehicle Park because it may be treated differently pursuant to article 6 of this division.

(b): The purpose of subdivision (b) is to define the requirements Mobilehome Parks are subject to. It is necessary to specify requirements for Mobilehome Parks because they can interfere with Levee and Floodway operations and maintenance and can become inundated during high water, resulting in severe damage to the Mobilehomes and risk to the residents, if not evacuated in time.

(b)(1): The purpose of subdivision (b)(1) is to specify that new Mobilehome Parks are not allowed within an Adopted Plan of Flood Control except in Floodway areas classified as Zone B as described in subdivision (d) of section 113 of this division. It is necessary to specify that new Mobilehome Parks are not allowed within an Adopted Plan of Flood Control except in Floodway areas classified as Zone B as described in subdivision (d) of section 113 of this division because areas classified as zone B are subject to shallow flooding which would cause little, if any, damage to Mobilehomes. Mobilehome Parks are not allowed in any area not classified as zone B within an Adopted Plan of Flood Control. Mobilehome Parks in areas other than zone B would not be compatible with the commitment to protect lives and property and to preserve the capacity of the Floodway. Optimum management of the flood control project would require frequent evacuation warnings for the removal of Mobilehomes. The lead time and resources needed to remove numerous mobile homes during pre-flood emergencies are not always adequate for complete evacuation. The expense and inconvenience of an evacuation for each possible flood forecast often causes deficiencies in public response to take immediate action.

(b)(2): The purpose of subdivision (b)(2) is to specify that New Mobilehome Parks are not allowed within the Levee Right of Way. It is necessary to specify that New Mobilehome Parks are not allowed within the Levee Right of Way because Mobilehome Parks located within the Levee Right of Way would prevent or interfere with the adequate inspection and maintenance of Levees and with flood fight procedures.

(b)(3): The purpose of subdivision (b)(3) is to specify that Existing Mobilehome Parks located within an Adopted Plan of Flood Control may remain if a Permit from the Board has been obtained, a current

implementable evacuation plan is on file with the Board, and the following criteria are continuously enforced. It is necessary to specify that Existing Mobilehome Parks located within an Adopted Plan of Flood Control may remain if a Permit from the Board has been obtained, a current implementable evacuation plan is on file with the Board, and the following criteria are continuously enforced because the Board retains control over Floodway Encroachments by issuing Permits for only those Encroachments that are compatible with the Adopted Plan of Flood Control. An effectual evacuation plan is a necessity in obtaining a Permit for a Mobilehome Park. Safe evacuation routes that can be travelled during severe weather conditions are required. To protect park residents from potential loss of life and property and to prevent the abandonment of Mobilehomes within the Floodway, the park management must be able to assure the complete evacuation of all mobile homes and park facilities within the time period specified in the evacuation plan.

(b)(3)(A): It is necessary to specify that locations of all structures, Mobilehomes, Recreational Vehicles, and appurtenances are shown on the evacuation plan because this information is required to make a judicious determination of the effectiveness of the proposed evacuation plan to achieve the complete evacuation of a Mobilehome Park within the required time period.

(b)(3)(B): It is necessary to specify that the location of the river staff gauge and the gauge height that will indicate an evacuation of a Mobilehome Park are shown on the evacuation plan because it must be verified that the staff gauge and gauge height to be used to initiate an evacuation are compatible with the flood forecasts issued by the Departments' Flood Operation Center in Sacramento.

(b)(3)(C): It is necessary to specify that the number of tow vehicles and the usual location of each tow vehicle to be used to evacuate the Mobilehome Park are shown on the evacuation plan because the number of tow vehicles, their accessibility and capability must be sufficient to evacuate an entire Mobilehome Park within the required time period during a flood emergency.

(b)(3)(D): It is necessary to specify that the locations of emergency storage areas outside the Floodway for the Mobilehomes, Recreational Vehicles, and portable and floatable structures are shown on the evacuation plan because this information is required to make a judicious determination of the effectiveness of the proposed evacuation plan to achieve the complete evacuation of a mobile home park within the specified time period.

(b)(3)(E): It is necessary to specify that the route to be used to evacuate Mobilehomes from the Mobilehome Park to the emergency storage area is shown on the evacuation plan to prevent delay of an evacuation due to confusion of the evacuation route or because of traffic congestion an explicit evacuation route to the emergency storage area must be known by all involved.

(b)(3)(F): It is necessary to specify that after the initiation of an evacuation, all Mobilehomes not anchored in place and all Recreational Vehicles, and portable and floatable structures are removed from the Floodway within the time period specified in the evacuation plan because the allowable time period to complete the evacuation of all Recreational Vehicles, Mobilehomes and portable and floatable structures, provides for the optimum protection of life and property from potential flooding by fast rising Streams. The maximum time allowed for the completion of an evacuation is determined by the park Permittee and approved by the Board. The evacuation time limit also serves as a restraint for,

Mobilehome Park residents when determining the type of facilities or structures they may wish to install, considering the possibility of compulsory evacuations from the park. Recreational Vehicles and single-wide Mobilehomes are generally more easily adapted to a travel mode than are multiple-wide Mobilehomes and, therefore, should be first to be evacuated from a Floodway in order to prevent congestion of the evacuation route and to expedite the later movement of the multiple-wide mobiles. Portable and floatable structures must be removed from the Floodway to prevent the structures from floating downstream and causing damage to bridges and flood control facilities.

(b)(3)(G): It is necessary to specify that existing multiple wide Mobilehomes, unless specially designed for quick removal, are anchored in place with concrete deadmen because multiple-wide Mobilehomes, unless specially designed for quick removal, require considerable time to prepare for evacuation. It is essential that the evacuation of a flood threatened Mobilehome Park is completed as expeditiously as possible. Multiple-wide Mobilehomes that cannot be evacuated within the allowable time limit must be securely anchored to concrete deadmen to prevent the units from floating downstream and causing damage to bridges or flood control facilities.

(b)(3)(H): It is necessary to specify that new multiple-wide Mobilehomes, unless specially designed for quick removal, are not allowed because existing multiple-wide Mobilehomes are allowed to remain within a Mobilehome Park provided the units are securely anchored or specially designed for quick removal. However, the addition of new multiple-wide Mobilehomes is not acceptable because of the increased potential for loss of life and excessive property damage, and the potential, detrimental impact upon flood control facilities. Few, if any, multiple-wide Mobilehomes can be evacuated from a Mobilehome park within the allowable evacuation time limit. The addition of multiple-wide Mobilehomes within an Adopted Plan of Flood Control could diminish flood channel capacities and increase flood flow stages and velocities.

(b)(3)(I): It is necessary to specify that a copy of the evacuation plan is provided to all residents of the Mobilehome Park to expedite the evacuation of a Mobilehome Park during a flood warning emergency. All Mobilehome owners within the park must be fully informed of the established evacuation plan.

(b)(3)(J): It is necessary to specify that the Mobilehome Park Permittee or the manager has a duplicate of all keys necessary to move each Mobilehome and a signed statement allowing the removal of an absentee owner's Mobilehome during an emergency evacuation to assure the complete evacuation of a mobile home park during a flood emergency, the Mobilehome Park Permittee or manager must have the jurisdiction and any keys necessary to evacuate the Mobilehomes of absentee owners. Mobilehomes remaining within the Floodway during flood flows are a serious potential detriment to flood project facilities.

(b)(3)(K): It is necessary to specify that the Mobilehome Park Permittee accepts sole responsibility for initiating an evacuation of the Mobilehome Park because the Department does not issue evacuation orders for potential flood sites. River stage forecasts are prepared by the Federal-State River Forecast Center and are disseminated by the State Flood Operations Center. Flood forecasts are updated on a 24-hour basis during a potential flood emergency. Mobilehome Park Permittees are responsible for obtaining current flood forecasts and for initiating an evacuation order.

(b)(3)(L): It is necessary to specify that Mobilehomes not anchored in place, all portable structures, and Recreational Vehicles have axles, wheels, and any required tow hitch installed, and are in a readily movable condition at all times to expedite the evacuation of a Mobilehome Park, it is necessary to have all units in condition for immediate removal. Any unit which is unable to be removed becomes a detriment to the flood project by diminishing the Floodway capacity, becoming a downstream debris problem, and possibly misdirecting flows against channel banks or Levees causing severe erosion.

(b)(3)(M): It is necessary to specify that any related structures, such as laundry rooms and storage Buildings, are securely anchored to prevent flotation during high water and are not utilized for Human Habitation because any Mobilehome Park structure that could float off its foundation would be a potential detriment to the flood control project. A structure floating downstream could be grounded in such a position as to cause the streamflow to be directed toward the channel bank or Levee causing excessive erosion and possible Levee failure. A floating structure could also be wedged against a bridge and contribute to the destruction of the bridge or impede channel capacity.

(b)(3)(N): It is necessary to specify that if Significant Damage occurs to any of the Mobilehomes or other park structures due to failure of the evacuation plan or its execution in response to flooding, the park may not continue operating without approval of the Board because such an occurrence demonstrates that the Mobilehome Park may not be safe if it continues at its current location. The Board is responsible for the protection of flood control projects, lives and property. A Mobilehome Park located within a Floodway is a potential problem site. The evacuation of the mobile home park from the Floodway prior to expected flood flows is essential in protecting the flood control facilities, lives and property, and maintaining maximum Floodway capacities.

(b)(3)(O): It is necessary to specify that facilities that would remain in place after evacuation of the park shall not cause a significant increase in Stream stage or velocities, applying the Hydraulic Impact Evaluation Procedure for evaluating the potential hydraulic impacts of Mobilehome Parks and Existing Mobilehome Parks because in locations where the effect of the proposed facilities on flood stages is uncertain, the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. Of special concern would be anchored multiple-wide Mobilehomes and various structures such as storage Buildings, communal Buildings, and offices. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(c): The purpose of subdivision (c) is to establish requirements for Recreational Vehicle Parks and specify that New and Existing Recreational Vehicle Parks are allowed within an Adopted Plan of Flood Control if a Permit is obtained from the Board, a current implementable evacuation plan is on file with the Board, and the following requirements are enforced. It is necessary to establish requirements for Recreational Vehicle Parks because they can interfere with operation and maintenance of a Levee and/or Floodway and can become inundated during high water, add significant debris to flood waters, and cause severe damage to the Recreational Vehicles and risk to the occupants, if not evacuated in time.

(c)(1): It is necessary to require that the locations of all Recreational Vehicle pads and appurtenances are shown on the evacuation plan because this information is required in order to make a judicious

determination of the effectiveness of the proposed evacuation plan to achieve the complete evacuation of a Recreational Vehicle Park within the required time period.

(c)(2): It is necessary to require that all Recreational Vehicles have axles, wheels, and any required tow hitch installed, and are in readily movable condition at all times to expedite the evacuation of a Recreational Vehicle Park, it is necessary to have all units in condition for immediate removal. Any unit which is unable to be removed becomes a detriment to the flood project by diminishing the Floodway capacity, becoming a downstream debris problem, and possibly misdirecting flows against channel banks or Levees causing severe erosion.

(c)(3): It is necessary to require that at the initiation of an evacuation, all Recreational Vehicles are removed from the Floodway within the time period specified in the evacuation plan because following a flood forecast, it is essential that the evacuation of a Recreational Vehicle Park is completed as expeditiously as possible so as to prevent the loss of life and property, to protect flood project facilities and to continue to provide optimal flood protection.

(c)(4): It is necessary to require that at the initiation of the evacuation, all floatable and portable structures are removed from the Floodway within the time period specified in the evacuation plan because the allowable time period to complete the evacuation of all Recreational Vehicles provides for the optimum protection of life and property from potential flooding by fast rising Streams. The maximum time allowed for the completion of an evacuation is determined by the park Permittee and approved by the Board. Portable and floatable structures must be removed from the Floodway to prevent the structures from floating downstream and causing damage to bridges and flood control facilities.

(c)(5): It is necessary to require that the locations of emergency storage areas outside the Floodway for Recreational Vehicles, and portable and floatable structures are shown on the evacuation plan because the information is required in order to make a judicious determination of the effectiveness of the proposed evacuation plan to achieve the complete evacuation of a Recreational Vehicle Park within the specified time period.

(c)(6): It is necessary to require that the location of the river staff gauge and the gauge height that will initiate an evacuation are shown on the evacuation plan because it must be verified that the staff gauge and gauge height to be used to initiate an evacuation are compatible with the flood forecasts issued by the Departments' Flood Operation Center in Sacramento.

(c)(7): It is necessary to specify that Permittees or managers of Recreational Vehicle Parks accept sole responsibility for initiating an evacuation because the Department does not issue evacuation orders for potential flood sites. River stage forecasts are prepared by the Federal-State River Forecast Center and are disseminated by the State Flood Operations Center. Flood forecasts are updated on a 24-hour basis during a potential flood emergency. Recreational Vehicle Park Permittees are responsible for obtaining current flood forecasts and for initiating an evacuation order.

(c)(8): It is necessary to specify that any related structures, such as laundry rooms and storage Buildings, are securely anchored and are not utilized for Human Habitation because any Recreational Vehicle Park structure that could float off its foundation would be a potential detriment to the flood control project.

A structure floating downstream could be grounded in such a position as to cause the streamflow to be directed toward the channel bank or Levee causing excessive erosion and possible Levee failure. A floating structure could also be wedged against a bridge and contribute to the destruction of the bridge.

(c)(9): It is necessary to require that if Significant Damage occurs to any of the Recreational Vehicles or other park structures due to the failure of the evacuation plan or its execution in response to flooding, the park may not continue operating without the approval of the Board because such an occurrence demonstrates that the Recreational Vehicle Park may not be safe if it continues at its current location. The Board is responsible for the protection of flood control projects, lives and property. A Recreational Vehicles Park located within a Floodway is a potential problem site. The evacuation of the mobile home park from the Floodway prior to expected flood flows is essential in protecting the flood control facilities, lives and property, and maintaining maximum Floodway capacities.

(c)(10): It is necessary to require that facilities that would remain in place after evacuation of the Recreational Vehicle Park shall not cause a significant increase in Stream stage or velocities, applying the Hydraulic Impact Evaluation Procedure for evaluating the potential hydraulic impacts of Recreational Vehicle Parks and Existing Recreational Vehicle Parks. In locations where the effect of the proposed facilities on flood stages is uncertain, the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. Of special concern would be structures such as storage Buildings, communal Buildings, and offices. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(d): The purpose of subdivision (d) is to specify that incidental day-use of Recreational Vehicles within an Adopted Plan of Flood Control does not require a Board Permit. It is necessary to clarify that owners of property located within a Floodway may allow Recreational Vehicles on their property outside of Flood Season because such use would have very little, if any, detrimental effect on the flood control project.

CCR Title 23. Article 8. Section 115. Dredged, Spoil, and Waste Materials

(a): The purpose of subdivision (a) is to establish that Board approval is required before any dredged, spoil, or waste material of any type is deposited on the Levee crown, Levee slope, adjacent Seepage Berm or Stability Berm, Levee Toe drains or relief wells, within any portion of the Levee Right of Way, or within the limits of a Floodway. It is necessary to establish this requirement to protect their integrity and prevent the indiscriminate dumping of material in locations that would obstruct visual inspections of Levees, other flood control facilities, and Floodways, or would impede their maintenance.

(b): The purpose of subdivision (b) is to establish that Board approval is required before suitable dredged, spoil, or waste material may be placed on or against the landside Levee slope, provided that the applicant submits sufficient evidence demonstrating that placement will not be detrimental to the safety of the Levee, toe drains, Seepage Berms or relief wells; and will not impact access or flood fighting operations. It is necessary to establish this requirement because placement of permeable material or material with excessive organic ingredients, or any contaminated substance, would not be approved because of resulting problems with required soil compaction and potential hazards to public health.

(c): The purpose of subdivision (c) is to establish that dredged material shall be drained of excess moisture before being placed, and shall have the moisture content controlled to the required limits to obtain proper compaction of the material. It is necessary to establish this requirement because acceptable compacted fill must be void of excess moisture before being used. Fill material requires a water content low enough to allow placement and achieve proper compaction.

(d): The purpose of subdivision (d) is to establish that placement of dredged, spoil or waste material shall be done pursuant to all applicable Board Standards and the approved Permit. It is necessary to establish this requirement to ensure that the placed material is free of unsuitable material and compacted with proper moisture controls and equipment required for the specific location of placement as required by other subdivisions of these regulations and/or by the Permit.

(e): The purpose of subdivision (e) is to establish that dredged, spoil, or waste material is typically not allowed to be placed in the Floodway, but if approved by the Board the material shall not redirect flows or cause a significant increase in Stream stage or velocities. The Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact. The Board may deny a Permit if the hydraulic impact is deemed significant. It is necessary to establish this requirement to (1) prevent any deterioration of the designed flood flow capacity of the Stream channel, Floodway, or bypass, (2) prevent flood damage by increasing Stream velocities and erosion, (3) apply the One Percent Blockage Criterion for evaluating any hydraulic impact caused by the material, and (4) inform applicants that the Board may deny a Permit if the hydraulic impact is significant.

(f): The purpose of subdivision (f) is to establish that hazardous dredged, spoil, or waste materials may not be placed within an Adopted Plan of Flood Control. It is necessary to establish this requirement because hazardous materials placed within an Adopted Plan of Flood Control would present a hazard to the public and wildlife and in some cases may be transported downstream by floodwaters, spreading the contamination.

CCR Title 23. Article 8. Section 116. Borrow and Excavation Activities – Land and Channel

The purpose of section 116 is to establish requirements for removal of material from a Floodway or near a Levee because such work may pose a threat to the safety of the Levee. Excavation within a flood control project Floodway can misdirect flood flows, modify channel capacities, increase erosion, increase seepage beneath a Levee, or weaken a Levee or its foundation. Environmental decline and mosquito abatement problems can also result from poorly designed or poorly managed excavation works. The standards described in section 116 are required to prevent Levee damage and erosion problems, and to ensure the integrity of the Adopted Plan of Flood Control including the design channel capacities.

(a): The purpose of subdivision (a) is to describe the conditions that must be satisfied before the removal of earthen material and related activities within the limits of an Adopted Plan of Flood Control or that may impact an Adopted Plan of Flood Control. The Board may limit removal of earthen material for Borrow (mining) and excavation activities based on the geotechnical characteristics, hydraulics, hydrology, sediment transport, and history of the site. The Board may waive specific requirements for Borrow and excavation activities if the Permittee provides appropriately detailed geotechnical, hydraulic, and/or sediment transport studies which the Board then deems sufficient to justify the

waiver. The Board may waive the requirement for a Permit or for detailed geotechnical, hydraulic, and/or sediment transport studies for Borrow and excavation activities of a minor, incidental, or temporary nature. Each water course has its own unique balance of nature that provides for a stable, or relatively stable, condition of channel, bank and overflow channel cross- section. Changes in this balance can result in damage to the flood control project and adjacent or other property. It is, therefore, necessary at times to require a detailed engineering study to confirm that the removal of material and related activities within an Adopted Plan of Flood Control will in no way adversely affect the flood control project or any other property.

(a)(1): The purpose of subdivision (a)(1) is to specify that the activity shall not negatively impact Levee stability or underseepage performance. It is necessary to specify that the activity shall not negatively impact Levee stability or underseepage performance because such impacts would impair the integrity of the Levee and reduce public safety.

(a)(2): The purpose of subdivision (a)(2) is to specify that the activity shall not cause an unplanned change of the Stream's alignment. It is necessary to specify that the activity shall not cause an unplanned change of the Stream's alignment because undesirable problems can emanate following the process of a stream changing its course. Not only will the channel hydraulics and sediment transport change, but agricultural and other activities as well as environmental values may be impaired.

(a)(3): The purpose of subdivision (a)(3) is to specify that the activity shall not change the sediment transport downstream from the site in a manner that produces or tends to produce increased flood or erosion concerns. It is necessary to specify that the activity shall not change the sediment transport downstream from the site in a manner that produces or tends to produce increased flood or erosion concerns because an increase in channel sediment transport can cause increased sediment deposition downstream which, in turn, changes channel hydraulics. Excessive sediment deposition can decrease Floodway capacities and increase flood flow stages. A decrease in sediment transport can cause increased erosion downstream which can adversely impact riparian vegetation and property in addition to flood control works.

(a)(4): The purpose of subdivision (a)(4) is to specify that the activity is consistent with the overall flood control objectives for the area. It is necessary to specify that the activity is consistent with the overall flood control objectives for the area because any Borrow activity that would impinge upon the safety or operations of a flood control facility is not allowed. Any Borrow activity within a stream or area having no flood control project is not allowed if the activity would increase streamflow levels or cause the erosion or inundation of any other property.

(b): The purpose of subdivision (b) is to describe the general requirements for Borrow and excavation, unless other specific provisions for a specific area or Stream modify these requirements. It is necessary to establish general requirements for Borrow and excavation because Borrow and excavation have the potential to create erosion, undesirable stream realignment, Levee slope instability, and increase Levee underseepage.

(b)(1): The purpose of subdivision (b)(1) is to specify that a geotechnical analysis may be required before initiating any Borrow or excavation activity within a Leveed Floodway or on the landside of a Levee

within four hundred (400) feet of the Levee Right of Way. The geotechnical analysis shall include seepage modeling performed by a California registered civil engineer demonstrating that the Borrow or excavation configuration is stable and will not adversely impact the underseepage and stability characteristics of the adjacent Levee. The seepage modeling shall be performed for Stream stage at the DWSE. Within or adjacent to Urban Criteria Areas, the seepage modeling shall include evaluation of performance for the Stream stage at the Hydraulic Top of Levee and demonstrate compliance with Levee underseepage requirements of the Urban Levee Design Criteria. Based upon the geotechnical analysis, the Board may deny the Permit or require monitoring, including installation of piezometers and monitoring of pore pressures to demonstrate there is no adverse impact on Levee safety. The investigation is required to determine if the proposed Borrow would increase seepage beneath Levees or expose soils susceptible to erosion. Soil conditions are important because they control the rate at which seepage will occur through and beneath Levees. Because of the effects of Borrow activities with respect to seepage, uplift pressures and overall Levee stability, Borrow areas within a Leveed Floodway must be carefully planned and designed.

It is necessary to specify that a geotechnical analysis may be required before initiating any Borrow or excavation activity within a Leveed Floodway or on the landside of a Levee within four hundred (400) feet of the Levee Right of Way because a Borrow or excavation site in the Floodway or within four hundred (400) feet of the Levee Right of Way could reduce Levee stability and/or increase seepage beneath the Levee, resulting in boils and piping of Levee foundation materials.

It is necessary to specify that the seepage modeling shall be performed by a California registered civil engineer to ensure adequate modeling, methods, and conclusions when considering the largest flood for which the Stream and facilities in the area have been designed. Numerous factors must be considered in modeling a Borrow or excavation site and the potential impacts on the Levee stability and underseepage, and stability of the site. These factors vary from project to project. An improperly analyzed Borrow or excavation can result in damage to the Levee(s) nearby.

It is necessary to specify that the seepage modeling shall be performed for Stream stage at the DWSE and within or adjacent to Urban Criteria Areas, the seepage modeling shall include evaluation of performance for the Stream stage at the Hydraulic Top of Levee and demonstrate compliance with Levee underseepage requirements of the Urban Levee Design Criteria because these are the appropriate water levels to use for the analyses. Use of a lower water surface in an Urban Criteria Area could compromise the two hundred (200) year flood protection provided to the area or planned for the area.

It is necessary to specify that based upon the geotechnical analysis, the Board may deny the Permit or require monitoring, including installation of piezometers and monitoring of pore pressures to demonstrate there is no adverse impact on Levee safety because a geotechnical analysis showing unreasonable risk to the Adopted Plan of Flood Control should not be approved and when there is uncertainty about the geotechnical analysis and potential impacts on Levee performance, instrumentation that measures water pore pressures (piezometers) with monitoring can be used to mitigate concerns.

It is necessary to specify that the investigation is required to determine if the proposed Borrow would increase seepage beneath Levees or expose soils susceptible to erosion because if such soils are

exposed, accelerated erosion can be anticipated. It is necessary to specify that soil conditions are important because they control the rate at which seepage will occur through and beneath Levees. Because of the effects of Borrow activities with respect to seepage, uplift pressures and overall Levee stability, Borrow areas within a Leveed Floodway must be carefully planned and designed

(b)(2): The purpose of subdivision (b)(2) is to establish that a hydraulic study and/or sediment transport study may be required by the Board before initiating any Borrow or excavation activity within a Leveed Floodway. The study shall determine if the proposed Borrow or excavation activity would increase Stream stages or velocities that may cause or increase erosion conditions during the Design Flood. A significant increase in stage or velocity or significant change to sediment transport conditions can be the basis for denying a Permit. It is necessary to establish that a hydraulic study and/or sediment transport study may be required by the Board because a Borrow or excavation activity can adversely change Stream stages and/or sediment transport conditions that increase the hydraulic loading on the Levee and/or destabilize a relatively stable sediment transport regime, triggering or increasing streambed downcutting due to lack of sediment load (that was removed by the Borrow or excavation activity). This downcutting can lead to increased Levee underseepage and waterside Levee slope instability, increasing the likelihood of a Levee failure and the risk to public safety.

(b)(3): The purpose of subdivision (b)(3) is to specify that the minimum required distance for locating a Borrow area or excavation within a Leveed Floodway is one hundred (100) feet measured from the waterside Levee Toe to prevent damage to the Levee, such as sloughing, foundation failure, or increased seepage during high water; geotechnical, hydraulic, and/or sediment transport studies acceptable to the Board are generally required for locating a Borrow area or excavation within a Leveed Floodway closer than three hundred (300) feet to the waterside Levee Toe.

It is necessary to specify that the minimum required distance for locating a Borrow area or excavation within a Leveed Floodway is one hundred (100) feet measured from the waterside Levee Toe to prevent damage to the Levee, such as sloughing, foundation failure, or increased seepage during high water. It is necessary to specify that geotechnical, hydraulic, and/or sediment transport studies acceptable to the Board are generally required for locating a Borrow area or excavation within a Leveed Floodway closer than three hundred (300) feet to the waterside Levee Toe because less than three hundred (300) feet is close enough to the Levee that the Borrow or excavation can penetrate a waterside blanket layer that is important for controlling Levee underseepage, leading to increased underseepage and possible piping of Levee foundation soils.

(b)(4): The purpose of subdivision (b)(4) is to specify that no Borrow or excavation is allowed within the existing or planned Levee Right of Way. It is necessary to specify that no Borrow or excavation is allowed within the existing or planned Levee Right of Way to protect the Levee from becoming destabilized by the removal of soil adjacent to the Levee and to protect the ability to operate and maintain the Levee, including patrolling and flood fighting.

(b)(5): The purpose of subdivision (b)(5) is to specify that material may not be removed within fifty (50) feet of the toe of any Spur Levee. Additional analysis may be required to verify stability and erosion conditions of the Spur Levee for removal of material within three hundred (300) feet of the toe of the Spur Levee. It is necessary to specify that material may not be removed from within fifty (50) feet of a

Spur Levee and additional analysis may be required within three hundred (300) feet because a Spur Levee has water on both sides and does not directly protect an area from flood waters. Without this rule, the general rule in (b)(3) of this section would apply, requiring one hundred (100) feet setback for excavation and four hundred (400) feet for potential analysis.

(b)(6): The purpose of subdivision (b)(6) is to require that in a Floodway or less than four hundred (400) feet landward of the Levee Toe, the side slopes of the perimeter of a Borrow area or excavation shall be 5h:1v or flatter unless steeper slopes are justified by engineering analyses of seepage, stability, and erosion to minimize erosion, prevent sloughing, or cave-in, within the Borrow area, and to enhance employee and public safety. It is necessary to require that in a Floodway or less than four hundred (400) feet landward of the Levee Toe, the side slopes of the perimeter of a Borrow area or excavation shall be 5h:1v or flatter unless steeper slopes are justified by engineering analyses of seepage, stability, and erosion to minimize erosion, prevent sloughing or cave-in within the Borrow area, avoid unintended enlargement of the Borrow area that could potentially impair the integrity of a flood control structure, and to enhance employee and public safety because, without engineering justification for a steeper slope, a 5h:1v slope or flatter slope is adequate to avoid erosion, sloughing, and cave-in within the Borrow area.

(b)(7): The purpose of subdivision (b)(7) is to specify that the bottom of a Borrow area or excavation landward of a Levee must be located above a 10h:1v slope projected downward from the landside Levee Toe, Seepage Berm toe, or Stability Berm toe unless a geotechnical analysis demonstrates that the Borrow or excavation will not adversely impact the integrity of the Levee. If the Borrow area or excavation will be seasonally dry and located within four hundred (400) feet of the landside Levee Toe, the bottom shall be graded to drain water away from the Levee Toe. It is necessary to specify that the bottom of a Borrow area or excavation landward of a Levee must be located above a 10h:1v slope projected downward from the landside Levee Toe, Seepage Berm toe, or Stability Berm toe unless a geotechnical analysis demonstrates that the Borrow or excavation will not adversely impact the integrity of the Levee because, per USACE guidance, a ditch or pond (or any similar excavation such as a Borrow pit or excavation) is generally considered to be too close to the landside Levee Toe, Seepage Berm toe, or Stability Berm toe if it is deep enough to intersect a line drawn at a 10h:1v slope projected downward from the landward extent of the landside Levee Toe, Seepage Berm toe, or Stability Berm toe. This requirement for setback reduces the likelihood of creating Levee instability or a path for Levee underseepage that results in boils and piping, causing loss of Levee foundation soils and possible Levee failure during high water.

It is necessary to specify that if the Borrow area or excavation will be seasonally dry and located within four hundred (400) feet of the landside Levee Toe, the bottom shall be graded to drain water away from the Levee Toe because this prevents development of a pond that saturates the Levee foundation.

(b)(8): The purpose of subdivision (b)(8) is to specify that any Levee crown or Access Ramp used to transport Borrow or excavated material shall be maintained by the Permittee in the same or better condition as existed at the start of the Borrow or excavation operation. It is necessary to specify that any Levee crown or Access Ramp used to transport Borrow or excavated material shall be maintained by the Permittee in the same or better condition as existed at the start of the Borrow or excavation operation

because Levee roads and Access Ramps must be maintained and be functional at all times in order to inspect and monitor Levee conditions and to conduct flood fight procedures whenever necessary. This requirement also helps avoid additional expenses to Local Maintaining Agencies responsible for Levee maintenance.

(b)(8)(A): It is necessary to require that a surveyed longitudinal profile of the existing Levee crown roadway and Access Ramps to be utilized for access to the Borrow area or excavation shall be submitted to the Board prior to excavation of material because this survey documents the profile at the start of Borrow or excavation activities for comparison to surveys performed after Borrow or excavation has commenced to determine if any subsidence of the Levee or Access Ramps occurs during Borrow activities.

(b)(8)(B): It is necessary to require that a surveyed longitudinal profile of the Levee crown roadway and Access Ramps utilized for access to the Borrow area shall be submitted yearly as well as upon abandonment of the Borrow area because these surveys enable the Board to determine if Levee crown subsidence has occurred due to the Permitted Borrow operations, and to what extent.

(b)(8)(C): It is necessary to require that the Permittee shall restore a damaged Levee and/or Access Ramp to the integrity, lines, grades, and slopes that existed at the start of the Borrow operation because the responsibility for restoring damage caused by the Borrow or excavation activity properly belongs to the Permittee and not the Levee owner or Local Maintaining Agency.

(b)(8)(D): It is necessary to require that the Permittee shall provide notifications to the Board when damage has occurred to a Levee and/or Access Ramp because the damage may not be noticed immediately by the Local Maintaining Agency and the repairs should be performed promptly to address the increased risk to public safety attributable to the damage. It is necessary to require the notifications to include a scope of work and date when repairs will commence because this provides for scheduling inspection of the work by Board staff. It is necessary to require that the repairs shall restore the integrity of the Levee and/or Access Ramp and, to the extent practical, be completed prior to the start of Flood Season so as to, inasmuch as possible, have the Levee and/or Access Ramp fully restored throughout the Flood Season. It is understood that if the damage is discovered around the time that Flood Season starts, the repairs may not be completed prior to the start of Flood Season.

(b)(9): The purpose of subdivision (b)(9) is to specify that Borrow or excavated material of any type may not be stored at any time within the Levee Right of Way without prior approval by the Board, and further setback may be required to prevent the stockpile from adversely impacting Levee integrity or operation and maintenance of the Levee. It is necessary to specify that Borrow or excavated material of any type may not be stored at any time within the Levee Right of Way without prior approval by the Board, and further setback may be required to prevent the stockpile from adversely impacting Levee integrity or operation and maintenance of the Levee, or flood fighting capability, because Levee Sections which are used to store any material cannot be adequately inspected for rodent holes, fissures or sloughing. An undetected hole, fissure or slough may readily advance to a Levee failure. Material stored on a Levee could be in a location that will interfere with a flood fight.

(b)(10): The purpose of subdivision (b)(10) is to specify that no Borrow or excavated material may be stored in a manner that could destabilize a Waterside Berm. The applicant shall demonstrate that stability of the Waterside Berm and any adjacent Levee are not impacted by the temporary storage of Borrow or excavated material. It is necessary to specify that no Borrow or excavated material may be stored in a manner that could destabilize a Waterside Berm and the applicant shall demonstrate that stability of the Waterside Berm and any adjacent Levee are not impacted by the temporary storage of Borrow or excavated material because riverbanks must be protected from loading conditions that could exceed the riverbank soil shear strength. Concentrating additional weight could cause displacement, or sloughing, of the bank.

(b)(11): The purpose of subdivision (b)(11) is to specify that periodic topographic surveys of the active Borrow area and vicinity may be required. It is necessary to specify that periodic topographic surveys of the active Borrow area and vicinity may be required to determine compliance with all Permit conditions.

(b)(12): The purpose of subdivision (b)(12) is to specify that all boundaries of an active Borrow area shall be delineated by steel posts or other permanent markers which are clearly visible to prevent excavations beyond authorized areas. It is necessary to specify that all boundaries of an active Borrow area shall be delineated by steel posts or other permanent markers which are clearly visible to prevent excavations beyond authorized areas because the markers also warn the public of potential hazards within the Borrow area.

(b)(13): The purpose of subdivision (b)(13) is to specify that stockpiles of materials or the storage of equipment, downed trees or brush, and floatable material of any kind are not allowed within a Floodway during the Flood Season. It is necessary to specify that stockpiles of materials or the storage of equipment, downed trees or brush, and floatable material of any kind are not allowed within a Floodway during the Flood Season because any such material could impede flood flows, diminish channel capacities, damage bridges and flood control structures, and cause increased flood stages and velocities.

(b)(14): The purpose of subdivision (b)(14) is to specify that channel or Waterside Berm excavations are not allowed within a Leveed Floodway where there is active erosion unless an engineering study demonstrates the Channel or Waterside Berm excavations will not exacerbate the erosion. It is necessary to specify that channel or Waterside Berm excavations are not allowed within a Leveed Floodway where there is active erosion unless an engineering study demonstrates the Channel or Waterside Berm excavations will not exacerbate the erosion because exacerbated erosion could threaten the integrity of the Levee.

(b)(15): The purpose of subdivision (b)(15) is to specify that the upstream and downstream ends of a Borrow area connected to a Low Water Channel shall be transitioned into the channel to prevent an abrupt change in Stream velocity or cause an Obstruction. It is necessary to specify that the upstream and downstream ends of a Borrow area connected to a Low Water Channel shall be transitioned into the channel to prevent an abrupt change in Stream velocity or cause an Obstruction because a gradual transition into and out of the Borrow area is necessary to provide maximum stability of the channel and prevent adverse changes to normal sediment transport.

(b)(16): The purpose of subdivision (b)(16) is to specify that when the Borrow area is to be connected to the Low Water Channel, excavation shall start at the riverward edge of the Borrow area and progress uniformly landward to allow the recharging of the excavated material during high water. It is necessary to specify that when the Borrow area is to be connected to the Low Water Channel, excavation shall start at the riverward edge of the Borrow area and progress uniformly landward to allow the recharging of the excavated material during high water because this procedure prevents the formation of a barrier between the channel and the Borrow area, or the formation of islands within the Borrow area which would impede or misdirect flood flows.

(b)(17): The purpose of subdivision (b)(17) is to specify that the bottom elevation of any Waterside Berm Borrow site may not be lower than the adjacent channel bottom without adequate setback from the channel. Five hundred (500) feet is generally considered an adequate setback. It is necessary to specify that the bottom elevation of any Waterside Berm Borrow site may not be lower than the adjacent channel bottom without adequate setback from the channel. Five hundred (500) feet is generally considered an adequate setback because during high water the main flow of the stream could divert through the Borrow area and erode the buffer zone, leaving the Low Water Channel permanently redirected through the Borrow pit.

(b)(18): The purpose of subdivision (b)(18) is to specify that dredging of material from channel waterways generally shall be confined to the area beyond one hundred (100) feet of the toe of the bank, or the waterside toe of the Levee if there is no bank. The slope of the dredging perimeter nearest the toe of the bank, or the waterside toe of the Levee if there is no bank, may not exceed 5h:1v. Localized exceptions may require bank protection. Additional seepage and stability analyses shall be required to verify the integrity of the Levee Section near the dredging area. It is necessary to specify that dredging of material from channel waterways generally shall be confined to the area beyond one hundred (100) feet of the toe of the bank, or the waterside toe of the Levee if there is no bank because this prevents undermining of the bank which could adversely affect bank stability. Riverbanks must be protected from any dredging activity that could cause displacement, or sloughing, of the bank.

It is necessary to specify that the slope of the dredging perimeter nearest the toe of the bank, or the waterside toe of the Levee if there is no bank, may not exceed 5h:1v and localized exceptions may require bank protection because this flatter slope is required for dredging, compared to a three (3) to one (1) slope required for other Borrow activities, because of the difficulty of verifying soil types, slope stability, and as-built conditions under water. The slope of the perimeter of the dredged area must be no steeper than five (5) horizontal to one (1) vertical to prevent a cave-in within the dredged area from affecting the stability of the riverbank.

It is necessary to specify that additional seepage and stability analyses shall be required to verify the integrity of the Levee Section near the dredging area.

(b)(19): The purpose of subdivision (b)(19) is to specify that before any Borrow operation in a Floodway, including suction dredging, is allowed within one (1) mile of a bridge, a study shall be submitted to show the Borrow operation will not adversely affect any of the bridge footings, piers, or bents. It is necessary to specify that before any Borrow operation in a Floodway, including suction dredging, is allowed within one (1) mile of a bridge, a study shall be submitted to show the Borrow operation will not adversely

affect any of the bridge footings, piers, or bents because excavating within a Floodway can change sediment transport and channel hydraulics, such as increasing upstream or downstream erosion, inducing the potential for damage to bridge foundations.

(b)(20): The purpose of subdivision (b)(20) is to specify that before any Borrow operation in a Floodway, including suction dredging, is allowed within one thousand (1,000) feet of any pipeline or cable crossing beneath the channel, or within one thousand (1,000) feet of a project control structure (e.g., a weir) a study shall be submitted to show that the Borrow operation will not adversely affect that facility. before any Borrow operation in a Floodway, including suction dredging, is allowed within one thousand (1,000) feet of any pipeline or cable crossing beneath the channel, or within one thousand (1,000) feet of a project control structure, e.g., a weir, a study shall be submitted to show that the Borrow operation will not adversely affect that facility. It is necessary to specify that before any Borrow operation in a Floodway, including suction dredging, is allowed within one thousand (1,000) feet of any pipeline or cable crossing beneath the channel, or within one thousand (1,000) feet of a project control structure, e.g., a weir, a study shall be submitted to show that the Borrow operation will not adversely affect that facility because excavating within a Floodway can change sediment transport and channel hydraulics, such as increasing upstream or downstream erosion, inducing the potential for damage or destruction of an underlying pipeline or cable or cause the undermining of a project control structure.

(b)(21): The purpose of subdivision (b)(21) is to specify that any proposed Borrow operation in a Floodway within one mile of a State highway bridge shall be approved by the California Department of Transportation. This standard applies at the request of the Department of Transportation. It is necessary to specify that any proposed Borrow operation in a Floodway within one mile of a State highway bridge shall be approved by the California Department of Transportation because excavating within a Floodway can change sediment transport and channel hydraulics, such as increasing upstream or downstream erosion, inducing the potential for damage to bridge foundations.

(c): The purpose of subdivision (c) is to specify that if periodic inspections reveal that a Borrow operation will adversely affect an Adopted Plan of Flood Control, additional Permit conditions may be imposed, or the Permit may be revoked. It is necessary to specify that if periodic inspections reveal that a Borrow operation will adversely affect an Adopted Plan of Flood Control, additional Permit conditions may be imposed, or the Permit may be revoked because Borrow operations can affect sediment transport and Floodway hydraulics in unpredictable ways. Consequently, the Board needs to reserve the authority to modify or revoke a Permit as necessary to protect the Adopted Plan of Flood Control.

(d): The purpose of subdivision (d) is to specify that removal of sediment deposits by Local Maintaining Agencies to restore flood channel capacity may be considered Maintenance Activities. It is necessary to specify that sediment deposits removed by a Local Maintaining Agency may be considered Maintenance Activities because when this work is performed by the Local Maintaining Agency of the channel it is performed to maintain the channel capacity of the Stream and is required by the USACE Operation and Maintenance Manual. Work that qualifies under Maintenance Activities does not require a Board Permit.

(e): The purpose of subdivision (e) is to specify that excavations made within a Floodway that are not an approved Borrow or excavation activity shall be backfilled with suitable material in conformance with

section 120(a) of this division. Analyses may be required to confirm seepage, stability, and erosion conditions have not been impacted for either the flood channel or adjacent Levee(s). Field density testing by an Approved Soils Testing Laboratory may be required to confirm the minimum relative compaction of backfill. All disturbed surface features shall be completely restored to the original condition. This restoration shall include but is not limited to, sodding, seeding, surfacing, slope protection, and bedding restoration. It is necessary to specify that unapproved Borrow or excavation activity shall be backfilled with suitable material in conformance with section 120(a) of this division and that analyses may be required to confirm that seepage, stability, and erosion conditions have not been impacted because the damage caused by the unapproved Borrow or excavation must be properly repaired to restore the pre-existing seepage, stability, and erosion conditions of the Floodway. It is necessary to specify that density testing by an Approved Soils Testing Laboratory may be required to confirm the minimum relative compaction of backfill because improperly compacted backfill may be subject to erosion and an Approved Soils Testing Laboratory meets stringent testing standards that produce reliable results. It is necessary to require that all disturbed surface features shall be completely restored to the original condition and that restoration shall include, but is not limited to, sodding, seeding, surfacing, slope protection, and bedding restoration because all of the damaged ground surface must be restored to prevent an adverse impact on seepage, stability, or erosion and the freshly restored ground surface will tend to be subject to erosion if not protected by sodding, seeding, or other appropriate measures.

CCR Title 23. Article 8. Section 117. Supplemental Borrow Standards for the Yuba River

The purpose of section 117 is to establish requirements for Borrow within the Yuba River Floodway, which contains vast deposits of silt, sand and gravel that provide an active yearly multi-million ton commerce in these products. Excessive, uncontrolled removal of material from the Yuba River Floodway could cause the river to shift its course, causing the channel to migrate periodically from one portion of the overflow area to another portion and possibly direct flood flows directly against the Floodway banks or Levees. These misdirected flows could cause serious erosion of Levees and lead to Levee failure.

Development within the Yuba River Floodway was allowed to meet the demands of the rapidly increasing population of the Marysville-Yuba City urban-suburban complex to upgrade land use in the Yuba River Floodway. Borrow sites must be carefully planned and controlled to protect this increasing land development, and to prevent potential adverse effects, such as increasing seepage, Levee uplift pressures, erosion and Levee instability. In addition, the continued sediment transport from the Yuba River is important to prevent increased erosion on the Feather River downstream.

(a): The purpose of subdivision (a) is to specify that material may not be removed within four hundred (400) feet of the waterside Levee Toe of Levees of the Yuba River. It is necessary to specify that material may not be removed within four hundred (400) feet of the waterside Levee Toe of Levees of the Yuba River to prevent Levee damage, such as sloughing, foundation failure, or increased seepage during high water. The Yuba River is especially erosive because of its steep gradient and the channel and overflow area being comprised of hydraulic mining debris. The four hundred (400) feet setback requirement is necessary because of susceptibility of the Yuba River banks and overflow areas to erosion.

(b): The purpose of subdivision (b) is to specify that material may not be removed within four hundred (400) feet of the perimeter of any bank or Revetment. It is necessary to specify that material may not be removed within four hundred (400) feet of the perimeter of any bank or Revetment because the removal of material from the area adjacent to a bank or Revetment poses a potential threat to the stability of the bank or Revetment. Serious damage to large segments of bank or Revetment can occur if the supporting soils at the base or side perimeters of the Revetment are disturbed or displaced. Slight movements of foundation soils can trigger a slide that causes extensive damage to the bank or Revetment material. The four hundred (400) feet setback requirement is necessary because of susceptibility of the Yuba River banks and overflow area to erosion.

(c): The purpose of subdivision (c) is to specify that between Daguerre Point Dam (approximately River Mile 11.4) and Cenedella Bend (approximately River Mile 4.1), material may not be removed within one thousand five hundred (1,500) feet of the top of the banks of the Yuba River. It is necessary to specify that between Daguerre Point Dam (approximately River Mile 11.4) and Cenedella Bend (approximately River Mile 4.1), material may not be removed within one thousand five hundred (1,500) feet of the top of the banks of the Yuba River to provide a sufficient buffer zone for protection of the flood control facilities. This reach of the Yuba River has a steep gradient with high velocities and. highly erodible banks, making it very susceptible to meandering. The existing channel alignment must be preserved to maintain optimum flood protection of extensive development within the overflow area, and also to prevent damage to channel banks and Levees.

(d): The purpose of subdivision (d) is to specify that the elevation of the bottom of the Borrow area nearest the bank of the river may be no lower than ten (10) feet above the normal low-water elevation of the Yuba River. It is necessary to specify that the elevation of the bottom of the Borrow area nearest the bank of the river may be no lower than ten (10) feet above the normal low-water elevation of the Yuba River to prevent migration of the Low Water Channel which could occur during periods of high water because of the erodible nature of the hydraulic mining debris deposited within the Yuba River Floodway.

(e): The purpose of subdivision (e) is to specify that existing Borrow pits or depressions between the Levee and four hundred (400) feet waterward of the waterside Levee Toe and adjacent to a proposed Borrow area shall be backfilled to within twenty (20) feet vertically of the Levee Crest Elevation by the Permittee of the proposed Borrow area. The backfill shall be placed in the ratio of one (1) cubic yard placed in the low areas to ten (10) cubic yards removed from the Floodway. It is necessary to specify that existing Borrow pits or depressions between the Levee and four hundred (400) feet waterward of the waterside Levee Toe and adjacent to a proposed Borrow area shall be backfilled to within twenty (20) feet vertically of the Levee Crest Elevation by the Permittee of the proposed Borrow to prevent saturation of a Levee Section by seepage from ponded water in pits or depressions adjacent to the Levee. It is necessary to specify the backfill shall be placed in the ratio of one (1) cubic yard placed in the low areas to ten (10) cubic yards removed from the Floodway because this procedure provides for sufficient filling of pits and depressions to mitigate the potential threat to the integrity of Levees caused by Borrow activity.

(f): The purpose of subdivision (f) is to specify that material may not be removed from the area between nine hundred (900) feet upstream of the Union Pacific Railroad bridge (near River Mile 1.2) and the confluence of the Yuba and Feather Rivers. It is necessary to specify that material may not be removed from the area between nine hundred (900) feet upstream of the Union Pacific Railroad bridge (near River Mile 1.2) and the confluence of the Yuba and Feather Rivers because the continued sediment transport from this reach of the Yuba River is important to prevent increased erosion on the Feather River downstream. In addition, this restriction protects the low-level training Levee located at approximately nine hundred (900) feet from the centerline of the left bank Levee. The purpose of the training Levee is to prevent the low flow river channel from migrating from its historical channel located adjacent to the right bank Levee.

CCR Title 23. Article 8. Section 118. Supplemental Borrow Standard for the Lower San Joaquin River Flood Control Project

The purpose of section 118 is to establish a supplemental standard for Borrow from the Lower San Joaquin River Flood Control Project because its Floodways require additional protections from Borrow activities, in large part due to many of the Floodways not being natural waterways. Prior to authorization of the Lower San Joaquin River Flood Control Project in December 1944, Levees were first constructed along the San Joaquin River by individual landowners and local Reclamation Districts. The Levees constructed by local interests beginning in 1850 provided only partial protection. In general, the Lower San Joaquin River Flood Control Project provided for construction or reconstruction of Levees, channel improvements, and riverbank protection along the lower San Joaquin River from the mouth of the Merced River to the Sacramento-San Joaquin Delta; a combined total distance of about 100 miles. Because of the relatively flat gradient of the lower San Joaquin River, sediment deposition within the project is a perennial problem that causes continual changes in the hydraulic characteristics of the flood project channels. The lower San Joaquin River Levees are extremely permeable because of the type of soil that was available for use in construction of the Levees. During extended periods of high flows in the San Joaquin River, which often occurs during the snowmelt season, extensive inundation of roads and agricultural lands is caused by water seepage through the porous Levees. Sediment removal from within the flood control project is encouraged, but rigid adherence to the Borrow standards is necessary to protect these sensitive Levees from destructive Encroachments.

The purpose of the supplemental standard is to require that all Waterside Berm excavations shall connect to the channel, and the bottom of Waterside Berm excavations shall be sloped to drain away from the Levee. It is necessary to require excavations to slope away from the Levee to prevent saturation of the Levee or Levee foundation by ponded water, and to prevent the promotion of undesirable vegetation on or adjacent to the Levee. Berm excavations must be designed to fill slowly during a rising stage and drain fully during a receding stage. This also avoids the entrapment of fish.

CCR Title 23. Article 8. Section 119. Dams and Related Structures

The purpose of section 119 is to establish requirements for dams and related structures within an Adopted Plan of Flood Control. Diversion dams are installed within streams and river channels, and within Floodways and bypasses to provide for the irrigation of adjacent farm lands. During the irrigation season, streamflows are usually low to moderate, and raising the water level within flood project facilities for irrigation purposes causes few, if any, problems. However, during the flood season, any dam

remaining within a flood control project creates unacceptable risks of raising water levels to flood heights, causing excessive saturation of Levee foundations and Levee Sections and adding Levee erosion problems by the sudden rise or lowering of the water level at the dam.

(a): The purpose of subdivision (a) is to specify that Dams and structures that act as dams constructed in the channels of Streams must meet the following criteria. It is necessary to establish criteria for dams because they can raise flood stages, destabilize Stream banks, cause erosion, interfere with conveyance of flood flows, interfere with operation and maintenance of Levees, and present a hazard to boaters.

(a)(1): It is necessary to require that a study shall be submitted to the Board confirming that the installation of a dam will not increase flooding outside of the Floodway or increase flood damages in the Floodway because it provides control over the potential threat of water levels being raised by dams causing the inundation of property, including crops, farm equipment and Buildings. The study must confirm that the dam will either erode during a reasonably expected summer flood, will not diminish the Floodway capacity to the point where a summer flood would not be completely confined within the Floodway, or increase flood damage to third Parties within the Floodway.

(a)(2): It is necessary to require that a study shall be submitted to the Board that evaluates the potential for erosion of the bank or Levee slopes upstream and downstream of the proposed dam because the rapid rise of water level behind a dam can have an erosion impact on the upstream banks or Levee slopes, and the sudden release of the stored water can have an even greater impact on downstream banks or Levees. If the analysis shows the potential for erosion, erosion control shall be required on the bank or Levee slopes upstream and downstream of the proposed dam based on the results of the study. Depending upon the types of soils within the channel banks and the material that was available during the construction of the Levees, erosion protection may be required to ensure bank and Levee stability.

(a)(3): It is necessary to require that earthfill, including sand, and rockfill dams shall be completely removed from the Floodway prior to the beginning of Flood Season each year and may not be reinstalled prior to the end of Flood Season unless approved by the Board (See Table 8.1) because it protects against the possibility of a dam obstructing streamflows and raising water levels to undesirable heights causing unnecessary saturation of Levees or the inundation of property outside of the Floodway.

(a)(4): It is necessary to require that all stanchions shall be removed or lowered, and all flashboards and slide gates of a dam shall be removed from the Floodway prior to the beginning of Flood Season each year and may not be reinstalled prior to the end of Flood Season unless approved by the Board (see Table 8.1) because it prevents increased water levels within Floodways causing inundation of adjacent property, or excessive saturation of Levees or Levee foundations.

(a)(5): It is necessary to require that the Permittee shall remove or lower all stanchions and shall remove the flashboards and slide gates of a dam within twenty four (24) hours after receiving written notification from the Board because it ensures the complete confinement of flood flows within the Floodway and prevents the inundation of property, or saturation of Levees or Levee foundations.

(a)(6): It is necessary to require that the Permittee shall remove an earthfill or rockfill dam within ninety-six (96) hours after receiving written notification from the Board because it protects against the

possibility of a dam obstructing streamflows and raising water levels to undesirable heights causing unnecessary saturation of Levees or the inundation of property outside of the Floodway.

(a)(7): It is necessary to require that upon removal of an earthfill or rockfill dam, the material from the dam shall not be stockpiled within the Levee Right of Way or within the Floodway because such material would obstruct flows, increase water levels, and impede or prevent the inspection and maintenance of the Levee Section.

(a)(8): It is necessary to require that the Permittee provide warning signs upstream and downstream of a rockfill dam at a distance that under normal conditions of visibility the warning will be recognizable by boaters in time to avoid danger because underwater rocks at the base of rockfill dams can be a serious threat to boaters, particularly during varying water stages or where influenced by tidal changes.
(b): The purpose of subdivision (b) is to specify that crop checks, ditch banks, ditch pads, road fills, and Secondary Levees installed within Floodways may not be reinforced or revetted and shall be limited to a height, length, and orientation that will not cause a significant increase in Stream stage or velocities and to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact. It is necessary to specify that crop checks, ditch banks, ditch pads, road fills, and Secondary Levees installed within Floodways may not be reinforced or revetted and shall be limited to a height, length, and orientation that will not cause a significant increase in Stream stage or velocities because these agricultural facilities are considered to be temporary and expendable. During flood flows, it is desirable to have these facilities levelled to prevent the Obstruction of flood flows and the accumulation of debris. To facilitate the removal or leveling of such facilities by flood flows, reinforcement or Revetment is not allowed. Crop checks, ditch banks and ditch pads limited to a maximum height of three (3) feet above the adjacent natural ground normally do not require a Permit. The three (3) foot height limitation minimizes the possibility of significant Obstruction to flow in the event flood flows fail to remove the facility. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the proposed facilities on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

CCR Title 23. Article 8. Section 120. Levees

Levees are among the most critical component of structural flood protection works. Levee failures can cause extensive loss of life and property. The principal causes of Levee failure are overtopping, surface erosion, internal erosion (piping) and slides within the embankment or the foundation soils. Any repair work or modifications to a Levee must be properly designed and constructed to ensure the integrity of the Levee. Numerous factors must be considered in Levee design, and the factors vary from project to project. Construction equipment and construction methods must also be considered to ensure stability of the Levee, prevent seepage through the embankment or foundation, and control settlement. Levees must be inspected, maintained and protected if they are to provide the flood protection for which they are built. The primary goals of the Board Standards are to provide Levee protection and to ensure the permanence of the structural integrity of Levees.

(a): The purpose of subdivision (a) is to require that Levees constructed, reconstructed, raised or enlarged within an Adopted Plan of Flood Control must be designed and constructed in accordance with USACE manual "Design and Construction of Levees" (EM 1110-2-1913) and USACE technical letter “Guidance for Levee Underseepage” (ETL 1110-2-569) supplemented with additional Board Standards (with reference to Figure 8.02 for illustrated details, dimensions, and terminology for Levees and Floodways to clarify various terms by showing their meanings). It is necessary to require compliance with USACE guidance because Levees constructed by USACE and regulated by the Board are constructed to USACE requirements. This USACE guidance, supplemented by Board Standards, presents the basic principles used in the design and construction of earth Levees. It is necessary to provide additional Board Standards because additional specific details of Levee design and construction beyond the general USACE guidance is helpful to the Board and to applicants who are planning to construct, reconstruct, raise, or enlarge Levees regulated by the Board.

(a)(1): It is necessary to specify that Levee construction or reconstruction shall be designed, stamped, and signed by a California registered civil engineer to ensure an adequate design and acceptable construction methods. Numerous factors must be considered in Levee design and construction, and these factors vary from project to project. An improperly designed or constructed Levee would pose a serious hazard to public safety.

(a)(2): The purpose of subdivision (a)(2) is to require submittal to the Board of an engineering analysis that evaluates Levee embankment and foundation stability with the Permit application.

(a)(2)(A): It is necessary to require use of the DWSE in performing the engineering computations, and in Urban Criteria Areas use of the water surface at the Hydraulic Top of Levee because these water surface elevations provide the appropriate loadings for designing the Levee. Outside of Urban Criteria Areas, the DWSE presents the extreme loading for which the Levee should be designed. Within Urban Criteria Areas a higher standard is applied for providing protection against the flood with a 1-in-200 annual chance of exceedance.

(a)(2)(B): It is necessary to require the analysis to verify that the Levee slopes are adequately designed and constructed to remain stable during loading conditions required in EM 1110-2-1913. It is necessary to require in Urban Criteria Areas that the Levee design meet the additional Board Standards applicable to such areas that are contained within the Department’s Urban Levee Design Criteria, developed pursuant to Government Code section 65007(l) and California Water Code section 9602(i). Pursuant to Government Code sections 65865.5, 65962, and 66474.5, failure to design Levees that protect Urban Criteria Areas to meet the Urban Levee Design Criteria (or equivalent criteria) would impact the ability of cities and counties within such Urban Criteria Areas to approve development and issue permits.

(a)(3): The purpose of subdivision (a)(3) is to specify some key requirements of the engineering analysis – seepage and slope stability, settlement, wind setup and wave runup. It is necessary to specify analysis of seepage and slope stability to ensure that the Levee will be stable for the design loading condition and not transmit Levee or foundation materials through excessive seepage or suffer a slope failure that could result in complete failure of the Levee. It is necessary to specify analysis of settlement because during construction, and after completion, a Levee will settle. An analysis to quantify the expected amount of settlement is necessary to ensure adequate Freeboard. Some areas may require an over-built

Levee by a determined percent of its height to take into account anticipated settlement of the foundation and within the Levee fill itself. It is necessary to specify analysis of wind setup and wave runup because wind will tilt the Stream slightly toward the Levee decreasing the available Freeboard, and waves will run up the waterside Levee slope and over the top of the Levee if inadequate Freeboard is available. The designed Freeboard needs to be adequate to prevent excessive overtopping of the Levee on windy days. Waves going over the top of the Levee can damage the Levee crown and landside Levee slope and cause flooding of areas near the Levee. It is necessary to require in Urban Criteria Areas that the Levee design meet the additional Board Standards applicable to such areas that are contained within the Department's Urban Levee Design Criteria, developed pursuant to Government Code section 65007(l) and California Water Code section 9602(i). Pursuant to Government Code sections 65865.5, 65962, and 66474.5, failure to design Levees that protect Urban Criteria Areas to meet the Urban Levee Design Criteria (or equivalent criteria) would impact the ability of cities and counties within such Urban Criteria Areas to approve development and issue permits.

(a)(4): The purpose of subdivision (a)(4) is to require that a copy of all geotechnical studies and tests used in the process of designing the Levee must be provided to the Board when applying for a Permit. It is necessary to require this information at the time of the application submittal to enable the Board to review all geotechnical information relevant to the Levee and its construction. The Board reviews the geotechnical information used in the design of a Levee to determine if the geotechnical investigation was adequate to ensure the structural integrity of the Levee.

(a)(5): The purpose of subdivision (a)(5) is to require the applicant to provide the Board with a permanent easement granting all flood control rights upon, over and across the property to be occupied by the proposed flood control works and the adjacent areas consistent with the Levee Right of Way, except where an alternative mechanism is provided satisfactory to the Board or if the flood control works will not be part of the State Plan of Flood Control. It is necessary to require the permanent easement to ensure the Local Maintaining Agency can properly operate and maintain the Levee, with limited exceptions discussed below. The Board is responsible for acquiring property rights, including acquisition of lands and easements necessary for flood protection. The Board may condition the issuance of a Permit on the granting of an interest in real property by an applicant. This type of requirement is particularly justified when an applicant proposes a major modification of a Levee system, including the realignment of the Levee. In almost all cases, the flood control Levees were constructed pursuant to specific rights in real property that were obtained by the Board or another public agency. When the Levee is relocated, the Levee may no longer be exactly where it was originally located and, therefore, the earlier acquired real property rights may not cover the relocated Levee. It is generally imperative for the Board to possess the rights to operate and maintain project features, to inspect such features, and to flood fight and to repair, replace or enlarge such features, if warranted. To date, the Board has been successful in negotiating such grants of flood control easements. When a Permittee grants such rights to the Board, other rights of the Board may become superfluous where the works or a portion of the Adopted Plan of Flood Control have been relocated. In such cases, the Board may grant (quit claim) such rights to the underlying landowner. Sometimes alternative mechanisms, such as joint use agreements with a Local Maintaining Agency, provide sufficient rights such that a permanent easement need not be conveyed to the Board. For Levees outside of the State Plan of Flood Control, the

Board may choose to limit its potential liability and not require a permanent easement if it is satisfied that the Local Maintaining Agency has sufficient property rights for operation and maintenance.

(a)(6): The purpose of subdivision (a)(6) is to require that all drains, abandoned conduits, and other penetrations be removed from the proposed Levee construction site prior to or during construction to avoid the unintentional or accidental burial of the pipes beneath the Levee. It is necessary to avoid unintentional or accidental burial of pipes beneath the Levee because a buried pipe can provide a ready exit for seepage beneath a Levee embankment. In addition, loss of fill or foundation material into abandoned pipes can occur, causing "soft spots" having inadequate strength within the Levee to withstand loads of overlying fill or loads applied by vehicular traffic.

(a)(7): The purpose of subdivision (a)(7) is to require that prior to construction of the Levee, Seepage Berm, or Stability Berm, all voids from pipe removal, holes, burrows, depressions and ditches in the foundation area must be backfilled with compacted Embankment Material unless the geotechnical analysis indicates a more permeable material should be used. This subdivision also requires field density testing by an Approved Soils Testing Laboratory to confirm the minimum relative compaction of backfill within or adjacent to a Levee or Seepage Berm or Stability Berm. It is necessary to require backfilling and compacting of voids, holes, burrow, depressions, and ditches with Embankment Material because when voids, holes, burrows, depressions or ditches are allowed to remain within Levee foundation soils, more Levee settlement could occur than can be tolerated, seepage paths could be formed within the foundation, and/or Levee slope failure could result. To provide adequate strength within the foundation, and to prevent the formation of seepage paths, all voids, holes, burrows, depressions and ditches in the foundation area must be backfilled with soils similar to the Levee, Seepage Berm, or Stability Berm and compacted to a density equal to the Levee, Seepage Berm, or Stability Berm. An exception to use more permeable material can be appropriate when justified by a geotechnical analysis to provide better drainage of Levee seepage and/or underseepage. It is necessary to require use of an Approved Soils Testing Laboratory so that the laboratory meets stringent testing standards that produce reliable results.

(a)(8): The purpose of subdivision (a)(8) is to require that prior to construction or enlargement of either the Levee or Seepage Berm or Stability Berm, all surface vegetation and their roots shall be removed from the area to receive fill. The depth of stripping is determined by local conditions and normally varies from six (6) to twelve (12) inches. Organic soil and roots one and one half (1-1/2) inches in diameter or larger, shall be removed to a depth of at least three (3) feet from the area to receive fill. It is necessary to remove all surface vegetation and organic top soil to an appropriate depth dictated by local conditions but generally between six (6) and (12 inches), and roots one and one-half (1-1/2) inches in diameter, or larger, to a depth of at least three (3) feet from the foundation prior to construction of the embankment. Such unsuitable material will eventually decay and must be removed from the construction site so that the Levee is placed on competent mineral soils and voids, "soft spots," and seepage paths along decayed roots under the Levee are avoided.

(a)(9): The purpose of subdivision (a)(9) is to require an inspection trench to be excavated, typically to a minimum depth of six (6) feet beneath Levees being constructed or reconstructed to a height of six (6) feet or greater. But the engineer inspecting the work may allow a lesser depth if material is exceptionally competent. If necessary to ensure a satisfactory foundation with competent material, the

depth of the inspection trench may be required to exceed six (6) feet. It is necessary to require an inspection trench to locate and remove weak and pervious materials, abandoned pipes, tile drains, water and sewer lines, and to expose tree root channels, animal burrows and other irregularities that would prevent adequate compaction or adversely affect the impermeability of the Levee foundation. In exceptionally competent material where there is no evidence of such defects, it is appropriate to allow the engineer to reduce the depth of the trench. Alternatively, in some locations the depth may need to exceed six (6) feet in order to reach competent foundation material.

(a)(9)(A): It is necessary to provide an exception for Levees less than six (6) feet high that allows the minimum depth of the inspection trench to be equal to the height of the Levee. The hydrostatic pressures developed within the foundation of such Levees by relatively low water stages are not excessive and the probability of developing sand boils or piping is lower than for Levees exceeding six (6) feet in height.

(a)(9)(B): It is necessary to specify that the inspection trench must have minimum bottom width of twelve (12) feet, and the side slopes must be no steeper than 0.25h:1v (which can also be said one (1) horizontal to four (4) vertical), or flatter for worker's safety. The base of the inspection trench must have a width sufficient to allow backfill compaction with regular compaction equipment, twelve (12) feet or more. Side slopes of 0.25h:1v, or flatter, provide for stability of the inspection trench and also ensure the bonding of the compacted fill material with the side slopes of the trench to prevent seepage from occurring at the interface of the trench and the backfill material.

(a)(9)(C): It is necessary to specify the location of the centerline of the inspection trench as being approximately under the outer edge of the shoulder of the waterside Levee crown, unless justified with a geotechnical analysis, subject to Board approval, to be located under the waterside Levee slope. Generally, the best location for the inspection trench is centered under the waterside Levee shoulder to minimize Levee underseepage and the height of the phreatic surface through the landside Levee slope. A lower phreatic surface increases the stability of the landside Levee slope, reducing the change of a slope failure. But in some locations a geotechnical analysis may be used to justify movement of the trench closer to the waterside Levee slope.

(a)(10): The purpose of subdivision (a)(10) is to specify that when subsurface explorations indicate a shallow pervious substratum underlying the Levee to be constructed or reconstructed, where practical the inspection trench shall be deepened to penetrate at least two (2) feet into an underlying low permeability stratum. If this is not practical, other seepage control measures such as Seepage Berms, pervious toe trenches, relief wells, and/or cutoff walls shall be constructed as needed to meet Levee underseepage criteria. It is necessary to use the inspection trench to cut off shallow pervious soils when practical, by deepening the cutoff trench solidly into an impervious stratum. Excessive seepage problems are most acute when a pervious substratum underlies a Levee, especially if it is shallow. Uncontrolled seepage beneath a Levee can result in sand boils and piping, which can lead to Levee failure. A cutoff trench excavated to an impervious stratum, and adequately backfilled with impervious material, is an effective means of eliminating shallow underseepage problems. It is necessary to require that where this is not practical, other seepage control methods such as Seepage Berms, pervious toe

trenches, relief wells, and/or cutoff walls must be constructed because Levee underseepage criteria must be met.

(a)(11): The purpose of subdivision (a)(11) is to specify that fill material for construction of new Levees and reconstruction, enlargement, and modification of existing Levees shall consist of Embankment Material, with exceptions, provided that exceptions shall not impair the usefulness or serviceability of the Levee. It is necessary to specify use of Embankment Material because it possess the proper engineering properties required for a high strength, low permeability Levee that will be stable and control through through-seepage.

(a)(11)(A): It is necessary to specify that an exception may be allowed by substituting special construction details where Embankment Material is not readily attainable because in some locations it is not feasible to economically obtain sufficient quantities of Embankment Material. Special construction details, such as zoning of Levee fill, may provide an economical and appropriate solution.

(a)(11)(B): It is necessary to specify that an exception may be allowed where design of a new Levee structure utilizes zones of various materials or soil types because a zoned design can result in a strong Levee that is not entirely constructed from embankment Material.

(a)(11)(C): It is necessary to specify that an exception may be allowed where a Levee has been excavated, the Levee backfill is localized, typically involving less than ten thousand (10,000) cubic yards of fill, and adjacent undisturbed Levee material does not meet Embankment Material specifications because localized reuse of excavated Levee material would not reduce the integrity of the Levee. In such situations, it would not improve the Levee integrity to have a localized reach of Levee backfilled with Embankment Material when adjacent reaches of the Levee have been constructed of material that does not meet Embankment Material specifications. It is necessary to specify that such exceptions apply for localized backfill typically involving less than ten thousand (10,000) cubic yards of fill so that large Levee construction projects, where use of Embankment Material would result in a significant reach of improved Levee, may not use this exception. In this rule, “localized” should be understood to be a very limited reach of Levee, such as might be associated with repair of a slope failure, consistent with the general limitation of ten thousand (10,000) cubic yards of fill.

(a)(11)(D): It is necessary to specify that an exception may be allowed where the fill or backfill is placed outside of the Levee Section of a wide Levee because use of Embankment Material is unnecessary outside of the Levee Section of wide Levees. Fill that does not meet the specifications of Embankment Material may be suitable in these areas and still improve the performance of the Levee.

(a)(12): The purpose of subdivision (a)(12) is to require Board approval for use of Levee fill that does not meet Embankment Material specifications, prior to placement and to require that when placed as Levee embankment backfill or as additional Levee fill, it shall be generally consistent with engineering properties of adjacent undisturbed Levee material. It is necessary to provide the Board with authority to approve or disapprove use of Levee fill that does not meet Embankment Material specifications so as not to allow construction of a Levee with poor performance with respect to slope stability, seepage control, or settlement. It is necessary to require that Levee fill that does not meet Embankment Material specifications is at least as good as the Levee fill in adjacent reaches of the Levee, otherwise the new or

reconstructed reach of Levee will perform worse than adjacent Levee reaches and become the weak point in the Levee system.

(a)(13): The purpose of subdivision (a)(13) is to specify that fill material for Levee embankment construction will be placed in loose lift thicknesses of no more than six (6) inches except for major Levee projects utilizing very large equipment, in which case the loose lift thickness may be increased to eight (8) inches if approved by the Board prior to construction. This subdivision also specifies that the fill shall be compacted to either a minimum ninety seven (97) percent Standard Proctor dry density according to ASTM D698 or minimum ninety two (92) percent Modified Proctor dry density according to ASTM D1557, or equivalent. Moisture control limits are to be within minus one (-1) percent to plus three (+3) percent of optimum and zero (0) percent to plus four (+4) percent of optimum for ASTM D698 and ASTM D1557, respectively, or equivalent. It is necessary to specify lift thickness, compactive effort, and moisture limits so as to ensure that the compacted Levee fill will be adequately dense and strong to prevent excessive Levee through-seepage, slope instability, and excessive settlement. The placement and compaction of fill material in thin layers, using appropriate compaction equipment, provides a homogeneous, well-compacted Levee with good bonding between the foundation and fill, and eliminates any potential plane of weakness within the Levee Section. Loose layers that are placed too thick cannot be effectively or efficiently compacted to the required density and may not properly bond with each other. The allowable moisture content range of the fill material is a key factor. At the time of compaction, the moisture content of the fill material should be such that the specified relative compaction will be obtained and the Levee will be in a firm and stable condition. The required compactive efforts and moisture limits per ASTM D698 and ASTM D1557 are conventional requirements for construction of Levees and dams and the differences between the two ASTM standards have been adjusted so as to produce equivalent results for whichever ASTM standard is used.

(a)(14): The purpose of subdivision (a)(14) is to specify that fill material for Seepage Berm and Stability Berm construction will be placed in loose lift thicknesses of no more than six (6) inches except for major Levee projects utilizing very large equipment, the loose lift thickness may be increased to eight (8) inches if approved by the Board prior to construction. This subdivision also specifies that the fill shall be compacted to either a minimum ninety (90) percent Standard Proctor dry density according to ASTM D698 or minimum eighty-eight (88) percent Modified Proctor dry density according to ASTM D1557, or equivalent. Moisture control limits are to be within minus one (-1) percent to plus three (+3) percent of optimum and zero (0) percent to plus four (+4) percent of optimum for ASTM D698 and ASTM D1557, respectively, or equivalent. It is necessary to specify lift thickness, compactive effort, and moisture limits so as to ensure that the compacted Levee fill will be adequately dense and strong to prevent slope instability. The compactive effort is relaxed from the compactive effort for Levee fill because these structures are outside of the Levee and do not need to be as impervious or strong as the Levee itself. The placement and compaction of fill material in thin layers, using appropriate compaction equipment, provides a homogeneous, well-compacted structure with good bonding between the foundation and fill, and eliminates any potential plane of weakness within the structure. Loose layers that are placed too thick cannot be effectively or efficiently compacted to the required density and may not properly bond with each other. The allowable moisture content range of the fill material is a key factor. At the time of compaction, the moisture content of the fill material should be such that the specified relative

compaction will be obtained and the structure will be in a firm and stable condition. The required compactive efforts and moisture limits per ASTM D698 and ASTM D1557 are conventional requirements for construction of Levees and dams and the differences between the two ASTM standards have been adjusted so as to produce equivalent results for whichever ASTM standard is used.

(a)(15): The purpose of subdivision (a)(15) is to specify that fill material placed outside of the Projected Levee Section shall be compacted to a minimum ninety (90) percent Standard Proctor dry density according to ASTM D698 or a minimum eighty eight (88) percent Modified Proctor dry density according to ASTM D1557, or equivalent, unless otherwise directed. Moisture control limits are to be within minus one (-1) percent to plus three (+3) percent of optimum and zero (0) percent to plus four (+4) percent of optimum for ASTM D698 and ASTM D1557, respectively, or equivalent. It is necessary to specify compactive effort and moisture limits so as to ensure that the compacted fill will be adequately dense and strong to prevent slope instability of the adjacent Levee and resist erosion. The compactive effort is relaxed from the compactive effort for Levee fill because this fill is outside of the Levee and does not need to be as impervious or strong as the Levee itself. The allowable moisture content range of the fill material is a key factor. At the time of compaction, the moisture content of the fill material should be such that the specified relative compaction will be obtained and the structure will be in a firm and stable condition. The required compactive efforts and moisture limits per ASTM D698 and ASTM D1557 are conventional requirements for earthwork and the differences between the two ASTM standards have been adjusted so as to produce equivalent results for whichever ASTM standard is used, except that eighty eight (88) percent relative compaction per ASTM D1557 is considered to be the low limit for compactive effort of earthwork associated with Levees.

(a)(16): The purpose of subdivision (a)(16) is to specify that fill materials placed outside the Levee or Seepage Berm or Stability Berm can consist of either Embankment Materials or native excavated soils. It is necessary to clarify that Embankment Materials may be used if desired, but are not necessary when fill is being placed outside of a Levee, Seepage Berm, or Stability Berm. The strength and impermeability of Embankment Material is not needed.

(a)(17): The purpose of subdivision (a)(17) is to specify that where zoning of the Levee and/or Seepage Berm or Stability Berm is consistent with the use of pervious material, it shall be placed in maximum six (6) inch thick layers in a manner that will prevent segregation. Compaction shall be performed to a minimum of seventy (70) percent relative density according to ASTM D2049, or equivalent. The moisture content shall be controlled to achieve the required minimum relative density. It is necessary to specify that where zoning of the Levee and/or Seepage Berm or Stability Berm is consistent with the use of pervious material, it shall be placed in maximum six (6) inch thick layers in a manner that will prevent segregation because pervious fill in zoned Levee embankments and Seepage Berms and Stability Berms must be properly compacted to provide for adequate stability. It is necessary to specify that compaction shall be performed to a minimum of seventy (70) percent relative density according to ASTM D2049, or equivalent and the moisture content shall be controlled to achieve the required minimum relative density because compaction of pervious material is measured differently than impervious material and the proper test method measures relative density. The industry standard test is ASTM D2049 and

seventy (70) percent relative density is adequate for avoiding liquefaction of pervious soils during strong ground shaking. Moisture control is important for achieving the target relative density.

(a)(18): The purpose of subdivision (a)(18) is to specify that fill material placed within four (4) feet of a structure or pipeline shall meet all requirements for Embankment Material, but with a maximum plasticity index of thirty five (35), and shall be compacted in horizontal lifts with a loose lift thickness no greater than four (4) inches using appropriate hand operated compaction equipment. Structures that would be easily damaged by soil expansion shall have this plasticity index limited to a maximum of fifteen (15). Horizontal lifts are not required alongside pipelines on Levee slopes. It is necessary to provide special rules for fill, its placement and compaction near structures and pipelines in Levees. The compaction of fill material adjacent to a structure within the Levee requires close supervision and inspection. Levee failures have initiated at the soil-structure interface because of the susceptibility to piping (transport of soil by seepage forces) in this area. Using large mobile compaction equipment adjacent to a structure within a Levee can result in extensive damage to the structure. Because of the overriding importance in obtaining adequate compaction of fill material along the structure, hand operated compaction equipment will be used. Hand operated equipment requires loose lifts of four (4) inches or less to achieve adequate compaction. It is necessary to limit the plasticity index of the fill material near structures because soil with a high plasticity index will swell when saturated and damage the structure. For easily damaged structures, the plasticity index needs to be especially low.

(a)(19): The purpose of subdivision (a)(19) is to require that fill material must only be placed within the area indicated on the submitted plans. It is necessary to fill placement as indicated on the plans because the Board carefully reviews submitted plan drawings and specifications, and approves applications in accordance with the submittal. Therefore, all work must conform with the plan drawings as submitted.

(a)(20): The purpose of subdivision (a)(20) is to require that fill placement on the existing Levee slope shall be keyed and benched into the Levee slope. The benches shall extend into the firm soil and shall have minimum width as required by the equipment, and maximum depth of two (2) feet, and shall extend the full length of the slope. Each fill layer shall be less than six (6) inches thick. These requirements do not apply for repairs of surficial damage. It is necessary to require fill on Levee slopes during repair and reconstruction of a Levee to be keyed into the existing Levee Section to ensure maximum shear strength in the Levee slope, and decrease the permeability along the interface between the existing Levee slope and the fill material, proper keying and compaction procedures must be used. It is necessary to require the fill to be placed within benches in the Levee slope, consistent with the width of the compaction equipment, so that the fill is compacted in horizontal layers. The layers need to be less than six (6) inches thick to ensure adequate compaction. The benches need to be limited to a maximum of two (2) feet to produce a well bonded Levee slope. It is not necessary to apply these requirements to repairs of damage limited to the surface of the Levee slope.

(a)(21): The purpose of subdivision (a)(21) is to specify that field density testing by an Approved Soils Testing Laboratory will be required to confirm the minimum relative compaction of Levee embankment fill and trench backfill. Levee embankment fill material index properties, strength tests, and/or permeability tests may be required to verify material suitability. It is necessary to require confirmation of relative compaction of Levee fill by an Approved Soils Testing Laboratory because two principal

causes of Levee failure are internal erosion, or piping, and slides within the Levee embankment or the Levee foundation. The severity of Levee through-seepage increases considerably through improperly compacted Levee fill. Poorly compacted trench backfill can result in erosion of the trench backfill and Levee slope instability. To prevent such occurrences, qualified laboratory tests are necessary for verification of adequate compaction. It is necessary to require use of an Approved Soils Testing Laboratory so that the laboratory meets stringent testing standards that produce reliable results.

(a)(22): The purpose of subdivision (a)(22) is to require that existing ditches, power poles, standpipes, distribution boxes, and other above-ground structures located within the Levee Right of Way shall be relocated outside of the Levee Right of Way. The required distance for relocation of ditches shall be determined based on underseepage analyses by a California registered civil engineer in accordance with section 120(a) of this division. It is necessary to require that ditches, power poles, standpipes, distribution boxes and other above ground structures located within the Levee Right of Way be relocated outside of the Levee Right of Way to provide for the unobstructed inspection and maintenance of the Levee and Levee foundation, and to provide for the unobstructed access of emergency flood fight equipment. Such installations may be allowed where they will not interfere with Levee maintenance or flood fight activities. The Board will generally accept endorsements of the local maintaining agency as sufficient evidence that a proposed installation will not interfere with maintenance. The Board will also consider the extent of its property rights in making exceptions, such as where the Levee Right of Way is exceptionally wide. It is necessary to require that ditch relocations be evaluated by a California registered civil engineer in accordance with section 120(a) of this division to ensure that the relocated ditch does not create a Levee underseepage problem or aggravate an existing Levee underseepage problem. Ditches on the landside of the Levee have significant potential to trigger or aggravate Levee underseepage and allow boils and piping of materials in the ditch, which can lead to Levee failure. Ditches on the waterside of the Levee can shorten the seepage path beneath the Levee, triggering or aggravating boils and piping on the landside of the Levee. Ditches close to the Levee can also reduce Levee slope stability. Such analyses are civil engineering and appropriate only for civil engineers to perform.

(a)(23): The purpose of subdivision (a)(23) is to require pipelines (but not pipeline crossings) located alongside (typically parallel to) the Levee and within the Levee Right of Way to be relocated outside of the Levee Right of Way. It is necessary to require that pipelines located alongside a Levee be relocated outside of the Levee Right of Way because a buried pipeline near the Levee Toe could jeopardize the stability of the Levee in the event of a break in the pipeline and interfere with operation, maintenance, and flood fighting. It is not feasible to require this for pipelines that cross over, through, or under the Levee.

(a)(24): The purpose of subdivision (a)(24) is to specify that construction work of any type may not be done on Levees or within the Floodway during the Flood Season unless authorized by the Executive Officer or Chief Engineer pursuant to section 112 of this division. It is necessary to require approval from the Executive Officer or Chief Engineer for such construction in the Flood Season because during construction work on a Levee, the integrity of the Levee may be impaired until completion of the construction. During the Flood Season, unfinished Levee work could jeopardize public safety in the event

of sudden high water. Construction within the Floodway during the Flood Season could cause the obstruction of flood flows and increase flood levels. Work may be authorized if weather and stream forecasts are favorable and the work can be finished in a relatively short period of time.

(a)(25): The purpose of subdivision (a)(25) is to require areas adjacent to the Levee to be graded to drain away from the Levee within the Levee Right of Way or for a minimum distance of fifteen (15) feet waterward of the waterside Levee Toe and twenty (20) feet landward of the landside Levee Toe, whichever is less. It is necessary to require that the areas adjacent to the Levee must drain away from the Levee Toe to help prevent the saturation of the Levee foundation, which could destabilize the Levee.

(a)(26): The purpose of subdivision (a)(26) is to require the finished slope of any Levee construction or reconstruction to be 3h:1v, or flatter, on both waterside and landside slopes. Existing Levees with landside slopes of 2h:1v or flatter may be used in Levee reconstruction projects if landside slope performance has been good and through seepage breakout is not a concern, or the reconstruction includes a cutoff wall and meets minimum USACE design criteria for slope stability. It is necessary to require that the finished slope of any Levee construction or reconstruction must be 3h:1v (three (3) horizontal to one (1) vertical), or flatter, on the waterside and landside Levee slopes because USACE guidance from 2008 requires this for new and reconstructed Levees and these standard slopes for Levees have proven to be reliably stable and satisfactory. These slopes provide for an adequate factor of safety for slope stability and ease of maintenance. Per USACE guidance, existing Levees with landside slopes as steep as 2h:1v may continue to be used where justified by good performance with respect to slope stability and Levee through-seepage. Exceptions may also be allowed if the Levee reconstruction includes a seepage cutoff wall, which would address concerns regarding slope stability and seepage, and USACE criteria for slope stability are met. These exceptions are consistent with USACE guidance would still provide a stable Levee.

(a)(27): The purpose of subdivision (a)(27) is to require the finished slopes of any bypass Levee to be 4h:1v or flatter on the waterside and 3h:1v or flatter on the landside except as may be approved by the Board when repairing or reconstructing an existing bypass Levee that has been authorized with steeper slopes and the Levee has performed well and meets minimum stability and seepage criteria. Narrow bypasses often have Levees with steeper waterside slopes due to the reduced fetch and the lack of large waves. It is necessary to require that the finished slope of any bypass Levee must be 4h:1v, or flatter, on the waterside, and 3h:1v, or flatter, on the landside of the Levee because of the large width of bypass channels that may fill during the Flood Season. Bypass Levees are highly susceptible to damage by wave action generated by strong winds across the great expanse of open water within the bypass. Requirements for slope protection and maintenance are reduced when the flatter Levee slopes are utilized. Bypass Levees are also constructed flatter than other project Levees to increase stability, and also provide a greater design factor of safety because of the excessive flood damage that would occur in the event of a bypass Levee failure. It is necessary to provide an exception for some bypass Levees that were constructed with steeper slopes and/or because the bypass is narrow and not susceptible to large wind generated waves. Most, but not all, bypasses are wide.

(a)(28): The purpose of subdivision (a)(28) is to require that an existing Levee Section being reconstructed, realigned, or otherwise altered and having Encroachments that are located within the

Levee that are to be replaced in-kind or modified, must have detailed plans of the changes submitted to the Board for approval prior to the start of construction. It is necessary to require Board approval for Encroachment replacements or modifications in a Levee Section to ensure the Encroachment meets current standards. Detailed plans of all proposed work that is intrusive to a Levee must be carefully reviewed to ensure the continued integrity of the Levee.

(a)(29): The purpose of subdivision (a)(29) is to require the modification, as necessary, of existing pipelines within a Levee Section that is being raised to accommodate a higher DWSE. It is necessary to enable the Board to require pipelines through the top of the Levee to be raised along with the Levee itself in order to prevent seepage along the pipeline and to prevent backflow through the pipeline during the design event.

(a)(30): The purpose of subdivision (a)(30) is to require a set of “as constructed” drawings, stamped and signed by a California registered civil engineer within 120 days after completion of any Levee project. It is necessary to require “as constructed” drawings to be submitted to the Board within a reasonable time after completion of the project. "As constructed" drawings, stamped and signed by a California registered civil engineer, are standard requirements of the engineering and construction professions. They graphically show that the project was constructed per the approved plans and they also capture any revisions to plans that may have been approved by the Board.

(a)(31): The purpose subdivision (a)(31) is to specify that stone Revetment may be required on Levee slopes where turbulence, flow or wave action may cause erosion. It is necessary to require stone Revetment on Levee slopes where erosion is a problem, so as to ensure the stability and integrity of the Levee.

(a)(32): The purpose of subdivision (a)(32) is to specify that grasses or other approved ground covers shall be required on new and reconstructed Levee slopes that do not have Revetment. It is necessary to require grasses or other approved ground covers to prevent erosion of the Levee slope where there is no Revetment. Levee slope erosion can result from rainfall runoff, high velocity Stream flow, and wave action. The placement of approved grasses or other ground covers will prevent such erosion.

(a)(33): The purpose of subdivision (a)(33) is to specify that the minimum crown width of a Levee is normally twenty (20) feet, and twelve (12) feet for Minor Tributary Levees. The crown width for a Levee on a specific stream is defined by the project document and/or operations manual in current use. It is necessary to specify the minimum width of the Levee crown to meet USACE guidance and provide for safety of personnel conducting Levee operation, maintenance, patrolling, and flood fighting. The width of the Levee crown on a Minor Tributary Levee depends primarily on roadway requirements for safe vehicular travel. Patrol roads are necessary on the crown of Levees for the general purpose of inspection, maintenance, and flood fight operations. A twelve (12) foot crown width is the minimum feasible for Minor Tributary Levees for safe operation, maintenance, and flood fighting (including night patrolling in heavy rain, wind, or fog). The minimum crown width of twenty (20) feet for Levees on most streams is required because such Levees are subject to water loading at or near flood stage for prolonged periods which may cause total saturation of the embankment and lead to slope instability. A wide crown is helpful in providing slope stability during sustained high water. A crown width of twenty

(20) feet also provides the capability for two-way vehicular travel, which is helpful during repairs, maintenance, patrolling, and emergency flood fight conditions.

(a)(34): The purpose of subdivision (a)(34) is to require that a Levee having a crown width of fifteen (15) feet or less must have vehicular turnouts at approximately two thousand-five hundred (2,500) foot intervals if there is no existing Access Ramp within that distance. It is necessary for the safety of personnel performing operation, maintenance, patrolling, and flood fighting to be able to turn their vehicles around so that they do not have to back up their vehicles for long distances on a narrow Levee crown. Turnouts at regular intervals are necessary to provide this turnaround capability. Under adverse conditions it is unsafe to back a vehicle long distances. The turnouts also provide for the passage of vehicles and equipment necessary for inspection, maintenance and flood fighting operations.

(a)(35): The purpose of subdivision (a)(35) is to specify that as used in this sub-section, the term "approved risk-based analysis" means an analysis which uses simulation modeling of river discharge versus probability of occurrence, river stage versus river discharge estimates, and river stage versus flood damage estimates and accounts for uncertainty in these functions to determine the performance of a proposed flood control feature.

(a)(35)(A): It is necessary to require all Levees to be constructed or reconstructed to have a minimum of three (3) feet of Freeboard above the DWSE, or a Crest Elevation no lower than designed using an approved risk-based analysis to provide an appropriate factor of safety for containing Stream flows on the waterside of the Levee. The elevation of a Levee crown is determined by flood profile computations plus allowances for Levee embankment and Levee foundation settlement, wind waves, and an acceptable margin-of-safety factor. The Freeboard requirement and risk-based design include this safety factor.

(a)(35)(B): It is necessary to require that Bypass Levees to be constructed or reconstructed shall have additional Freeboard as needed for large waves. It is necessary to require that the Freeboard of reconstructed bypass Levees shall not be reduced from the previously authorized design, creating a low reach of Levee that compromises public safety and the previous investment in the Levee. Freeboard required for bypass Levees varies from three (3) feet to six (6) feet depending on fetch and authorized design, with wide bypasses requiring between four (4) and six (6) feet of Freeboard due to their large fetch, which can result in large wind waves. Freeboard for bypass Levees may be designed using an approved risk-based analysis

(a)(35)(C): It is necessary to require, unless designed using an approved risk-based analysis, the design Freeboard of a Levee to be constructed or reconstructed shall be appropriately increased to address the several specific conditions that could cause overtopping of the Levee, resulting in Levee failure. These conditions are:

(a)(35)(C)(i): High velocity Stream flow, because the reliability of the DWSE can be relatively low when the design is based on high velocity stream flow.

(a)(35)(C)(ii): Excessive wave action, because bodies of water with a wide expanse (i.e., large fetch) and subject to high winds can produce increased stages due to wind-wave setup and wave runup on the Levee slope.

(a)(35)(C)(iii): Excessive hydrologic, hydraulic, or geotechnical uncertainty in the Levee design parameters, because the reliability of the DWSE can be relatively low when there is excessive uncertainty in the design parameters.

(a)(35)(C)(iv): Settlement, because settlement directly reduces available Freeboard.

(a)(35)(C)(v): Superelevation of the water surface on the outside of a Stream's meander bend, because superelevation of the water surface resulting from the force on the water turning through a bend directly reduces available Freeboard.

(a)(35)(C)(vi): Sea level rise, because sea level rise that reaches the Levee directly reduces available Freeboard.

(a)(35)(C)(vii): Increased peak Stream flow for the Design Flood resulting from climate change, because this may increase the peak flood stage and directly reduce available Freeboard without any change in the return period of the flood event.

If a risk-based analysis is used to design the Levee crest elevation, the above conditions, and the uncertainty associated with each of them, are directly considered in the risk-based analysis.

(a)(35)(D): It is necessary to require that, unless designed using an approved risk-based analysis, Levees within one hundred (100) feet of a bridge, or other potential constriction to flow, must have one (1) foot of additional Freeboard. It is necessary to require additional Freeboard to address the transition of flood flows through bridge piers or bents, which usually cause increased water stages. Increased water stages also occur at these sites because of debris accumulation. When flood flows encroach into the Levee Freeboard, the potential for Levee failure increases considerably. To minimize the increased potential risk, the Levee Freeboard is increased one (1) foot at bridge sites and also at all other structures that may constrict flood flows. A risk-based analysis would directly consider the hydraulic uncertainty associated with bridges and other structures that may constrict flows.

(b): The purpose of subdivision (b) is to specify that pavement is not allowed on Levee slopes with the exception of Access Ramps and bicycle trails. Pavement subject to travel by Levee maintenance vehicles must be designed to withstand a load of sixty-eight thousand (68,000) pounds from two consecutive sets of tandem axles. Soil tests may be required to determine that the design of the pavement can accommodate the design load. It is necessary to preclude pavement on the Levee slope because of its potential to obscure observation of Levee defects. It is necessary to require that pavement approved for placement of the Levee be adequately strong to support Levee maintenance vehicles, which can include heavy equipment and fully loaded dump trucks. Design of the pavement may require soil tests to determine the support provided by the underlying soil.

(c): The purpose of subdivision (c) is to specify that pavement for roadways and similar uses may be allowed within the Levee Right of Way. It is necessary to clarify that such pavement may be allowable even when it is placed in the Levee Right of Way because it would neither prevent nor obstruct inspections, maintenance or flood fight procedures.

(d): The purpose of subdivision (d) is to require that pavement within the Levee Right of Way must have drainage features. It is necessary to require drainage features because during periods of high stream

flows, Levees are susceptible to seepage which can cause boils and piping, and impervious pavement can also create excessive hydrostatic pressure build-up. The pressure can cause uplift sufficient to damage the pavement adjacent to the Levee Toe. Drainage features are required to vent the hydrostatic pressure and to control seepage.

(e): The purpose of subdivision (e) is to establish requirements for Levee seepage control facilities such as Seepage Berms, relief wells, toe drains, and toe ditches.

(e)(1): It is necessary to require Levee seepage control facilities to be designed, stamped, and signed by a California registered civil engineer to ensure that the Levee seepage control facilities will prevent excessive saturation of the Levee, piping of Levee material, and ponding at the landside Levee Toe during high stream flows.

(e)(2): It is necessary to require that all studies and calculations relating to the design and maintenance of a Levee seepage control facility must be submitted to the Board with the Permit application because this will enable the Board to verify that the Levee seepage control facilities will meet USACE and Board Standards to prevent excessive saturation of the Levee, piping of Levee material, and ponding at the landside Levee Toe during high Stream flows.

(e)(3): It is necessary to require easements for Levee seepage control facilities consistent with the Levee Right of Way because such facilities are features of the flood control project and, consequently, require appropriate easements.

(f): The purpose of subdivision (f) is to establish that the Board may require installation of piezometers within the Levee and the Levee Right of Way in association with construction of a new Levee or reconstruction of a Levee, with requirements for monitoring and reporting piezometric readings. This subdivision also establishes that piezometer design and installation shall be approved by the Board prior to installation and Board approval is required before abandoning a piezometer. It is necessary to establish that the Board may require installation of piezometers within the Levee and the Levee Right of Way in association with a new Levee or reconstruction of a Levee, and require monitoring and reporting of piezometric readings, to determine whether the new or reconstructed Levee is performing as designed and enable correction of poor performance before a Levee failure occurs. Piezometer readings indicate pore water pressures and the location of the phreatic surface within the Levee, which are important for evaluating slope stability, through-seepage, and underseepage. It is necessary to require Board approval of piezometer design to ensure that the piezometers are properly located, with properly sealed discrete sensing zones, and designed to provide timely responses to changes in pore water pressures (usually by using a small pipe diameter). It is also necessary to require Board approval for abandoning a piezometer so that it is not prematurely abandoned and so that it is properly abandoned and not creating an undesirable vertical path for seepage.

(g): The purpose of subdivision (g) is to establish that the Hydraulic Impact Evaluation Procedure applies for evaluating the potential hydraulic impacts of Levees to be constructed, raised, enlarged, or modified. It is necessary to require application of the Hydraulic Impact Evaluation Procedure to ensure that the new, raised, enlarged, or modified Levee is located and oriented to have minimal impact on flood flows. In locations where the effect of the proposed work on flood stages is uncertain, the Board needs to be

able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(h): The purpose of subdivision (h) is to establish that if a proposed project which includes Levee improvements would result in substantial Residential Development within an area that without the Levee improvements would be subject to the Federal Emergency Management Agency's regulatory 100-year floodplain constraints, the Board may require the Permittee to mitigate for any increased average annual flood damage by increasing the required level of flood protection provided by the proposed project, up to and including the 200-year flood. It is necessary to enable the Board to require a higher level of flood protection than the minimum Federal Emergency Management Agency's regulatory 100-year level of flood protection for areas that will no longer be constrained by Federal Emergency Management Agency floodplain constraints, such as mandatory purchase of flood insurance and the finished floor of new structures being required to be elevated above the elevation of the 100-year flood. Once these restraints are removed as a result of certification of a Levee as providing protection against the 100-year flood, intense Residential Development can occur in the area – greatly increasing the risk to property and lives despite the somewhat higher level of flood protection. One appropriate way to measure the risk to property is by computing the average annual flood damage, which is the annualized damage to property in the area considering the chance of flooding. If a substantial increase in annual flood damage will result from the project that removes the Federal Emergency Management Agency's regulatory floodplain constraints, it is appropriate for the Board to be able to require a higher level of flood protection for the area to mitigate that increased flood risk. Urbanized Criteria Areas are required to have a 200-year level of flood protection if they are to continue developing (effectively one half the chance of flooding present for the Federal Emergency Management Agency's regulatory 100-year flood protection standard). Therefore it is appropriate to cap the Board's requirement for a higher level of flood protection at the 200-year flood.

(i): The purpose of subdivision (i) is to establish that the Hydraulic Impact Evaluation Procedure is the rule for evaluating Secondary Levees and their potential hydraulic impacts. It is necessary to require the application of the Hydraulic Impact Evaluation Procedure to evaluate first whether a Secondary Levee is blocking more than one (1) percent of the Floodway. In locations where the proposed Secondary Levee is blocking more than one (1) percent of the Floodway the Board needs to be able to require a modeled hydraulic analysis to make a determination about the hydraulic impacts. If the hydraulic analysis shows a significant increase in flood stage or velocity the Board needs the ability to deny a Permit because the Secondary Levee would be injurious to the Adopted Plan of Flood Control.

(j): The purpose of subdivision (j) is to enable the Board to waive or modify the requirements of this section that conflict with other special Levee design requirements for Levees in the Delta outside of an Urban Criteria Area that are to be constructed, reconstructed, raised, enlarged, or modified within an Adopted Plan of Flood Control. It is necessary to enable the Board to waive or modify the requirements of this section for Levees in the Delta outside of an Urban Criteria Area because many Delta Levees are founded on peat and organic soils that warrant unconventional Levee design and special considerations

for settlement, stability, and seepage. In addition, the Department and USACE have developed some standard designs and goals for Delta Levees that may be inconsistent with some requirements of this section, including but not limited to the Hazard Mitigation Plan (HMP) standard for federal recovery assistance from the Federal Emergency Management Agency and the Public Law 84-99 (PL 84-99) standard developed by USACE.

CCR Title 23. Article 8. Section 121. Erosion Control

The purpose of section 121 is establish requirements for erosion control. Erosion control on channel banks, Levees and berms is a continual problem. Levees, berms and channel banks that have been adequately revetted are considered to have greater stability than similar slopes which are not revetted. This increased stability is a factor in ensuring optimum operating conditions within a flood control project. While some types of bank protection have proved to be effective at some locations, they have, due to various conditions, failed or proved to be only partially effective at other locations. The erosion control standards are, therefore, of a general nature, and erosion control methods may need to be modified to meet conditions at the eroding site. Prior to the placement of erosion protection material, regardless of location and nature, an application with detailed plans must be presented to the Board for approval.

(a): The purpose of subdivision (a) is to specify that riprap rock armoring may be used for erosion control along Streams if the material meets the criteria below. Typical sections delineating methods of placement and dimensions of Revetment using rock are shown in Figure 8.03. It is necessary to use proper materials for erosion control because unapproved material used to prevent erosion could be detrimental to the flood control project. Any material that disintegrates in water, is easily weathered, or is insufficient in density or mass, would not remain in place on a Levee slope or in areas of high streamflow velocities. Revetment with appropriate material increases embankment or Levee stability and decreases maintenance requirements.

(a)(1): It is necessary to require that riprap rock armoring and bedding materials shall be designed by a California registered civil engineer for the Stream velocities associated with the Design Flood to ensure an adequate design and acceptable construction methods when considering the largest flood for which the Stream and facilities in the area have been designed. Numerous factors must be considered in design of erosion control measures, and these factors vary from project to project. An improperly designed or constructed erosion control measure will be damaged or washed away during high flows and potentially expose a Levee to erosion.

(a)(2): It is necessary to require that bedding materials shall be placed under the stone protection at locations where the underlying soils require such material for stabilization, considering such factors as gradation of the stone protection, soil properties of the base material, tidal fluctuation, wave action, and Stream flow velocity because tidal fluctuations, high velocities, and wave action can cause the erosion of soil between and beneath the pieces of Revetment. To prevent such erosion, or to stabilize underlying soils, particularly sand and loam, a bedding material is required before Revetment is placed.

(a)(3): It is necessary to specify that riprap shall be composed of properly sized and graded quarry stone or equivalent because excessive streamflow velocities can dislodge cobble or undersized or poorly graded quarry stone Revetment. It is necessary to specify that quarry stone should be durable and with

an angular shape and a specific gravity of two and one-half (2-1/2) or greater and should not be thin or platy because only durable, angular (to provide additional erosion resistance through particle interlocking), and adequately dense quarry stone that is not thin or platy can be relied upon to withstand weathering and high velocity Stream flow without damage.

(a)(4): It is necessary to require that riprap shall be placed on prepared slopes or fill so that the finished slope of the rock Revetment is no steeper than one and one-half (1-1/2) feet horizontal to one (1) foot vertical (1.5h:1v) unless a steeper slope is demonstrated to be stable to the satisfaction of the Board because steeper Revetment is likely to be too close to the revetment's angle of repose to remain stable under all loading conditions. Any slight erosion, or movement of an embankment, could cause the riprap covering a much larger area to progressively unravel and roll down the embankment, destroying a large section of Revetment.

(a)(5): It is necessary to require that quarry stone shall be placed in a manner which avoids segregation because methods commonly used for loading, dumping and placement of quarry stone as Revetment can allow segregation of the quarry stone, preventing proper particle interlocking and concentrating the smaller material in a localized area, leaving it vulnerable to erosive forces. With proper care to avoid segregation, adequate size distribution and particle interlocking can be achieved to provide for stable Revetment with smaller voids throughout the entire revetted area.

(a)(6): It is necessary to require that alternative bank protection materials may be allowed by the Board because methods other than riprap may be appropriate or more environmentally sensitive, if properly designed and constructed. Possible alternatives include but are not limited to: reinforced concrete, block units, biotechnical treatments, and stone-filled gabion baskets. It is necessary to require that a complete design by a California registered civil engineer shall be submitted to the Board for approval to ensure an adequate design and acceptable construction methods. Numerous factors must be considered in design of erosion control measures, and these factors vary from project to project. An improperly designed or constructed erosion control measure will be damaged or washed away during high flows and potentially expose a Levee to erosion.

(a)(7): It is necessary to require that asphalt or other petroleum-based products shall not be used either as fill or as erosion control on a Levee Section or within a Floodway because water and sunlight eventually will leach the petroleum from asphalt or other petroleum based products, causing disintegration of the material and loss of density and mass, resulting in water pollution that threatens drinking water supply and aquatic life.

(a)(8): It is necessary to require that the minimum thickness of Revetment shall be the larger of one and one-half (1-1/2) times D50 (rock diameter for which fifty (50) percent is finer by weight) or one (1) times D100 (rock diameter for which one hundred (100) percent is finer by weight) perpendicular to the bank or Levee slope because high velocity streamflows or wave action can cause extensive Levee or bank erosion where the thickness of Revetment is inadequate.

(a)(9): It is necessary to require that the Revetment shall extend a minimum of two (2) feet vertically above the DWSE, except where demonstrated to the satisfaction of the Board that this height is infeasible or unnecessary based on a hydraulic analysis of the site specific conditions because the DWSE

may have been underestimated for the Design Flow, localized increases of the water surface may occur due to impinged debris, and waves may occur during the Design Flow. All of these possibilities would result in erosive flow overtopping the Revetment and allowing damage to the Levee, but it is appropriate to allow for exceptions to be approved by the Board based on hydraulic analysis at the specific site.

(a)(10): It is necessary to require that if bank erosion is anticipated to occur at the toe of the Revetment, the toe of the Revetment shall be properly keyed to the maximum expected scour depth and that if a toe key cannot be placed, a mounded toe shall be designed in such a manner as to be launchable (EM 1110-2-1601) if erosion occurs because the Revetment will become unstable and fail if undermined at the toe by scour. But it is appropriate to allow an alternative that provides extra launchable Revetment designed to fall into the scour hole and stabilize the remaining Revetment.

(a)(11): It is necessary to require that Revetment shall be uniformly placed and gradually transitioned into the bank, Levee slope, or adjacent Revetment because in areas where Revetment has not been uniformly placed or smoothly transitioned into the existing bank, Levee slope or adjacent Revetment, erosion or damage to the adjacent bank, Levee slope or Revetment can result from wave action or from local eddies.

(b): The purpose of subdivision (b) is to specify that when Revetment is proposed by an applicant but not required by the Board, the standards relating to Revetment bedding, gradation, size, shape, and thickness are recommended but not required. It is necessary to specify that these standards are recommended but not required because the Board may allow an applicant to place Revetment in an area where the Board considers the Revetment to be nonessential. Such Revetment must be uniformly placed and properly transitioned into the bank, Levee slope or adjacent Revetment to prevent erosion or damage to the adjacent bank, Levee slope or Revetment resulting from wave action or local eddies. However, the standards relating to Revetment bedding, gradation, size, shape and thickness are not considered by the Board to be mandatory because failure of the Revetment would have little, if any, adverse consequence for the Adopted Plan of Flood Control.

(c): The purpose of subdivision (c) is to specify that Revetment placed by Local Maintaining Agencies to repair erosion damage to a Stream bank or Levee may be considered Maintenance Activities. It is necessary to specify that Revetment placed by Local Maintaining Agencies may be considered Maintenance Activities because when this work is performed by Local Maintaining Agencies it is performed to prevent erosion of the Stream bank or Levee and is required by the Operation and Maintenance Manual. Work that qualifies under Maintenance Activities may not require a Board Permit.
(d): The purpose of subdivision (d) is to specify that the Revetment shall not cause a significant increase in Stream stage or velocities. The Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact. The Board may deny a Permit if the hydraulic impact is deemed significant. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the Revetment on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be

performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

CCR Title 23. Article 8. Section 122. Irrigation and Drainage Ditches, Detention and Retention Ponds, and Septic Systems

The purpose of section 122 is establish requirements for Irrigation and drainage ditches, detention and retention ponds and septic systems. Irrigation ditches, drainage ditches, tile drains, septic systems and similar facilities that are poorly designed, improperly placed, or defective, have the potential to interfere with Levee maintenance or to saturate an adjacent Levee causing sloughing and eventual Levee failure. The standards described in section 122 ensure that irrigation and drainage ditches, detention and retention ponds, tile drains, and septic systems will have no adverse effect upon the Adopted Plan of Flood Control.

(a): The purpose of subdivision (a) is to specify the criteria that irrigation ditches, drainage ditches, detention and retention ponds, and similar facilities must satisfy. It is necessary to specify these criteria because ditches and ponds that are too close to the Levee for their depth can impact Levee stability and provide a path for Levee underseepage that results in boils and piping, causing loss of Levee foundation soils and possible Levee failure during high water.

(a)(1): It is necessary to specify that all ditches and ponds shall be located outside of the Levee Right of Way because this provides for full use of the Levee Right of Way for operation, maintenance, inspection, patrolling, and flood fighting and avoids any interference with these activities. This also provides some protection against impacts on Levee integrity.

(a)(2): It is necessary to specify that the bottom of any ditch or pond landward of the Levee must be located above a 10h:1v slope projected downward from the landside Levee Toe, Seepage Berm toe, or Stability Berm toe unless a geotechnical analysis demonstrates that the ditch or pond will not adversely impact the integrity of the Levee because, per USACE guidance, a ditch or pond (or any similar excavation such as a pool) is generally considered to be too close to the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of a flood control project feature if it is deep enough to intersect a line drawn at a 10h:1v slope projected downward from the landward extent of the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of a flood control project feature. This requirement for setback reduces the likelihood of creating Levee instability or a path for Levee underseepage that results in boils and piping, causing loss of Levee foundation soils and possible Levee failure during high water.

(a)(3): It is necessary to specify that for any ditch or pond within four hundred (400) feet landward of the Levee Right of Way, the Board may require a geotechnical analysis with appropriate seepage modeling to demonstrate that the ditch or pond excavation does not result in a configuration whereby the Levee and/or Seepage Berm or Stability Berm does not meet design criteria or an existing seepage problem is worsened because a ditch or pond within four hundred (400) feet of the Levee Right of Way could increase seepage beneath the Levee and/or reduce Levee stability. It is necessary to require that the geotechnical analysis shall include seepage modeling that demonstrates compliance with Levee design criteria for stability and underseepage or not make an existing seepage problem worse where design criteria are not met prior to constructing the ditch or pond. It is necessary to specify that the modeling

shall use the DWSE because this is the appropriate water surface elevation to use for the geotechnical analysis and use of a lower water surface elevation could lead to incorrect conclusions about the effects of the ditch or pond. It is also recognized that some Levees may not meet design criteria prior to construction of the ditch or pond. In this case the requirement is relaxed such that the ditch or pond must not make the seepage or stability problem worse. It is necessary to require that the modeling shall assume the ditch or pond is empty unless adequate assurances of a water level in the ditch or pond are provided to the Board because piping and boils are more likely to occur and to be more damaging within an empty ditch than a ditch that contains water (water in the ditch reduces the head differential that drives the Levee underseepage). It is necessary to require that the bottom of the ditch shall remain visible and accessible for inspection of potential boils during high water because undetected boils and piping of Levee foundation soils could lead to Levee failure. It is necessary to specify that the Board may waive this geotechnical analysis requirement for a temporary ditch or pond or for a minor, shallow ditch or pond that, in the judgment of the Board, poses no risk to the integrity of the Levee because applicants should not have to pay for such an analysis when the ditch or pond is temporary, shallow, or distant and does not pose a threat to Levee integrity.

(a)(4): It is necessary to specify that in Urban Criteria Areas, the seepage modeling shall include evaluation of performance for the Stream stage at the Hydraulic Top of Levee and comply with Levee underseepage requirements of the Urban Levee Design Criteria because within Urban Criteria Areas this is an additional water surface elevation to use for the geotechnical analysis as required by the Urban Levee Design Criteria and use of a lower water surface elevation could undermine the two hundred (200) year flood protection provided and recognized in the area.

(b): The purpose of subdivision (b) is to specify the criteria tile drains, septic systems, and similar facilities must satisfy. It is necessary to specify these criteria because it reduces the risk of saturation of the Levee and Levee foundation.

(b)(1): It is necessary to specify that tile drains, septic systems, and similar facilities must be designed to maintain Levee safety for all seepage and stability conditions and must be located outside of the Levee Right of Way and, where other alternatives for location/features exist, these improvements shall be avoided within at least fifty (50) feet from the Levee Toe because this reduces the risk of saturation of the Levee, Levee foundation, and Levee Right of Way caused by the malfunctioning of a buried tile drain or septic system and potential piping of Levee foundation soils into the openings of the tile drain or septic system.

(b)(2): It is necessary to specify that the bottom of any tile drain, septic tank, or leach field must be located above a 10h:1v slope projected downward from the nearest Levee Toe, Seepage Berm toe, or Stability Berm toe unless a geotechnical analysis demonstrates that the tile drain, septic tank, or leach field will not adversely impact the integrity of the Levee because, per USACE guidance, a ditch or pond (or any similar excavation such as a tile drain, septic tank, or leach field) is generally considered to be too close to the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of a flood control project feature if it is deep enough to intersect a line drawn at a 10h:1v slope projected downward from the landward extent of the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of a flood control project feature. This requirement for setback reduces the

likelihood of creating Levee instability or a path for Levee underseepage that results in boils and piping, causing loss of Levee foundation soils and possible Levee failure during high water. In the case of a septic tank or leach filed it also reduces saturation of the foundation area of a Levee caused by leakage of the drain or septic system. It is necessary to specify that the geotechnical analysis shall include appropriate seepage modeling using the DWSE because this is the appropriate water surface elevation to use for the geotechnical analysis and use of a lower water surface elevation could lead to incorrect conclusions about the effects of the tile drain, septic tank, or leach field. It is also recognized that some Levees may not meet design criteria prior to construction of the tile drain, septic tank, or leach field. In this case the requirement is relaxed such that the tile drain, septic tank, or leach field must not make the seepage or stability problem worse. It is necessary to specify that in Urban Criteria Areas, the seepage modeling shall meet requirements of the Urban Levee Design Criteria because within Urban Criteria Areas evaluation of performance for the Stream stage at the Hydraulic Top of Levee is also required and use of a lower water surface elevation could undermine the two hundred (200) year flood protection provided and recognized in the area.

(b)(3): It is necessary to specify that positive closure valves may be required on a tile drain pipeline to prevent backflow because it could cause saturation of an adjacent Levee or Levee foundation.

CCR Title 23. Article 8. Section 123. Pipelines, Conduits, and Utility Lines

(a): The purpose of subdivision (a) is to define Delta Lowlands, a term used only in section 123. It is necessary to define Delta Lowlands so that special considerations can be established in this section for installation of pipelines in this area. This area is depicted in Figure 8.04 and is near or below sea level, so that Levees in this area are subject to frequent or continuous hydraulic loading, unlike most Levees in the Sacramento-San Joaquin Valley. Levees in the Delta Lowlands also tend to be constructed partly with organic soils and are often founded upon peat or peaty soils, which can compromise their integrity.

(b): The purpose of subdivision (b) is to establish general rules for installation of pipelines, conduits, utility lines, and their appurtenant structures.

(b)(1): The purpose of subdivision (b)(1) is to prohibit installation of pipelines, conduits, and utility lines parallel to the Levee within the Levee Right of Way, with certain except ions identified below. It is necessary to prohibit pipelines parallel to the Levee within the Levee Right of Way because the rupture of a pressurized fluid or gas line could expose the adjacent Levee to extensive erosion of the embankment, or the Levee foundation, and possibly cause Levee failure. Electrical lines installed parallel to the Levee within the Levee Right of Way expose maintenance and flood fight personnel to risk of electrocution. A parallel line carrying pressurized fluid, gas, or electricity can expose a substantial reach of Levee to these risks. It is necessary to prohibit parallel low voltage electrical and communication lines within the Levee Right of Way because they can unnecessarily complicate future encroachments, Levee rehabilitation and maintenance activities.

(b)(1)(A): It is necessary to specify that an exception is allowed for low voltage electrical or communication lines installed pursuant to section 123(b)(7) of this division because such a line is located beyond fifteen (15) feet waterward of the waterside Levee Toe and twenty (20) feet landward of the landside Levee Toe, is demonstrated to be necessary, and will not interfere with the integrity of Levee or appurtenances, Levee maintenance, inspection, flood fight procedures, and future planned uses of the

Levee Right of Way. Such a line would cause no serious Levee maintenance problem or impedance of flood fight activities, and, if broken, would pose little threat to the Levee. Also, low voltage electrical lines and communication lines are highly unlikely to cause a serious injury to maintenance or flood fight personnel and therefore, if demonstrated to be necessary, may be allowed parallel to the Levee within the Levee Right of Way.

(b)(1)(B): It is necessary to specify that an exception is allowed for pipelines, conduits, and utility lines installed within or on an authorized structure, such as a pump station because it is usually impractical to install all pipelines, conduits, and utility lines within or on the structure perpendicular to the Levee and the reach of Levee exposed to the parallel lines is limited to the length of the structure.

(b)(2): The purpose of subdivision (b)(2) is to specify that pipelines, conduits, utility lines, utility poles, and appurtenant structures shall not be installed within the Levee Right of Way or Floodway during the Flood Season unless authorized by the Executive Officer pursuant to section 112 of this division. It is necessary to require approval by the Executive Officer before installing pipelines, conduits, utility lines, utility poles, and appurtenant structures within the Levee Right of Way during the Flood Season because installations within the Levee Right of Way require cuts into the Levee or near the Levee Toe. Cuts in a Levee, such as for the installation of pipelines, conduits or utility lines, are not allowed during Flood Season because the Levee may need to function while its integrity is compromised by the cut. A cut in a Levee crown reduces the freeboard available during high water and could cause an overtopping failure of the Levee. Installation in the Floodway presents a risk posed by sudden wet weather that stops construction and a sudden rise in Stream stage that inundates the work area, exposing excavations to erosion damage. Based on the construction schedule, current Stream stages, and near-term weather and Stream forecasts, the Executive Officer may be able to approve some installations during the Flood Season.

(b)(3): The purpose of subdivision (b)(3) is to specify that appurtenant structures such as standpipes, utility poles, distribution boxes, guy wires and anchors are generally not allowed in the Levee Right of Way, but appurtenant structures may be allowed where they will not interfere with Levee Maintenance Activities or flood fight activities. Where no alternative exists for placing a pole within the Levee Section and/or foundation, special requirements apply. It is necessary to specify that appurtenant structures such as standpipes, utility poles, distribution boxes, guy wires and anchors are generally not allowed in the Levee Right of Way because such facilities or installations could hinder adequate maintenance of Levees and interfere with flood fight activities. Clearance from the Levee Toe consistent with the Levee Right of Way is needed for the passage of emergency and maintenance vehicles and equipment. However, such installations may be allowed where they will not interfere with Levee Maintenance Activities or flood fight activities. The board will generally accept endorsements of the Local Maintaining Agency as sufficient evidence that a proposed installation will not interfere with Maintenance Activities.

(b)(3)(A): It is necessary to require applicants to submit for Board approval a seepage and stability analysis that supports the request for installing a pole within the Levee Section and/or foundation and specify that the analysis should include boring logs of the area adjacent to the proposed pole location, identifying the stratigraphy, because a pole can compromise Levee integrity with respect to seepage and stability and the analysis should utilize geotechnical information developed from nearby borings.

(b)(3)(B): It is necessary to require that new poles within the Levee Section and within fifteen (15) feet of the Levee Toe must be installed in pre-drilled holes in order to avoid vibration during installation that can cause cracking of the Levee and/or nearby foundation. Such cracking can reduce Levee stability and increase seepage.

(b)(3)(C): It is necessary to require the entire hole to be filled with a cement-bentonite grout slurry to the surrounding ground surface, or allow the upper two (2) feet to be compacted soil, with soil mounded immediately adjacent to the pole because vertical seepage alongside the pole would otherwise occur. Such seepage from rainfall and runoff would penetrate into the Levee and/or nearby foundation reducing Levee slope stability. Also, a void alongside the pole could create a shortened path for seepage through or under the Levee to exit and create boils and heavy seepage.

(b)(3)(D): It is necessary to specify that guy wires should be anchored with concrete because the guy wires and pole supported by the guy wires need to be stable in wet and windy conditions so as to not topple and interfere with Levee maintenance, patrolling, or flood fight activities.

(b)(3)(E): It is necessary to specify that exceptions and alternate pole installations may be approved under some circumstances after appropriate engineering review because there may be feasible alternative installations that should not be precluded.

(b)(3)(F): The purpose of subdivision (b)(3)(F) is to establish maintenance requirements for poles.

(b)(3)(F)(i): It is necessary to specify that poles shall not be allowed to deteriorate and create holes in the impervious layer because such voids created by the deteriorated pole would allow seepage from rainfall and runoff to penetrate into the Levee and/or nearby foundation reducing Levee slope stability. Also, a void alongside the pole could create a shortened path for seepage through or under the Levee to exit and create boils and heavy seepage.

(b)(3)(F)(ii): It is necessary to specify that poles shall not be allowed to lean or fall over or interfere with Levee inspections, operations, maintenance, or flood fighting because poles that interfere with Levee inspections, operations, maintenance, or flood fighting – including leaning or fallen poles – could compromise Levee integrity and increase the chance of a Levee failure.

(b)(3)(F)(iii): It is necessary to specify that the bases of poles shall be kept free of debris because accumulated debris would interfere with Levee inspection, maintenance, and flood fighting.

(b)(3)(F)(iv): It is necessary to specify that supports and anchors shall be maintained to prevent overturning by wind or water because poles need to be stable in wet and windy conditions so as to not topple and interfere with Levee maintenance, patrolling, or flood fight activities.

(b)(4): The purpose of subdivision (b)(4) is to require that appropriate, visible markers acceptable to the Local Maintaining Agency, such as metal post with paddle, are required to identify the location of buried pipelines, conduits and utility lines. Markers must be made of durable, fire resistant material, and must be maintained by the Permittee until the pipeline, conduit or utility line is properly removed or abandoned. The Local Maintaining Agency may also require the Permittee to record information on the marker, including but not limited to, Encroachment identification, date of installation, contents, contact information, date of last exercise of any closure device, and date of last inspection or pressure test. It is

necessary to require markers indicating the location of all buried pipelines, conduits and utility lines because buried pipelines, conduits, and utility lines can be damaged by heavy Levee maintenance equipment and interfere with flood fighting. It is essential to be able to determine the exact location of a buried line that may possibly rupture and cause rapid internal erosion of the Levee. Durable, fire resistant markers are required in order to withstand burning of Levee vegetation, whether unintentional or intentionally done for Levee maintenance. The markers need to be installed and labelled with up-to-date information as requested by the Local Maintaining Agency because the Local Maintaining Agency needs to be confident when performing Levee maintenance that the pipelines, conduit, or utility line is being properly maintained and will not be damaged by Levee maintenance or interfere with Levee maintenance or flood fighting.

(b)(5): The purpose of subdivision (b)(5) is to require that pipelines, conduits and utility lines that pose a threat or danger to Levee maintenance or flood fight activities, such as high-voltage lines, gas lines and high pressure fluid lines, shall be distinctively labeled to identify the contents. It is necessary to identify every buried line that could pose a threat or danger to Levee maintenance or flood fight activities, including being damaged or ruptured, be identified as to its contents in order to minimize or prevent hazardous conditions from developing, and to prevent injury to maintenance, patrol and flood fight personnel.

(b)(6): The purpose of subdivision (b)(6) is to require overhead electrical and communication lines to have a minimum vertical clearance above the Levee crown and Access Ramps of twenty-one (21) feet for lines carrying 750 volts or less, twenty-five (25) feet for lines carrying between seven hundred fifty (750) volts and twenty two thousand five hundred (22,500) volts, and thirty (30) feet for lines carrying twenty two thousand five hundred (22,500) volts or higher voltage. It is necessary to require adequate overhead clearance of overhead power lines to provide for safety of the public and Levee maintenance personnel with adequate clearance to operate trucks, cranes and other Levee maintenance equipment. The described vertical clearances are also required by the May 2018 update to PUC General Order No. 95 for overhead power line crossings along thoroughfares in urban districts or crossing thoroughfares in rural districts.

(b)(7): The purpose of subdivision (b)(7) is to require that low voltage electrical or communication lines of twenty-four (24) volts or less may be installed parallel to a Levee, within the Levee Right of Way but beyond fifteen (15) feet waterward of the waterside Levee Toe and twenty (20) feet landward of the landside Levee Toe, when it is demonstrated to be necessary and to not interfere with the integrity of the Levee or appurtenances, Levee maintenance, inspection, flood fight procedures, and future planned uses of the Levee. Such lines shall be protected within a conduit and encased in concrete or Controlled Low Strength Materials (CLSM) with a minimum thickness of four (4) inches or one-half (1/2) times the conduit exterior diameter, whichever is greater, for conduits with an exterior diameter less than two (2) feet; for larger conduits the minimum thickness of encasement is one (1) foot or one-quarter (1/4) times the conduit exterior diameter, whichever is greater. These requirements apply where the Levee Right of Way exceeds fifteen (15) feet waterward of the waterside Levee Toe and twenty (20) feet landward of the landside Levee Toe. It is necessary to generally prohibit parallel low voltage electrical and communication lines within the Levee Right of Way because they can unnecessarily complicate future

encroachments, Levee rehabilitation and maintenance activities. However, if demonstrated to be necessary, such lines would cause no serious Levee maintenance problem or impede flood fight activities, and, if broken, would pose no threat to the Levee. Also, low voltage electrical lines and communication lines are highly unlikely to cause a serious injury to maintenance or flood fight personnel and therefore, if demonstrated to be necessary, may be allowed parallel to the Levee within the Levee Right of Way where Levee Right of Way exceeds fifteen (15) feet waterward of the waterside Levee Toe and twenty (20) feet landward of the landside Levee Toe as needed for access by maintenance vehicles and equipment. It is necessary to require concrete or CLSM encasement of these low voltage electrical and communication lines to protect them from damage by equipment during Levee maintenance and flood fighting. It is necessary to specify minimum encasement thickness in proportion to the pipe diameter so as to not have inappropriately thin encasement that is easily damaged or penetrated.

(b)(8): The purpose of subdivision (b)(8) is to require the applicant to have any pipelines, conduits, utility lines and appurtenant structures designed by a California registered civil engineer. It is necessary to require design by a California registered civil engineer to ensure an adequate design and acceptable construction methods for pipelines, conduits, and utility lines within the Levee Right of Way or Floodway. Numerous factors must be considered in pipeline design and construction, and these factors vary from project to project. An improperly designed or constructed pipeline within the Levee Right of Way would jeopardize Levee integrity and pose a serious hazard to public safety. An improperly designed or constructed pipeline within the Floodway could be damaged by flood waters and/or result in unnecessary erosion in the Floodway, possibly exposing the pipeline and breaking it. A broken pipeline would expose its contents to the Floodway and portions of the pipeline may wash downstream and create an obstruction.

(b)(9): The purpose of subdivision (b)(9) is to establish requirements for visual inspection and pressure testing of pipelines, conduits, and utility lines within the Levee Right of Way. It is necessary to require periodic visual inspection and pressure testing to ensure the continued integrity of pipelines, conduits, and utility lines within the Levee Right of Way because they deteriorate over time and eventually can rupture and damage the Levee. Also, seepage can develop alongside the pipeline and damage the Levee.

All gravity drains, conduits, and utility lines installed within the Levee Right of Way shall be periodically visually inspected no less frequently than every five (5) years. It is necessary to require visual inspection every five (5) years to comply with USACE guidance and, in Urban Criteria Areas, with the Urban Levee Design Criteria. Five (5) years is considered to be a reasonable period of time to wait between inspections that will probably reveal deterioration before a pipe failure occurs.

Pressurized pipelines shall be periodically pressure tested no less frequently than every five (5) years against the same benchmark time and pressure that were set for pressure testing during construction (usually the pressure test during construction exceeds the design working pressure to provide a margin of safety, often in the range of one hundred twenty five (125) percent to one hundred fifty (150) percent of the design working pressure). It is necessary to require pressure testing every five (5) years of pressurized pipelines to verify their continued structural integrity, consistent with USACE guidance and, in Urban Criteria Areas, with the Urban Levee Design Criteria. Pressure testing is usually considered to be better than visual inspection for verifying structural integrity. The pressure testing performance of

the pipeline during construction establishes the baseline against which future tests should be compared to determine whether deterioration is occurring. Baseline tests are usually recommended to exceed design working pressures to provide a factor of safety.

With justification satisfactory to the Board, pressurized pipelines may be visually inspected, no less frequently than every five (5) years, instead of pressure tested. Visual inspection of the pipeline interior may be accomplished with an inspector or a camera. Alternative methods for inspection and testing may be approved by the Board for pipelines that do not contain water and would be difficult to inspect by camera, or that would present a hazard if the pipe were to leak during a pressure test (e.g., a petroleum pipeline). Visual inspection of the exterior shall include all exposed areas and should include sample representative areas where the pipeline is in contact with soil. It is necessary to specify that alternatives to pressure testing, such as visual inspection may be acceptable to the Board, how the visual inspection is to be performed, and that a camera may be used to perform the inspection inside of the pipeline. This provides for a reasonably complete inspection that should be readily achievable and economical.

The Board may also require a visual inspection and/or pressure test in response to an unplanned event that may have compromised the integrity of the pipeline, such as evidence of potential damage from vandalism, Levee slope instability, or settlement. It is necessary to enable the Board to require unplanned inspections should an event, such as an earthquake, potentially damage a pipeline. It would not be prudent to wait months or years until the next periodic inspection.

The Board may waive or reduce the requirements for visual inspection and/or pressure testing for pipelines, conduits, and utility lines of one (1) inch or less internal diameter, electrical and communication lines, and within or on Dwellings and structures authorized by the Board within the Levee Right of Way. It is necessary to specify that there can be exceptions for pipelines, conduits, and utility lines that are small diameter, carry electrical or communication lines, or are within or on authorized structures, such as Dwellings, due to the low risk that such pipelines pose to the Levee should they break. In addition, pressure testing would be inappropriate for many of these pipelines and visual inspection would be very difficult.

(b)(10): The purpose of subdivision (b)(10) is to require a report on the results of the pipeline, conduit, or utility line inspection and/or pressure test and any other tests to be provided to the Board, stamped and signed by a California registered civil engineer or a pipeline inspector certified through the National Association of Sewer Service Professionals Pipeline Assessment Certification Program. It is necessary to require a report to the Board on the results of the inspection and tests stamped and signed by a California registered civil engineer or a pipeline inspector certified through the National Association of Sewer Service Professionals Pipeline Assessment Certification Program because the report is needed by the Board to determine the continued integrity of the pipeline and the report needs to be stamped and signed by a person with appropriate responsibility and training so that the Board can reasonably expect the inspection and/or testing to have been properly performed and the results appropriately analyzed.

(b)(11): The purpose of subdivision (b)(11) is to compel owners of pipelines, conduits, and utility lines within the Levee Right of Way to perform the required periodic inspections and/or pressure tests, to make any necessary repairs in a timely manner, and to submit the report to the Board within a reasonable time period. It is necessary to require that Permits for gravity drains, pressurized pipelines,

conduits, and utility lines within the Levee Right of Way shall be subject to revocation after the date of required inspection and/or pressure test if the inspection and/or pressure test has not been performed, if the report of the inspection and/or pressure test has not been provided to the Board, or if the inspection and/or pressure test revealed a deficiency and that deficiency has not been repaired and documented in a report stamped and signed by a California registered civil engineer or a pipeline inspector certified through the National Association of Sewer Service Professionals Pipeline Assessment Certification Program. If any of these conditions were to occur, the Board would not be able to verify the continued safe operating condition of the pipeline, conduit, or utility line. Such pipelines, conduits, and utility lines can pose a serious threat to the Levee should they break or should a path for heavy seepage develop alongside the pipeline, conduit, or utility line. Broken pipelines, conduits, and utility lines can cause substantial erosion of the Levee if pressurized fluid is released. They can also allow Levee and/or foundation soils to be transported into the pipeline at the location of the break and carried away, damaging the Levee and possible causing Levee failure. Broken gas pipelines can start fires and be dangerous for the public and Levee maintenance personnel. The report needs to be stamped and signed by a person with appropriate responsibility and training so that the Board can reasonably expect the repairs have been properly performed and documented.

It is necessary to establish that the Permit automatically expires if the report is not provided to the Board within one (1) year after the date of required inspection and/or pressure test and the Permit has not been revoked or otherwise acted upon by the Board because a reasonable deadline for report submittal needs to be set and an appropriate consequence for failure to submit the report also needs to be established. This requirement is expected to compel most Permittees to submit their report in a timely manner. This requirement is also necessary because the Board needs to be empowered, and the Permittees be on notice of such empowerment, to resolve the question of the continued safe operating condition of the pipeline, conduit, or utility line within a reasonable time period. This requirement provides up to six (6) years between reports of inspection and/or testing. In most instances, it is expected that the Permittee would contact the Board if the report will be late. In addition, the Board is developing a tracking system that should result in notifications by the Board to late Permittees, warning them of imminent Permit revocation should they fail to contact the Board and work with the Board to meet or amend the deadline for report submittal.

It is necessary to establish that once the Permit has been revoked or has expired, the pipeline, conduit, or utility line and appurtenances shall be removed or properly abandoned by the Permittee at Permittee's expense pursuant to the requirements of section 124 of this division, unless the Permittee applies for a new Permit and such Permit is granted, because the only appropriate options at this point are to remove or otherwise properly abandon the pipeline, conduit, or utility line – or to issue a new Permit for the continued operation of the pipeline, conduit, or utility line, with appropriate conditions. A pipeline, conduit, or utility line without a Permit and conditions for continued operation presents a significant unwarranted risk to the Levee, the public, and possibly to Levee maintenance personnel.

It is necessary to require that removal of the pipeline, conduit, or utility line shall be accomplished under supervision of the Board after providing written notice to the Board because removal will involve work

and excavation within the Levee Right of Way that must be inspected for proper workmanship, backfilling, and compaction.

It is necessary to require that removal or abandonment shall be performed within ninety (90) days after the Permit is expired, but may occur later with Board approval, because the Board has not been able to verify the continued safe operating condition of the pipeline, conduit, or utility line and timely removal or abandonment is necessary to avoid continued unwarranted risk to the Levee, public, and Levee maintenance personnel. The Board may approve delay of removal or abandonment when it deems a delay is reasonable, such as to avoid excavation in the Levee during the Flood Season.

It is necessary to establish that if the Permittee does not remove or properly abandon the pipeline, conduit, or utility line and appurtenances as required by the Board, the Board will remove or abandon the pipeline, conduit, or utility line and appurtenances at the Permittee's expense because the removal or abandonment needs to occur and the Permittee has not performed the removal or abandonment. Furthermore, since the work is the responsibility of the Permittee, it is appropriate to require the Permittee to reimburse the Board for the cost of the work.

(b)(12): The purpose of subdivision (b)(12) is to establish that the Board Permit approving the construction or modification of a pipeline, conduit, or utility line within the Levee Right of Way shall run with the land, pursuant to a recorded document executed pursuant to section 16(f) and that upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner’s name and address. It is necessary to establish for certain Encroachments that present an exceptional risk to public safety and for which ownership of the Encroachment may change in the future, that when ownership changes the new owner is notified of the Permit and its conditions and the Board is notified that ownership has changed and has contact information to follow up with the new owner. Pipelines, conduits, and utility lines within the Levee Right of Way are Encroachments that warrant this requirement to inform the new property owner of the Permit and associated responsibilities.

(b)(13): The purpose of subdivision (b)(13) is to require that all pipes and structures related to the piping system (e.g., sumps, distribution boxes, etc.) shall be analyzed during design for uplift based on hydraulic gradients determined pursuant to EM 1110-2-1913 using the appropriate water surface elevation(s) pursuant to section 120(a)(2)(A) of this division. It is necessary to require that pipes and associated structures be analyzed for uplift forces that would displace and damage them. The analysis must use appropriate hydraulic gradients and water surface elevations, consistent with USACE requirements in EM 1110-2-1913 and section 120(a)(2)(A) respectively, to be consistent with the expected loadings for which the Levee is designed.

(b)(14): The purpose of subdivision (b)(14) is to prohibit installation of plastic pipe within the Levee Section or foundation unless it is encased in concrete, a minimum thickness of four (4) inches or one-half (1/2) times the pipe exterior diameter, whichever is greater, for pipes with an exterior diameter less than two (2) feet; for larger pipes the minimum thickness of concrete encasement is one (1) foot or one-quarter (1/4) times the pipe exterior diameter, whichever is greater. This subdivision also clarifies that electrofusion butt-welded high-density polyethylene is considered to be plastic for purposes of this requirement, except when installed by horizontal directional drilling under the Levee pursuant to the

requirements of section 123(f) of this division. It is necessary to prohibit unencased plastic pipe within the Levee Section or foundation of the Levee because USACE guidance in EM 1110-2-2902 prohibits plastic pipe within the Levee unless specifically authorized by USACE headquarters. The specific reasons for this prohibition in EM 1110-2-2902 are not detailed, but appear to be based on the limited performance history of plastic pipe, its viscoelastic properties, and its susceptibility to damage from loading. Approval of exceptions by USACE headquarters is typically a time consuming and uncertain process, which can be inconsistent with timely Permit approval requirements under California's Permit Streamlining Act. However, the Sacramento District of USACE has developed special guidance which allows for plastic pipe in the Levee if it is encased in concrete. Concrete encasement strengthens the sidewalls of the plastic pipe and protects the pipe from being overloaded or unintentionally damaged. It is necessary to require sufficient thickness of concrete encasement to protect plastic pipes from damage by equipment during Levee maintenance and flood fighting. It is necessary to specify minimum encasement thickness in proportion to the pipe diameter so as to not have inappropriately thin encasement that is easily damaged or penetrated. It is necessary to clarify that this encasement requirement applies to electrofusion butt-welded high-density polyethylene pipe when installed across a Levee because such pipe installation is specifically allowed in section 123(d) of this division. It is necessary to clarify that this encasement requirement does not apply to electrofusion butt-welded high-density polyethylene pipe when bored under a Levee because such pipe installation is specifically allowed in section 123(f) of this division.

(b)(15): The purpose of subdivision (b)(15) is to require plastic pipe and high-density polyethylene pipe within and on the Levee Section to be protected from being damaged by fire, in areas where the Levee is subject to maintenance burning or wildfires. It is necessary to require plastic and high-density polyethylene pipe to be protected from damage by fire in areas subject to maintenance burning for control of Levee vegetation because the Local Maintaining Agency would have to take special measures to avoid damage to the pipe when conducting Levee burning. Pipes damaged by maintenance burning or wildfires would need to be repaired or replaced before the next Flood Season to avoid seepage problems along the pipe or uncontrolled flow through the pipe. Such repairs would require excavation in the Levee that could be avoided by protecting the pipes from damage by fire. If the damage occurs in late summer or fall, the Levee excavation would have to occur during Flood Season.

(b)(16): The purpose of subdivision (b)(16) is to establish that a new Permit may be required for installing a liner inside of an existing pipeline, conduit, or utility line if the existing pipeline, conduit, or utility line has a Permit or should have a Permit and that the new Permit may establish new conditions consistent with Board Standards. The purpose of this subdivision is also to require that the method of installing the new liner is subject to Board approval and must be appropriate for the demonstrated integrity of the existing pipe and fill all significant voids between the liner and existing pipe without causing damage to the Levee. It is necessary to establish that the Board may require a new Permit for installing a liner inside of an existing pipeline, conduit, or utility line if the existing pipeline, conduit, or utility line has a Permit or should have a Permit because the liner will become the new pipeline and a Permit is the Board's vehicle for establishing appropriate conditions for installation and continued safe operation of the pipeline. In addition, the Board's records need to reflect the new condition resulting from the liner installation. It is necessary to require that the installation is subject to Board approval and

is appropriate for the demonstrated integrity of the existing pipe because there are a wide range of possible pipe conditions and deterioration that warrant installation of a liner, which can affect the success of the installation and its longevity. It is necessary to require filling of all significant voids between the liner and existing pipe without causing damage to the Levee because voids are a potential cause of seepage, particle migration from the Levee Section, and Levee crown settlement. Excessive pressure used for injecting grout or cement between the liner and the existing pipeline can cause damage to the Levee by jacking or hydraulic fracturing.

(b)(17): The purpose of subdivision (b)(17) is to establish that replacement of an existing pipeline, conduit, or utility line within the Levee Right of Way or Floodway, including in-kind replacement, requires a new Permit unless such replacement is performed by a Local Maintaining Agency under Maintenance Activities and prior written approval from Board staff has been provided. It is necessary to require a new Permit for replacement, including in-kind replacement and liner installation, of an existing pipeline, conduit, or utility line within the Levee Right of Way because the work involves installation of a new pipe and cuts into the Levee or near the Levee Toe. Cuts in a Levee and near a Levee require proper backfilling and compaction, with inspection by the Board. Pipe installation requires proper workmanship, with inspection by the Board. Poor installation or backfilling and compaction can jeopardize Levee integrity. The existing Permit may not have all of the appropriate conditions for the new pipe and new conditions may be needed on the Permit. It is necessary to require a new Permit for replacing an existing pipeline, conduit, or utility line within the Floodway because the work involves installation of a new pipe and excavation in the Floodway. Excavation in a Floodway requires proper backfilling and compaction, with inspection by the Board. Pipe installation requires proper workmanship, with inspection by the Board. Poor installation or backfilling and compaction can result in damage to the pipe, and erosion in the Floodway. The existing Permit may not have all of the appropriate conditions for the new pipe and new conditions may be needed on the Permit. Written approval is required for this work by a Local Maintaining Agency to ensure that the Board is aware of the planned work and has the ability to make sure it will be performed according to Board Standards.

(b)(18): The purpose of subdivision (b)(18) is to establish that pipelines, soil cover, Revetment, and related structures shall not cause a significant increase in Stream stage or velocities and the Hydraulic Impact Evaluation Procedure applies for evaluating the potential hydraulic impacts. It is necessary to require that pipelines, soil cover, Revetment, and related structures not cause a significant increase in Stream stage or velocities to ensure that the pipelines, soil cover, Revetment, and related structures do not increase flood risk by increasing water levels or velocities. In locations where the effect of the proposed work on flood stages or velocities is uncertain, the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. It is necessary to require application of the Hydraulic Impact Evaluation Procedure for evaluating any hydraulic impact because the Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage or Stream velocity will occur.

(c): The purpose of subdivision (c) is to establish additional conditions for pipelines, conduits, and utility lines installed within the Floodway.

(c)(1): The purpose of subdivision (c)(1) is to require an appropriate depth of cover over pipelines, conduits, and utility lines installed within a Floodway, as determined by a scour analysis performed by a California registered civil engineer, with minimum covers of five (5) feet beneath the Low Water Channel, and two (2) feet in the remaining area of the Floodway. The purpose of this subdivision is also to specify that the same cover provided beneath the Low Water Channel shall be maintained beyond the Low Water Channel for an appropriate distance, but not less than ten (10) feet, transitioning to the depth of cover required in the remaining area of the Floodway and that a greater depth of cover may be required in the remaining area of the Floodway based upon the feasibility of achieving the required cover or local soil stability and channel hydraulics. It is necessary to require an appropriate depth of cover for pipelines buried within the Floodway and under the Low Water Channel because inadequate cover will result in exposure of the pipeline – which can catch large debris that obstructs flow and result in damage to the pipeline, possibly causing it to release its contents into the Floodway. It is necessary to require that a California registered civil engineer perform a scour analysis to determine an appropriate depth of cover that considers the potential for scour when considering Floodway soils and Stream velocities. It is also necessary to specify a minimum depth of cover – five (5) feet beneath the Low Water Channel and two (2) feet in the remaining area of the Floodway – because of the uncertainty involved in scour analyses and to protect the pipe from damage by equipment. The minimum cover of five (5) feet beneath the low water channel also allows for the clearing and reshaping of the channel, sediment removal by the Local Maintaining Agency, and provides for seasonal scouring of the channel bottom without exposing the buried lines. It is necessary to specify that the scour analysis shall be performed by a California registered civil engineer to ensure that this engineering study is done adequately. Numerous factors must be considered in a scour analysis and these factors vary from site to site. An improperly conducted scour analysis could result in inadequate soil cover and exposure of the pipe during high flow events.

(c)(2): The purpose of subdivision (c)(2) is to specify that open trench backfill to cover pipes shall be placed in a manner consistent with Floodway characteristics such as erosion, deposition, and Stream flow velocities. The purpose of this subdivision is also to specify that this requirement is generally ensured by using suitable material and compacting to at least the density of adjacent undisturbed material, or ninety (90) percent as per ASTM D698 with moisture content within minus one (-1) percent to plus three (+3) percent of optimum, or eighty eight (88) percent as per ASTM D1557 with the moisture content within zero (0) percent to plus four (+4) percent of optimum, or equivalent. The purpose of this subdivision is also to require field density testing by an Approved Soils Testing Laboratory to confirm the minimum relative compaction of trench backfill. It is necessary to specify that open trench backfill to cover pipes within the Floodway shall be placed in a manner consistent with the Floodway characteristics at the location of the pipe. To prevent erosion of the backfill, it must be properly compacted – in general by compacting suitable material to at least the density of the adjacent soils, or ninety (90) percent as per ASTM D698 with moisture content within minus one (-1) percent to plus three (+3) percent of optimum, or eighty eight (88) percent as per ASTM D1557 with the moisture content within zero (0) percent to plus four (+4) percent of optimum, or equivalent. Matching the density of adjacent undisturbed material is usually sufficient, but for many installations the cost of determining the density of adjacent undisturbed material can be avoided by simply compacting to the

specified percentage of the density resulting from either ASTM compaction method, controlling the moisture content within a narrow range to facilitate achieving the proper density. These percentages are reasonable densities appropriate for avoiding erosion of pipe cover in a Floodway. It is necessary to require field density testing by an Approved Soils Testing Laboratory so that the relative compaction can be verified and the laboratory meets stringent testing standards that produce reliable results.

(c)(3): The purpose of subdivision (c)(3) is to specify that in general, any standard material may be used for pipelines or conduits to be installed within the Floodway fifteen (15) feet or more waterward of the waterside Levee Toe, or the waterside toe of the Projected Levee Section if the location of the waterside Levee Toe is not evident. It is necessary to specify that, unlike pipelines within Levees, the Board provides great latitude to install pipe of almost any standard pipe material within the Floodway as long as it is a sufficient distance from the Levee. For pipes within the Floodway there is little concern about seepage alongside the pipe. Breakage of the pipe is still a concern and could cause release of pipe contents into the Floodway or cause an obstruction if large debris were to catch on it, but this concern is addressed by use of standard pipe materials and by providing adequate cover.

(c)(4): The purpose of subdivision (c)(4) is to require that all debris that accumulates around utility poles and guy wires within the Floodway shall be completely removed following the Flood Season and immediately after major accumulations. It is necessary to require removal of debris that accumulates around utility poles and guy wires within the Floodway following the Flood Season and immediately after major accumulations because accumulated debris can become a detriment to the flood control project by diminishing the Floodway capacity, increasing Stream stages, and misdirecting Stream flows against channel banks or Levees – causing severe erosion.

(d): The purpose of subdivision (d) is to establish additional conditions for pipelines, conduits, and utility lines that cross over, through, or under a Levee.

(d)(1): The purpose of subdivision (d)(1) is to require that pipelines, conduits, and utility lines shall be installed over, through, or under a Levee as nearly at a right angle to the Levee centerline as practical. It is necessary to require installation at a right angle to minimize the length of exposure of the pipeline, conduit, or utility line to the Levee and enable flood patrol personnel to immediately determine if seepage in the Levee is through or along the conduit. Floods often occur during the worst of weather conditions and at night. Accurate observations of Levee conditions and determining the origin of any seepage within a Levee are vital for effective flood fighting.

(d)(2): The purpose of subdivision (d)(2) is to require buried pipelines, conduits, and utility lines that do not surface near the Levee Toes to have location markers near both Levee Toes. It is necessary to require location markers near the Levee Toes to reveal its location to Levee maintenance, Levee patrol and flood fight personnel. Marking the location of all buried lines helps to prevent damage to a line by heavy maintenance equipment and expedites the search for the source of seepage through a Levee. Marking the location of buried electrical and gas lines also provides for worker safety.

(d)(3): The purpose of subdivision (d)(3) is to require that buried pipelines, conduits, and utility lines that cross the Levee at right angles shall have a location marker located on the Levee slope adjacent to either shoulder and that the markers should include Permit information, date installed, owner, and contact

information for emergencies. It is necessary to require a location marker on the Levee slope adjacent to either shoulder and that the markers should include Permit information, date installed, owner, and contact information for emergencies because this requirement helps prevent the destruction or loss of markers during normal maintenance, patrolling, or flood fight activities, and still provides prominent locations for the markers. Permit information, date installed, owner, and contact information for emergencies is helpful for maintenance and emergency personnel to quickly determine the type of pipeline, size, contents, location, and the owner's contact information should a problem occur. This reduces risk to maintenance and emergency workers.

(d)(4): The purpose of subdivision (d)(4) is to require that buried pipelines, conduits, and utility lines that cross the Levee at other than right angles shall have location markers on the Levee slopes adjacent to each shoulder and that at least one of these markers shall include Permit information, date installed, owner and contact information for emergencies. It is necessary to require a location marker on the Levee slope adjacent to each shoulder and that the markers should include Permit information, date installed, owner, and contact information for emergencies because this requirement helps prevent the destruction or loss of markers during normal maintenance, patrolling, or flood fight activities, and still provides prominent locations for the markers. A marker near each shoulder is necessary because the buried pipeline, conduit, or utility line is not crossing the Levee at a right angle and a marker nearly only one shoulder would not clearly indicate the location of the entire crossing. Permit information, date installed, owner, and contact information for emergencies is helpful for maintenance and emergency personnel to quickly determine the type of pipeline, size, contents, location, and the owner's contact information should a problem occur. This reduces risk to maintenance and emergency workers.

(d)(5): The purpose of subdivision (d)(5) is to require the invert of all pipelines to be above the DWSE and for Levees designed without Freeboard using risk and uncertainty, the invert of all pipelines shall be above the Levee crown, with certain exceptions provided in subdivisions (d)(5)(A) through (d)(5)(C). It is necessary to require pipelines installed through a Levee to be entirely above the DWSE to reduce the risk of seepage through the Levee alongside the pipeline during high water, and also limit the potential damage that could occur if the pipeline ruptured. It is necessary to require pipelines through Levees designed without Freeboard using risk and uncertainty to be placed over the Levee crown because USACE guidance requires pipelines to cross over the top of the Levee since the entire height of the Levee is designed for containing Stream flow.

(d)(5)(A): It is necessary to specify that where the Levee crown has additional fill that has been placed on top of the designed Levee Section, the fill may be considered as being above the Levee crown because some Levees have additional fill that effectively raises the Levee crown. This clarifies that the additional fill is not considered to be the Levee crown for the purpose of establishing the height at which the pipeline must be placed.

(d)(5)(B): It is necessary to specify that where a railroad line or paved public roadway for motor vehicle travel occupies the Levee crown, the invert of the pipeline otherwise required to be above the Levee crown may be placed below the Levee crown to the minimum extent required for establishing adequate cover, but in no case shall the pipeline invert be placed below the DWSE (if there is a DWSE below the Levee crown) because it is impractical to raise a railroad line and it is undesirable to create bumps in

paved public roadways. It is necessary to minimize the potential for seepage alongside the pipeline by placing it as high as possible within the Levee. This can be achieved by requiring a reinforced concrete cover or other engineered cover.

(d)(5)(C): It is necessary to specify that the pipeline elevation requirements do not apply for gravity drains installed pursuant to section 123(e) of this division or pipelines installed under the Levee pursuant to section 123(f) of this division because such pipelines are necessarily installed below the DWSE and have other requirements that address concerns about seepage alongside the pipeline.

(d)(6): The purpose of subdivision (d)(6) is to require all pressurized pipelines to have a positive closure device, except for pipelines open to the Stream with the pipeline invert above the Levee crown, and to require closure instructions and any necessary equipment and keys to be provided to the Local Maintaining Agency, if requested. The purpose of this subdivision is also to specify the locations for closure devices for specific types of pipeline installations. It is necessary to require a positive closure device to provide for rapid closure in the event of leakage or rupture of the pipeline. A leaking or ruptured pipeline could cause serious erosion of a Levee and/or saturation of the Levee slope leading to sloughing of the Levee slope. A valve, or other rapid closure device, is required to prevent continued or extensive Levee damage that can be caused by a ruptured pipeline. It is necessary to require closure instructions, equipment, and keys for locks on closure devices to enable personnel from the Local Maintaining Agency quickly shut the closure device if the pipeline is leaking or ruptured.

(d)(6)(A): It is necessary to require that for pipelines open to the Stream with the pipeline invert below the Levee crown, the closure device shall be located at the waterside edge of the Levee crown because it needs to be easily accessible during high water but out of the way for most Maintenance Activities and located so as to minimize the amount of pipeline within the Levee that is pressurized after closure. A positive closure device is necessary to prevent high water in the Stream that is above the DWSE from entering the pipeline and flooding the adjacent property; a siphon breaker alone would be insufficient. It is essential that the prime function of the flood protection works is not nullified by backflow through pipelines. Flap gates are not considered to provide positive closure because flap gates often become stuck open by accumulated debris.

(d)(6)(B): It is necessary to require that for pipelines not open to the Stream, particularly gas lines, the closure device shall be clearly labeled for contents and located landward of the Levee outside of the Levee Right of Way but no further than one hundred (100) feet from the landside Levee Toe because the closure device needs to be located away from the Levee to depressurize the pipeline that is within and near the Levee, but close enough to the Levee so that it is accessible. It is necessary to require for pipelines that would still be pressurized within the Levee Right of Way if such a closure device was shut, that the Board may require a closure device waterward of the Levee instead or in addition because flow in the pipeline is coming from the waterside of the Levee and closing a landward valve would still keep the pipeline pressurized in or under the Levee. If it is possible for flow to come from either direction, then valves would be needed on both sides of the Levee.

(d)(6)(C): It is necessary to require that for pipelines installed by horizontal directional drilling, the closure device shall be located no farther from the Levee than the nearest points of entry and exit used for installation and that closure devices that can be controlled remotely must be located a reasonable

distance from the landside Levee Toe, acceptable to the Board, because the closure device needs to be located away from the Levee to depressurize the pipeline that is within and near the Levee. Pipelines installed by horizontal directional drilling are too deep near the Levee for manually operated closure devices to be located near the Levee; remotely controlled closure devices could be located closer to the Levee and should be located appropriately to isolate the depressurized pipeline to the vicinity of the Levee. It is necessary to require for pipelines that would still be pressurized within the Levee Right of Way if such a closure device was shut, that the Board may require a closure device waterward of the Levee instead or in addition because flow in the pipeline is coming from the waterside of the Levee and closing a landward valve would still keep the pipeline pressurized under the Levee. If it is possible for flow to come from either direction, then valves would be needed on both sides of the Levee.

(d)(7): The purpose of subdivision (d)(7) is to require pressurized pipelines to be confirmed free of leaks during construction by pressure tests, X-ray, or equivalent methods, and to be tested at the end of construction, or any time necessary, upon request of the Board. The purpose of this subdivision is also to require access to the interior of the pipeline for performing periodic pressure tests (and/or visual inspection when approved by the Board) in subsequent years so as to confine the tests or inspections to the length of pipeline within the Levee Right of Way, such as through access ports or flanged apertures or connections. It is necessary to require tests at the end of construction to determine the reliability of the pipeline or conduit to avoid problems of leakage-induced damage to the Levee, and to minimize the possibility of a pipeline or conduit failure after installation which would entail excavation of the Levee Section. Confining the pressure tests to the vicinity of the Levee limits any detected problems to the reach of pipeline near the Levee, which is the area of concern for the Board. Pressure tests are the most reliable method to confirm pipeline integrity, but for some pipelines other tests or visual inspection may be more appropriate. It is necessary to require access to the interior of the pipeline for performing periodic pressure tests (and/or visual inspection when approved by the Board) in subsequent years so as to confine the tests or inspections to the length of pipeline within the Levee Right of Way, such as through access ports or flanged apertures or connections because the access enables the tests and/or inspections to occur without cutting the pipe and potentially compromising its integrity.

(d)(8): The purpose of subdivision (d)(8) is to require that backfill for pipelines crossing over the Levee shall be compacted fill, concrete, or CLSM and that no anti-seepage collars shall be allowed. It is necessary to require that backfill for pipelines crossing over the Levee shall be compacted fill, concrete, or CLSM because these methods prevent or minimize seepage alongside the pipeline. Poorly compacted fill would allow seepage alongside the pipeline. Such seepage can cause erosion of the Levee, and/or landside Levee slope instability and potentially Levee failure. It is necessary to specify that anti-seepage collars are not allowed because they are not allowed by USACE guidance due to a history of poor performance caused by seepage working its way around them.

(d)(9): The purpose of subdivision (d)(9) is to require that pipelines on a Levee slope shall be provided with a minimum twelve (12) inches of soil cover locally on the Levee slope which shall be transitioned horizontally to 10:1 slopes (see Figure 8.05), except where leaving the pipeline exposed on the landside Levee slope is acceptable to the Local Maintaining Agency. The purpose of this subdivision is also to require the applicant to provide additional Levee Right of Way pursuant to section 120(a)(5) of this

division to compensate for the space occupied by the pipeline and/or soil cover on the Levee slope at the Levee Toe. It is necessary to require cover on pipelines on the Levee slope to enable mowing of the Levee slope by the Local Maintaining Agency or to protect the pipeline from damage by burning of the Levee slope vegetation. Burying the pipeline a minimum of twelve (12) inches not only eliminates any possible interference with Levee maintenance or flood fight activities, but also provides protection for the line from potential damage by maintenance equipment. The 10:1 slope transition facilitates use of a mower. However, this is not always an issue and some Local Maintaining Agencies may allow exposed pipelines on the Levee slope because there is little or no interference with their Levee maintenance. When the installation will not interfere with Levee maintenance or flood fight activities, it may not be necessary to bury the pipeline within the Levee slopes. The board will generally accept endorsements of the Local Maintaining Agency as sufficient evidence that a proposed installation will not interfere with maintenance. It is also necessary to require additional Levee Right of Way to offset the loss of Levee Right of Way caused by the pipeline and/or cover fill at the Levee Toe and maintain adequate clearance for maintenance and emergency vehicles.

(d)(10): The purpose of subdivision (d)(10) is to require a minimum pipeline cover over or through the Levee crown of twenty four (24) inches and since it is usually necessary to increase the height of the Levee crown to provide the minimum cover, a gradual transition of fill and Patrol Road surfacing along the longitudinal slope of the crown is required, no steeper than 10h:1v. Where twenty four (24) inches of cover is not practical, a reinforced concrete cover or other engineered cover is required (see Figure 8.05). It is necessary to require twenty four (24) inches of cover to prevent equipment and traffic loads from exceeding the pipeline design limits. It is necessary to require that when the Levee crown must be raised to provide sufficient cover, the longitudinal slope of the crown must be a minimum of ten (10) horizontal to one (1) vertical to provide a smooth transition and eliminate the speed-bump effect. It is necessary to specify that when twenty-four (24) inches of cover is not practical, a concrete cover or other engineer-designed cover is required to protect the pipeline from being overloaded.

(d)(11): The purpose of subdivision (d)(11) is to specify that the slopes of trench walls excavated for the installation of pipelines, conduits, or utility lines that will be backfilled with compacted soil shall be constructed no steeper than 1h:1v, or flatter if required for worker's safety. This requirement does not apply where the backfill will be concrete or CLSM, unless required for worker's safety. It is necessary to specify that slopes of trench walls shall be no steeper than 1h:1v because the overall effective permeability of a Levee can be significantly affected by the excavation of a trench through the Levee. The required slope of the sidewalls of a trench within a Levee will help ensure adequate compaction of the backfill and good bonding with the sidewalls. These conditions are essential to prevent the development of seepage paths through the fill or at the interface of the fill and the trench sidewall. The requirement does not apply for concrete or CLSM because these backfill materials will bond adequately to a vertical sidewall.

(d)(12): The purpose of subdivision (d)(12) is to require the bottom width of trenches excavated for the installation of a pipeline, conduit, or utility line to be a minimum of two (2) feet wider than the exterior diameter of the pipeline, conduit, or utility line or two (2) times the exterior diameter of the pipeline, conduit, or utility line, whichever is greater, unless concrete or CLSM is used. If concrete or CLSM is used

for backfill, the required width shall be a minimum of eight (8) inches wider than the exterior diameter of the pipeline, conduit, or utility line or two (2) times the exterior diameter of the pipeline, conduit, or utility line, whichever is greater, for pipes with an exterior diameter less than two (2) feet; for larger pipelines the required width shall be a minimum of two (2) feet wider than the exterior diameter of the pipeline, conduit, or utility line or one and one-half (1 1/2) times the exterior diameter of the pipeline, conduit, or utility line, whichever is greater. It is necessary to require a minimum bottom width of trenches to allow adequate room for backfill compaction with regular compaction equipment, especially for backfill between the pipeline invert and springline. Adequate compaction of the entire area is necessary to ensure the impermeability of a Levee and to prevent the development of a seepage path alongside the pipeline during high water. It is necessary to specify that different rules apply for concrete and CLSM backfill because vibratory equipment is used instead of compaction equipment and less room is required. The specified minimum width is consistent with the minimum encasement thickness for CLSM and concrete required in other subdivisions of this section.

(d)(13): The purpose of subdivision (d)(13) is to require pipelines, conduits, and utility lines to have a minimum vertical clearance of six (6) inches between them when crossing other pipelines, conduits, or utility lines. It is necessary to require a minimum vertical clearance of six (6) inches between pipelines, conduits, and utility lines to obtain adequate compaction of fill within areas where a newly installed pipeline, conduit or utility line crosses an existing pipeline, conduit, or utility line.

(d)(14): The purpose of subdivision (d)(14) is to require pipelines, conduits, and utility lines installed parallel to each other on or within a Levee Section to be separated with a minimum horizontal clearance of twelve (12) inches, or the exterior diameter of the largest pipeline, conduit, or utility line, whichever is larger. It is necessary to require a minimum separation of twelve (12) inches, or the diameter of the largest pipeline, conduit or utility line, whichever is larger to provide adequate spacing between pipelines for compaction of backfill around all pipelines to ensure the impermeability and stability of the Levee and to prevent the development of seepage paths along the pipelines. This separation also provides ability to carefully remove a pipeline without damaging nearby pipelines when removal is required.

(d)(15): The purpose of subdivision (d)(15) is to require pressurized pipelines crossing over the Levee or within the Levee above the DWSE to be limited to coated steel and high-density polyethylene unless it can be shown to the satisfaction of the Board that the preferred pipe material is equivalent or superior. The Board may deny use of high-density polyethylene where significant Levee settlement is expected. It is necessary to limit pipeline materials crossing over the Levee or within the Levee to materials with proven longevity and capable of having welded joints required by other subdivisions of this section. Only steel and high-density polyethylene have been shown to meet these requirements, but in the future other materials may become acceptable to the Board. It is necessary to specify that the Board may deny use of high-density polyethylene where significant Levee settlement is expected because this type of pipe must be encased in concrete, greatly restricting its flexibility and potentially resulting in a pipe rupture that could erode the Levee or saturate the Levee slope and cause slope instability. The concrete encasement does not need to be reinforced, so it too would be subject to significant cracking.

(d)(16): The purpose of subdivision (d(16) is to require steel pipelines to have butt-welded connections, except at structures and except that a minimal number of flexible bolted joints may be allowed for steel pipelines in Levees expected to experience significant settlement after installation of the pipeline (e.g., new Levees, and Levees recently raised or enlarged). The purpose of this subdivision is also require protection for bolted connections when using soil cover, so that each bolted joint is protected from soil contact within a vault that can be accessed for inspection. Seals between the vault and pipeline shall be designed to accommodate deflection and differential settlement without damage to the seal, vault, or pipeline. The purpose of this subdivision is also to require a report prepared by a California registered civil engineer to be submitted for the Board's approval that justifies the need for any flexible bolted joints and estimates expected settlement of the Levee and pipeline, and deflections at the bolted joints and vaults. It is necessary to require steel pipelines to have butt-welded connections because these connections provide for a uniformly strong pipe without weaknesses at the connections or potential for connections becoming loose. Butt-welded joints will withstand all anticipated loadings without losing joint integrity. However, at structures and for Levees subject to significant settlement after installation of the pipeline, it is necessary to provide flexible bolted connections that allow for some deflection without damage to the joint or pipeline. Without such flexible joints, differential settlement would likely damage the pipeline. It is necessary to protect the bolted connections, when buried in the Levee slope, from damage and rust caused by soil cover – by enclosing the connections within a vault that is designed to accommodate the pipeline deflection. It is necessary to require a report prepared by a California registered civil engineer to be submitted for the Board's approval that justifies the need for any flexible bolted joints and estimates expected settlement of the Levee and pipeline, and deflections at the bolted joints and vaults because the flexible bolted connections need to accommodate the future Levee settlement to avoid damage to the pipeline, joints, and vault. It is necessary to specify that the report on Levee settlement and flexible bolted joints shall be prepared by a California registered civil engineer to ensure an adequate calculations and design. An improper analysis or design could result in a damaged pipeline or joints, or unnecessary bolted joints, increasing the risk to public safety and possibly to Levee maintenance and emergency personnel.

(d)(17): The purpose of subdivision (d)(17) is to require that steel and high-density polyethylene pipeline connections at structures shall be designed to accommodate deflection and differential settlement without leaking. It is necessary to require special attention where pipelines connect to structures because there is the possibility of differential settlement between the Levee and the structure which will deform or break the pipeline if not properly addressed. A leaking pipeline can damage the Levee by erosion or saturation of the Levee slope, decreasing its stability.

(d)(18): The purpose of subdivision (d)(18) is to specify that high-density polyethylene pipeline joints must be electrofusion butt-welded (ASTM Standard F1055-16a, dated 2016, or equivalent). It is necessary to require electrofusion butt-welded joints for high-density polyethylene pipeline to provide a pipeline of uniform strength without weaknesses at the connections or potential for connections becoming loose. Butt-welded joints will withstand all anticipated loadings without losing joint integrity. ASTM has developed an acceptable standard for electrofusion butt-welding of high-density polyethylene pipe.

(d)(19): The purpose of this subdivision is to require all pressurized pipelines open to the Stream to have a siphon breaker with protective housing. The siphon breaker shall be located off the Levee crown roadway near the waterside Levee shoulder, landward of any positive closure device. It is necessary to require a siphon breaker to enable stoppage of flow in the pipeline after a siphon has begun, even for pipes above the Levee crown and even if there is a positive closure device. For pipes above the Levee crown a positive closure device is not required; once a siphon has begun it will continue until broken. For pipes below the Levee crown, a siphon breaker located landward of the positive closure device can supply air needed to prevent a vacuum in the pipe when closing the positive closure device. A vacuum could enable outside pressure to crush the pipe, which can occur with large pipes. Siphon breakers installed within the Levee crown must extend above the Levee crown in order to function. The section extending above the Levee crown must be installed off the crown roadway to prevent it from being damaged by maintenance equipment and other traffic using the roadway. It is necessary to require a protective housing covering the extended section to prevent damage to the section by maintenance equipment used on Levee slopes.

(d)(20): The purpose of subdivision (d)(20) is to require electrical lines of greater than twenty four (24) volts to be protected with schedule 40 PVC conduit, or equivalent, encased in concrete with a minimum thickness of four (4) inches or one-half (1/2) times the conduit exterior diameter, whichever is greater, for conduits with an exterior diameter less than two (2) feet; for larger conduits the minimum thickness of concrete encasement is one (1) foot or one-quarter (1/4) times the conduit exterior diameter, whichever is greater. CLSM may be used instead of concrete for encasement of an equivalent non-plastic conduit. It is necessary to require high voltage lines (greater than twenty four (24) volts) to be enclosed within a suitable conduit that is also protected by concrete or CLSM to protect Levee maintenance, Levee patrol and flood fight personnel from a potential electrical hazard and to protect the electrical line from being damaged by Levee maintenance and flood fight personnel. Digging with hand tools or heavy equipment could easily cut through an unencased conduit. Reasonably safe protection is provided by a robust PVC conduit encased in concrete. It is necessary to specify minimum encasement thickness in proportion to the pipe diameter so as to not have inappropriately thin encasement that is easily damaged or penetrated. It is necessary to specify that CLSM may be used if the conduit is not made of plastic.

(d)(21): The purpose of subdivision (d)(21) is to require communication lines and electrical lines of twenty four (24) volts or less buried within the Levee Right of Way to be protected within a conduit and encased in concrete or CLSM with a minimum thickness of four (4) inches or one-half (1/2) times the conduit exterior diameter, whichever is greater, for pipes with an exterior diameter less than two (2) feet; for larger conduits the minimum thickness of concrete encasement is one (1) foot or one-quarter (1/4) times the conduit exterior diameter, whichever is greater. CLSM may only be used for encasing non-plastic conduit. It is necessary to require low voltage lines (twenty four (24) volts or less) to be enclosed within a suitable conduit that is also protected by concrete or CLSM to protect the communication line or low voltage electrical line from being damaged by Levee maintenance and flood fight personnel. Digging with hand tools or heavy equipment could easily cut through an unencased conduit. Reasonably safe protection is provided by a placing the line in a conduit encased in concrete or CLSM. It is necessary to specify minimum encasement thickness in proportion to the pipe diameter so as

to not have inappropriately thin encasement that is easily damaged or penetrated. It is necessary to specify that CLSM may be used if the conduit is not made of plastic.

(d)(22): The purpose of this subdivision is to require that existing Levee erosion protection shall be restored by the Permittee if it is damaged during the installation of a pipeline, conduit, or utility line. It is necessary to require the Permittee to restore any Levee erosion protection that has been damaged during the installation of a pipeline, conduit or utility line because erosion protection that has been damaged or destroyed during the installation of a pipeline, conduit or utility line should not be neglected, and should be restored to ensure the stability and integrity of the Levee.

(d)(23): The purpose of subdivision (d)(23) is to require the Permittee to provide for replanting or reseeding Levee slopes to restore sod, grasses, or other non-woody ground covers that are destroyed or damaged during the installation of a pipeline, conduit, or utility line. It is necessary to require the Permittee to provide for restoration of appropriate ground covers on both landside and waterside Levee slopes because they serve as protection against erosion to help ensure Levee stability and are aesthetically and environmentally appropriate. As long as the Permittee provides for the restoration, the work need not be performed by the Permittee if arrangements are made with the Local Maintaining Agency.

(d)(24): The purpose of subdivision (d)(24) is to require the Permittee to provide for restoring the Levee crown surfacing damaged by the installation of a pipeline, conduit, or utility line. It is necessary to require the Permittee to provide for restoration of damaged Levee crown surfacing to provide for all weather access by Levee maintenance, patrol, and flood fight vehicles and equipment. As long as the Permittee provides for the restoration, the work need not be performed by the Permittee if arrangements are made with the Local Maintaining Agency or the agency responsible for road maintenance.

(d)(25): The purpose of subdivision (d)(25) is to require that within the Levee Right of Way any excavation for the installation of a pipeline, conduit, or utility line shall be backfilled in less than six (6) inch layers with approved material and compacted as per section 120(a) of this division, except for backfill accomplished with concrete or CLSM. It is necessary to require placement and compaction of fill material in layer of less than six (6) inches thickness with approved material and compaction per section (120(a) of this division because this will result in a homogeneous, well-compacted Levee with good bonding between the existing material and fill, and eliminates a potential plane of weakness within the Levee Section. The moisture content range of the fill material is important in aiding compaction and reducing permeability. At the time of compaction, the moisture content of the embankment material should be such that the specified relative compaction will be obtained and the Levee will be in a firm and stable condition.

(d)(26): The purpose of this subdivision is to require that no new pipeline penetrations shall be installed through a seepage cutoff wall below the DWSE. It is necessary to require no new pipeline penetrations through a seepage cutoff wall below the DWSE because this would damage the seepage cutoff wall, allowing seepage past the wall. It is very difficult to establish a good seal between the pipeline and the seepage cutoff wall below the DWSE. If a good seal is not established, seepage could result in boils that jeopardize Levee integrity.

(e): The purpose of subdivision (e) is to establish additional conditions for gravity drain pipelines crossing the Levee and requiring installation by the open cut method. It is necessary to require the open cut method for installing gravity drain pipelines to ensure that the installation does not create a problematic seepage path alongside the pipeline and to enable inspection of the construction. Open cuts can be backfilled and adequately compacted to ensure the impermeability and overall structural integrity of the Levee.

(e)(1): The purpose of subdivision (e)(1) is to require the gravity drain pipeline to be maintained by a public agency that can demonstrate good long-term capability for maintenance of the pipeline. It is necessary to require the pipeline to be maintained by a public agency that can demonstrate good long-term capability for maintenance of the pipeline because the pipeline will be installed below the DWSE. Pipelines installed below the DWSE increase the risk of seepage through the Levee during high water, and also increase the potential damage that could occur if the pipeline or conduit ruptured. For these reasons such installations must be limited to those situations in which a responsible public agency will maintain the installation in perpetuity. Efficient maintenance extends the life span of pipelines, conduits and utility lines and, thereby, prolongs the intrusive excavation of a Levee to repair or replace such facilities.

(e)(2): The purpose of subdivision (e)(2) is to require gravity drain pipelines to be constructed of reinforced concrete and equipped with a sluice gate or equivalent positive closure device at the waterside edge of the Levee crown and a flap gate at the waterside outlet. It is necessary to require gravity drain pipelines to be constructed of reinforced concrete because they need to have an exceptionally long service life, which is provided by reinforced concrete pipe, to avoid repair and replacement as long as possible. Repair and replacement involves intrusive excavation of the Levee. It is necessary to require gravity drain pipelines to be equipped with a sluice gate or equivalent positive closure device at the waterside edge of the Levee crown and a flap gate at the waterside outlet because a flap gate is needed to keep water from the Stream flowing back through the pipeline to the landside of the Levee during high water and the sluice gate is required to do the same in the event the flap gate is stuck open (or partly open) due to debris. Also the sluice gate can provide vertical access for inspection and isolation of the pipeline between the flap gate and the sluice gate if repairs are needed.

(e)(3): The purpose of subdivision (e)(3) is to establish that unless CLSM is specifically approved as backfill for the entire length of the gravity drain pipeline, seepage along gravity drain pipelines shall be controlled by constructing a minimum eighteen (18) inch thick drainage layer around the landside one third (1/3) of the length of the pipeline where landside Levee zoning does not provide for such drainage fill, constructed in accordance with EM 1110-2-1913 and EM 1110-2-2902. The purpose of this subdivision is also to require the drainage layer to have sufficient permeability to convey seepage and filter compatibility with adjacent Levee and/or foundation materials that it contacts. If a zoned drainage layer is required to achieve this, each layer shall be a minimum of nine (9) inches thick. The terminus of the drainage layer near the landside Levee Toe shall be designed and constructed to allow seepage to exit freely without transporting particles, and to prevent long term contamination of the drainage material. The purpose of this subdivision is also to require that seepage along the waterward two thirds (2/3) of the pipeline shall be controlled by any of three methods.

It is necessary to establish that unless CLSM is specifically approved as backfill for the entire length of the gravity drain pipeline, seepage along gravity drain pipelines shall be controlled by constructing a minimum eighteen (18) inch thick drainage layer around the landside one third (1/3) of the length of the pipeline where landside Levee zoning does not provide for such drainage fill, constructed in accordance with EM 1110-2-1913 and EM 1110-2-2902 because this drainage layer is required by USACE guidance to prevent uncontrolled seepage alongside the pipeline, which could erode the Levee and lead to Levee failure. However, USACE has also approved use of CLSM to encase the entire length of some gravity drain pipelines, providing a possible alternative to the drainage layer. CLSM can provide a good seal between existing material and the pipeline, adequately controlling seepage alongside the pipeline.

It is necessary to require the drainage layer to have sufficient permeability to convey seepage and filter compatibility with adjacent Levee and/or foundation materials that it contacts because it will not relieve seepage pressures alongside the pipeline if it does not have adequate permeability, much greater than the permeability of surrounding materials.

It is necessary to specify that if a zoned drainage layer is required to achieve sufficient permeability, each layer shall be a minimum of nine (9) inches thick because thinner layers could not be reliably constructed to perform as intended.

It is necessary to require the terminus of the drainage layer near the landside Levee Toe to be designed and constructed to allow seepage to exit freely without transporting particles, and to prevent long term contamination of the drainage material because the seepage needs to exit freely to provide full pressure relief and particle migration needs to be prevented because such internal erosion could quickly lead to a major void and heavy seepage that leads to Levee failure. Long term contamination of the drainage layer(s) can occur if the design does not provide filter compatibility with adjacent materials. Such contamination would reduce the permeability of the drainage layer(s) and ultimately prevent relief of excess seepage pressure.

(e)(3)(A): It is necessary to require that, as one option for preventing seepage alongside the gravity drain pipeline, the pipeline is encased in reinforced concrete cast against firm undisturbed earth because properly designed and constructed reinforced concrete can withstand the anticipated loadings without damage, has a very long service life, and when cast against undisturbed earth provides a permanent integral bond between the concrete and the undisturbed earth that minimizes seepage alongside the pipeline.

(e)(3)(B): It is necessary to require that, as one option for preventing seepage alongside the gravity drain pipeline, the pipeline is encased in reinforced concrete battered walls at an inclination of one (1) horizontal to four (4) vertical or flatter to facilitate compaction of soil against the structure because properly designed and constructed reinforced concrete can withstand the anticipated loadings without damage, has a very long service life, and the battering, or inclination, of conduit sidewalls provides the horizontal component desired during backfill compaction to provide for adequate bonding between the concrete structure and the backfill material to minimize seepage alongside the pipeline.

(e)(3)(C): It is necessary to require that, as one option for preventing seepage alongside the gravity drain pipeline, the pipeline is encased in reinforced concrete or made of reinforced concrete pipe, backfilled

with CLSM placed against undisturbed earth to at least one (1) foot above the top of the reinforced concrete because properly designed and constructed reinforced concrete and reinforced concrete pipe can withstand the anticipated loadings without damage, provide a very long service life, and when completely encased with CLSM placed against undisturbed earth, provides a permanent integral bond between the CLSM and the undisturbed earth that minimizes seepage alongside the pipeline as well as providing a reasonably level bed for placement and compaction of the overlying fill.

(e)(4): The purpose of subdivision (e)(4) is to require that Permitted Work shall commence and be completed prior to the Flood Season unless a Time Variance Request is approved by the Chief Engineer. It is necessary to require Permitted Work be for installation of a gravity drain pipeline be performed entirely outside of Flood Season because it involves a major cut through the Levee that makes the Levee ineffective until the Levee is restored at the end of construction. Depending on Stream, reservoir, weather conditions, and forecasts it can be appropriate for the Chief Engineer to approve a Time Variance Request to allow work to begin late in the Flood Season or, if work falls behind schedule, to complete the work early in the Flood Season.

(e)(5): The purpose of subdivision (e)(5) is to require that Levees located within the Delta Lowlands may only be cut below the DWSE after appropriate engineering studies are performed and approved. It is necessary to require engineering studies before cutting a Levee in the Delta Lowlands below the DWSE because within the Delta Lowlands, the normal water surface elevation is above the land surface and close to flood stage. In addition, adequate compaction of fill in an open-cut within Delta Lowlands Levees is difficult, and in some areas can overload the foundation – inducing settlement and/or slope instability, because the Levees and Levee foundations are weak and compressible. Engineering studies are necessary to ensure that these concerns are resolved.

(f): The purpose of subdivision (f) is to establish additional conditions for pipelines, conduits, and utility lines crossing a Stream channel and/or a Levee by tunneling, jacking, or boring (boring is also known as horizontal directional drilling) under the Stream channel and/or under the Levee embankment. Many of these conditions are recommended in the June 8, 2005 Technical Memorandum, Trenchless Crossings at Levees, Technical Information to Support The Reclamation Board Encroachment Permit Reviews, prepared for the Division of Flood Management by HDR and Kleinfelder.

(f)(1): The purpose of subdivision (f)(1) is to require that the pipeline, conduit, or utility line shall not pass through the Levee embankment using tunneling, jacking, or boring. It is necessary to require that the pipeline not be tunneled, jacked, or bored through a Levee embankment because the open-cut method is available for installation through a Levee embankment and provides much greater certainty about long term prevention of seepage problems alongside the pipeline. It is difficult with tunneling, jacking, and boring to make a tight seal along the pipeline that prevents seepage and to verify in the field that the seal is being achieved.

(f)(2): The purpose of subdivision (f)(2) is to require pipelines, conduits, or utility lines installed through a Levee foundation or other flood control project feature foundation to be designed by a California registered civil engineer. The design shall include an analysis of the pipe's ability to sustain installation load and long-term loads and comply with USACE guidance in EM 1110-2-1913, EM 1110-2-2902, and ERDC/GSL TR-02-9. The purpose of this subdivision is also to specify additional requirements applicable

to tunneling, jacking, and boring. It is necessary to require the pipeline, conduit, or utility line installed through a Levee foundation or other flood control project feature foundation to be designed by a California registered civil engineer to ensure that the installation does not create a seepage problem alongside the pipeline, conduit, or utility line. Pipelines installed by tunneling, jacking, and boring below a Levee have significant potential to create a seepage path alongside the pipeline and allow boils and piping of materials landward of the Levee that can lead to Levee failure. Pipelines installed beneath Levees are also subject to significant loading during and after installation that need to be analyzed, in compliance with USACE guidance in EM 1110-2-1913, EM 1110-2-2902, and ERDC/GSL TR-02-9. Such analyses are civil engineering and appropriate only for civil engineers to perform. It is necessary to specify additional requirements applicable to tunneling, jacking, and boring to avoid damage to the Levee, unintended release of Stream flows through the tunnel or borehole, and seepage problems alongside the installation.

(f)(2)(A): It is necessary to require that the pipeline, conduit, or utility line installed by tunneling or jacking shall be at least thirty (30) feet under the Levee embankment and that borings shall be a minimum of fifty (50) feet below the Levee embankment and channel unless less depth is justified with a geotechnical analysis, but the depth shall not be less than thirty (30) feet because these depths provide adequate separation between the installation and the base of the Levee embankment and the channel thalweg. Less separation can result in damage to the Levee by settlement or by hydraulic fracturing or uplift caused by high grouting pressures used to seal around the pipeline. Less separation can result in an unintended connection between the Stream and the pipeline installation that leads to Stream water entering the pipeline installation and exiting on the landward side of the Levee. Borings (also known as horizontal directional drilling) can easily be installed deeper to provide additional separation due to the great horizontal distances of such installations. These types of installations are performed without visible observation of the pipe or surrounding materials and it is possible that they can encounter anomalies such as buried rotten trees that provide a connection to the channel thalweg or be misdirected by adverse ground conditions. It is necessary to specify that greater than fifty (50) feet depth may be required for borings over two thousand (2,000) feet long or when installed in adverse ground conditions to provide additional confidence that adequate separation is achieved. If a geotechnical analysis is provided that justifies shallower depths, the Board may reduce the required separation.

(f)(2)(B): It is necessary to require detailed subsurface investigations along the proposed tunneling, jacking, or boring site because the construction parameters such as pressures, setback distances, and depth of cover are based on the stratigraphy, which is established through detailed subsurface investigation. For instance, without knowing the stratigraphy it is possible to damage the Levee by hydraulic fracturing from excessive fluid pressures during installation.

(f)(2)(C): It is necessary to require grout improvements and dewatering plans associated with the pipe installation to be designed by a California registered civil engineer experienced in such works and plans for the ground improvements and/or dewatering to be submitted to the Board for approval prior to start of construction to ensure that the grouting and dewatering do not cause damage to the Levee by

jacking, hydraulic fracturing, or settlement. Such analyses are civil engineering and appropriate only for civil engineers to perform.

(f)(2)(D): It is necessary to establish that the Board may require the Permittee to complete a technical questionnaire regarding the proposed pipeline installation, construction methods, installer experience, and other information because the completed questionnaire can be helpful to the Board for evaluating the proposed project's potential effects on the Levee and Floodway to make sure that it does not create a risk to public safety.

(f)(2)(E): It is necessary to require that the Levee shall be monitored for movement during and after pipe installation and any associated settlement due to pipe installation shall be repaired at the Permittee's expense because it is possible that movement of the Levee will result from the installation and the Permittee, instead of the taxpayer, should be responsible for any repairs. It is necessary to require that monitoring and remediation plans shall be approved by the Board prior to installation and a survey shall be performed at the Permittee's expense to establish baseline conditions at and near the Levee crossing prior to start of construction because a baseline needs to be established for comparison during and after construction to enable measurement of any movement. Poorly designed monitoring plans can miss Levee movement that occurs, and the Permittee and the Board may disagree about remediation – such disagreement should be resolved prior to start of work or the work should not occur. Movement of a Levee caused by installation of a pipeline is cause for concern about damage to the Levee's integrity.

(f)(2)(F): It is necessary to require a contingency plan for anticipated adverse conditions and unintended occurrences during installation that could adversely impact Levee integrity to be submitted to the Board for approval prior to start of construction because adverse conditions and unintended occurrences sometimes occur during subsurface installations and the Permittee and the Board may disagree about how they must be addressed – such disagreement should be resolved prior to start of work or the work should not occur. A contingency plan provides readily available and actionable ways to address potential problems.

(f)(2)(G): It is necessary to require thorough documentation of the progress of the installation that includes notes on steering and tracking, significant events, rig performance parameters such as thrust and torque, times, distances, and other relevant data because this information can be helpful in determining the cause of any incident and in establishing future requirements for installations to protect Levees from damage. It is necessary to require the documentation to be made available to the Board upon request because it is not helpful to the Board if it is not made available for Board review.

(f)(2)(H): It is necessary to require that shaft entrance and exit points for tunneling and jacking shall be located outside of the Levee Right of Way and at least twenty (20) feet beyond the Projected Levee Section and further as needed to keep all shaft components at least twenty (20) feet from the Projected Levee Section because it is important to set back the entrance and exit shafts sufficiently to prevent Levee slope instability and to keep components sufficiently distant to maintain clearance from the Levee for maintenance vehicles, equipment, and flood fighting.

(f)(2)(I): It is necessary to specify that fluid jetting is not allowed when crossing through the Levee Right of Way because the tunnel size created by fluid jetting is not well controlled and can create excessive

voids around the pipeline that can compromise the Levee foundation, potentially resulting in settlement and seepage problems alongside the pipeline. It is difficult to verify complete filling of the voids by grouting and excessive grout pressure may be required – potentially causing uplift or hydraulic fracturing in the Levee foundation.

(f)(2)(J): The purpose of subdivision (f)(2)(J) is require evaluations and specific measures to mitigate the risk of hydraulic fracturing due to high fluid pressures used for excavation during the boring process and the risk of borehole collapse due to high fluid pressures. It is necessary to perform these evaluations and use measures to mitigate the risk of hydraulic fracturing because hydraulic fracturing in the Levee and/or Levee foundation can create preferential seepage paths and slope instability. It is necessary to perform these evaluations and use measures to mitigate the risk of borehole collapse because this can lead to settlement of the Levee and a preferential seepage path.

(f)(2)(J)(i): It is necessary require pressure in the annular space of the borehole to remain below the maximum allowable pressure throughout the drilling process to minimize the potential for losing drilling mud to the surface because loss of mud is indicative of potential hydraulic fracturing in the Levee foundation that can create seepage paths and Levee instability. It is necessary to require consideration, when establishing the maximum allowable drilling fluid pressure, of the internal friction angle of the soil, the shear modulus of the soil, the depth of the soil cover, and the initial pore pressure. Maximum allowable drilling fluid pressures are a function of pore pressure, the pressure required to counterbalance the effective normal stresses acting around the bore, and the undrained shear strength of the soil. It is necessary for the pressure in the annular space of the bore to remain below the maximum allowable pressure throughout the drilling process to minimize the potential for initiating plastic yield and losing drilling mud to the surface.

(f)(2)(J)(ii): It is necessary to specify that the minimum required drilling fluid pressure shall be maintained above the groundwater pressure to prevent collapse of the borehole because low drilling fluid pressure can severely hinder the drilling process and, in some cases, make the pipe installation impossible. It is undesirable to abandon an incomplete installation within the Levee Right of Way and potentially create a new seepage path or cause Levee settlement.

(f)(2)(J)(iii): It is necessary to require the minimum required drilling fluid pressure and the maximum allowable drilling fluid pressure to be estimated prior to construction and clearly stated in the contract documents or in the contractor's submittals because this establishes a range of desirable fluid pressures and provides assurance that the operator is familiar with these fluid pressures, so that he/she is more likely to confine pressures within this range, and achieve a successful installation without damage to the Levee or Levee foundation.

(f)(2)(K): The purpose of subdivision (f)(2)(K) is to specify additional requirements for boring installations.

(f)(2)(K)(i): It is necessary to require that during the drilling process the fluid pressure in the annular space shall be monitored because this fluid pressure should be maintained within the estimated range of desirable fluid pressures. It is necessary to recommend that an external pressure measuring device shall be installed when boring beneath flood protection structures because it is important to have

accurate pressure readings when boring beneath flood protection structures to avoid excessively low or high fluid pressures.

(f)(2)(K)(ii): It is necessary to require that the drill shall not penetrate the top stratum within three hundred (300) feet from the Levee centerline on the landside because this distance is required to ensure that the required depth is achieved beneath the Levee. It is necessary to require that when entering or exiting the top stratum on the waterside of the Levee, the entrance or exit shall be at least twenty (20) feet farther waterward of the waterside Levee Toe than the distance between the waterside Levee Toe and an eroding bank line that meets minimum Levee slope stability requirements because this is required by USACE guidance in EM 1110-2-1913 to achieve sufficient separation from the Levee without decreasing bank stability.

(f)(2)(K)(iii): It is necessary to require that the minimum depth of cover for the pipeline, conduit, or utility line shall be established by comparing the maximum borehole pressures to the drilling pressures and the depth of scour as per section 123(c)(1) of this division because the cover provides confinement that resists hydraulic fracturing by the borehole fluid and the depth of scour needs to be considered when establishing the cover requirement for the pipeline so that the pipeline does not become exposed in the Floodway. An exposed pipeline can become an obstruction, catch debris, and rupture – exposing the Floodway to the contents of the pipeline and allowing Stream water to enter the pipeline and possibly exit landward of the Levee causing unintended flood damage.

(f)(2)(K)(iv): It is necessary to require that the speed of boring shall be controlled to maintain the planned line and grade and drill bit advance rates shall be limited to prevent pressure buildup because improper speed control can result in fluid pressures getting out of the desirable range and significant deviations in line and grade can occur, potentially resulting in inadequate cover for the pipeline.

(f)(2)(K)(v): It is necessary to require the annular space between the boring and pipeline to be grouted with cement or a cement-bentonite grout mixture, with grout pressures controlled to prevent hydraulic fracturing of overlying soils because the grout expels the mixture drilling fluid and mud, providing a watertight seal between the pipe and native soils required for preventing a preferential seepage path alongside the pipeline. It is necessary to control grout pressure to prevent hydraulic fracturing of the Levee foundation, leading to preferential seepage paths, and possibly uplift of the Levee.

(f)(2)(K)(vi): It is necessary to require the design depth of the pipeline, whenever feasible, to remain below the water table when boring within a lateral distance of twenty five (25) feet from the Levee Toe because pore water pressures below the water table tend to counterbalance drilling fluid pressures, providing additional resistance to hydraulic fracturing.

(f)(2)(K)(vii): It is necessary to require boring installations outside of the Delta Lowlands to have containment cells adequate to hold heavy seepage along the borehole coming from the Stream, constructed at the points of entrance and exit when the installation is less than seventy (70) feet below the streambed and the installation occurs during the Flood Season, except as may be provided through a Time Variance Request granted pursuant to section 112 of this division, because during high water (which can occur any time during Flood Season) if a connection develops between the borehole and the streambed above the borehole, flood waters could enter the borehole and exit landward of the Levee at

the entrance and/or exit point. This would result in flooding landward of the Levee and internal erosion of the borehole could proceed rapidly, leading to very high flood flows through the borehole. This concern can be addressed to installing the pipeline very deep beneath the streambed, seventy (70) feet of more, deeper than any buried rotten tree or other vertical anomaly could go and allowing for the fact that the process of boring does not allow visual observation of the depth of cover. This concern can also be addressed by constructing containment cells at the entrance and exit points to confine and equalize any floodwaters that reach them through the compromised borehole. It is necessary to specify that the containment cells shall be constructed to the elevation of the DWSE that applies at the Levee crossing because flooding of the containment cells could reach this elevation.

(f)(2)(K)(viii): It is necessary to require boring installations under Levees in the Delta Lowlands to have containment cells adequate to hold heavy seepage along the borehole coming from the Stream, constructed at the points of entrance and exit when the installation is less than seventy (70) feet below the streambed because if a connection develops between the borehole and the streambed above the borehole, flood waters could enter the borehole and exit landward of the Levee at the entrance and/or exit point. In the delta Lowlands this would result in flooding landward of the Levee at any time of year and internal erosion of the borehole could proceed rapidly, leading to very high flood flows through the borehole. This concern can be addressed to installing the pipeline very deep beneath the streambed, seventy (70) feet of more, deeper than any buried rotten tree or other vertical anomaly could go and allowing for the fact that the process of boring does not allow visual observation of the depth of cover. In addition the light, weak soils common to the Delta Lowlands increase the likelihood of hydraulic fracturing – which can be mitigated by having deep cover over the borehole. This concern can also be addressed by constructing containment cells at the entrance and exit points to confine and equalize any floodwaters that reach them through the compromised borehole. It is necessary to require the containment cells to be constructed to the elevation of the Stream stage at high tide that could be expected during the time of installation to avoid overtopping of the containment cells if they are filled. It is necessary to specify that during Flood Season the DWSE that applies at the Levee crossing could be expected because flooding of the containment cells could reach this elevation. It is necessary to require that the potential for migration of drilling fluid upward through light, weak soils needs to be addressed in the contingency plan because light, weak soils are common throughout the Delta Lowlands.

(f)(2)(K)(ix): It is necessary to require that evidence of any drilling fluid returning to the surface or any surface fracturing shall require complete repair of the affected blanket layer, Levee, and flood control project feature in accordance with Board Standards because the blanket layer is important for controlling Levee underseepage and preventing boils that could cause Levee failure. Any damage to the Levee or flood control project feature must be repaired in accordance with Board Standards to restore full functionality of the feature and not reduce public safety.

(f)(2)(K)(x): It is necessary to require only experienced operators who have “Proof of Training” for horizontal directional drilling by the North American Society of Trenchless Technology to operate the drilling equipment within the Levee Right of Way and within and under the Floodway because operator error can cause the fluid pressures to get outside of the desired range, resulting in a failed installation or hydraulic fracturing that creates preferential seepage paths, or cause the drill head to stray from the

intended course and result in a pipeline with inadequate cover, possibly allowing a seepage path from the streambed into the borehole. Experienced operators with "Proof of Training" for horizontal directional drilling by the North American Society of Trenchless Technology have demonstrated their ability to operate the drill properly. This is recommended in USACE guidance per ERDC/GSL TR-02-09, Guidelines for Installation of Utilities Beneath Corps of Engineers Levees Using Horizontal Directional Drilling.

(f)(2)(L): It is necessary to establish that a Levee underseepage analysis may be required by the Board where the installation penetrates a blanket layer that may be important for Levee underseepage performance because penetration of a blanket layer, especially a thin blanket layer, can allow for boils to form during high water – progressively carrying away Levee foundation material and possibly causing Levee failure. The blanket layer is the top stratum or clayey or silty soil extending waterward and landward of the Levee that covers more permeable layers beneath.

(f)(2)(M): It is necessary to require that the pipeline shall not penetrate through a cutoff wall that has been installed beneath the Levee embankment, or that is planned for installation. The penetration must be at least five (5) feet lower than the lowest elevation of the cutoff wall because this would damage the seepage cutoff wall, allowing seepage past the wall. It is very difficult to establish a good seal between the pipeline and the seepage cutoff wall below the DWSE. If a good seal is not established, seepage could result in boils that jeopardize Levee integrity. It is necessary to require five (5) feet of clearance below the base of the cutoff wall because the actual base of the cutoff wall is not known with high accuracy due to the construction methods used, the boring may deviate from the planned course, and considering that the process of tunneling, jacking, or boring may not allow visual observation of the depth of the installation.

(f)(2)(N): It is necessary to require any evidence of impending danger to the Levee or flood control project feature to be immediately reported to the Board and if unplanned deviations from the planned installation occur during installation, the installation shall immediately cease, and the issue shall be reported to the Board because the first priority is to avoid damage to the Levee or flood control project feature if possible and unplanned deviations can present a risk to the Levee or flood control project feature, especially if the deviations result in a shallower borehole than planned or excessive fluid pressures are occurring. Ceasing operations and reporting the issue to the Board enables the Board and the Permittee to decide how to proceed with minimal risk to the Levee or flood control project feature. It is necessary to establish that, if required by the Board, all equipment shall be removed and the entire installation shall be grouted because in some cases the damage may be imminent or already starting and it will be necessary to abandon and grout the borehole so that it does not provide a new preferential seepage path or collapse and cause Levee settlement.

(f)(2)(O): It is necessary to require for tunneling and jacking, the annular space between the casing and the carrier pipe should be filled with grout from the bottom using "pull back tubes" because this method can reliably fill the annular space between the pipe and the carrier pipe and avoid a preferential seepage path along the annular space. It is necessary to specify that the volume of the space to be filled should be calculated and the material being placed should be measured and monitored as it is placed because actual grout usage may be significantly less than the estimate, which would indicate that voids remain

and secondary grouting will be required. It is necessary to specify that the measurements should include volume, pressure, and flow rate as a minimum because these parameters provide an indication of how successful the grouting is and significant deviations in some places suggest that those places may require special attention. It is necessary to require a plan prepared by a California registered civil engineer for how this will be accomplished to be provided to the Board for approval before starting the installation to ensure that the grouting plan does not create a seepage problem alongside the pipeline. Such plans for grouting are civil engineering and it is appropriate to require a civil engineer to perform this work. It is necessary to require the plan to include the placing method, mix design, monitoring plan, measurement plan, and measurement devices because these details can affect the success of the plan and they enable the operator and the Board to determine during the operation and afterward if the grouting was successful.

(f)(2)(P): It is necessary to require for tunneling and jacking, a plan prepared by a California registered civil engineer for contact grouting outside of the tunnel which is provided to the Board for approval before starting installation to ensure that the grouting plan does not create a seepage problem alongside the pipeline or cause uplift or settlement of the Levee or flood control project feature. Pipelines installed by tunneling and jacking below a Levee have significant potential to create a seepage path alongside the pipeline and allow boils and piping of materials landward of the Levee that can lead to Levee failure. The purpose of contact grouting is to create a watertight seal along the pipeline and fill all voids without using excessive grout pressure that uplift or fracture the nearby and overlying soils. Such plans for grouting are civil engineering and it is appropriate to require a civil engineer to perform this work. It is necessary to require that the plan address pressure monitoring, injection ports, mix design, and measurement requirements because these details can affect the success of the plan and they enable the operator and the Board to determine during the operation and afterward if the grouting was successful.

(f)(2)(Q): It is necessary to require that installed pipeline shall have watertight joints because leaking joints can allow seepage to carry Levee foundation materials into the pipeline and damage the Levee, potentially resulting in an unexpected Levee failure. Leaking joints can also allow pipe contents to escape into the Levee foundation causing erosion or, in the case of hazardous materials, create an environmental hazard.

(g): The purpose of subdivision (g) is to identify pipe materials allowed on a Levee, within a Levee Section, and under a Levee embankment when designed to resist all anticipated loading conditions and properly installed, and the conditions required for each allowed pipe material.

(g)(1): The purpose of subdivision (g)(1) is to specify that cast-in-place reinforced concrete pipes and box culverts may be used above and below the DWSE if the concrete wall thickness is at least six (6) inches. The purpose of this subdivision is also to establish that the pipeline liner inside of the reinforced concrete is considered to be a form for placement of the concrete and may be constructed of any suitable pipe material that will hold its form for concrete placement and that waterstops shall be installed at the cast-in-place reinforced concrete pipe joints. It is necessary to specify that cast-in-place reinforced concrete pipes and box culverts may be used above and below the DWSE because cast-in-place reinforced concrete pipe when properly designed and constructed can withstand the anticipated

loadings without damage, has a very long service life, and when cast against undisturbed earth provides a permanent integral bond between the concrete and the undisturbed earth that minimizes seepage alongside the pipeline. Repair and replacement involves intrusive excavation of the Levee, which should be prolonged to the extent possible. It is necessary to specify a minimum wall thickness of six (6) inches because this wall thickness is needed to provide adequate cover for the reinforcing steel. It is necessary to establish that the pipeline liner inside of the reinforced concrete is considered to be a form for placement of the concrete and may be constructed of any suitable pipe material that will hold its form for concrete placement because it is not necessary to specify a particular material or thickness for the liner and the engineering calculations should be based on the reinforced concrete alone. It is necessary to require waterstops at the cast-in-place reinforced concrete pipe joints to prevent leakage from the pipe that could erode the Levee or Levee foundation and to prevent seepage from entering the pipe and carrying away Levee or Levee foundation materials, causing damage to the Levee.

(g)(2): The purpose of subdivision (g)(2) is to specify that precast reinforced concrete pipes and box culverts and concrete cylinder pipes may be used above and below the Design Water Surface if certain conditions are met. It is necessary to specify that precast reinforced concrete pipes and box culverts and concrete cylinder pipes may be used above and below the DWSE because precast reinforced concrete pipe, box culverts, and concrete cylinder pipe when properly designed and constructed can withstand the anticipated loadings without damage and have a very long service life. Repair and replacement involves intrusive excavation of the Levee, which should be prolonged to the extent possible.

(g)(2)(A): It is necessary to specify that precast reinforced concrete pipe meets the ASTM C76 dated November 1, 2016 because ASTM Specification C-76 provides the engineering standard loading design for precast reinforced concrete pipe.

(g)(2)(B): It is necessary to specify that precast reinforced concrete pipe joints and precast box culvert joints shall use rubber gaskets because this is the industry standard for providing a watertight seal that prevents leakage into or out of the pipe joints.

(g)(2)(C): It is necessary to specify that the cylinders of concrete cylinder pipes are welded and corrosion protected internally and externally because welding is the proper method of connecting the cylinders to avoid leakage into or out of the pipe joints and the welded steel is subject to corrosion if not protected internally from fluid in the pipe and externally from groundwater and seepage. Corroded joints will eventually leak.

(g)(2)(D): It is necessary to require that when installed below the DWSE, precast reinforced concrete pipes shall be fully encased in CLSM cast against undisturbed earth to at least one (1) foot above the top of the pipeline, except for the landside one third (1/3) of the length of the pipeline where a drainage layer is installed instead of CLSM, because when completely encased with CLSM placed against undisturbed earth, the CLSM provides a permanent integral bond with the undisturbed earth that minimizes seepage alongside the pipeline.

(g)(3): The purpose of subdivision (g)(3) is to specify that steel pipe may be used for all types of pipeline or conduit installations over a Levee or through a Levee above the DWSE if certain conditions are met.

(g)(3)(A): It is necessary to require that the steel pipe is resilient and not materially reduced in quality due to weathering, prior use or other deteriorating conditions because the steel pipe must be of material that is capable of resisting loads without permanent deformation or rupture. Defective or deteriorating steel pipe could deform or rupture under loads, and would also have a reduced life span which would require the early repair or replacement of the pipeline, necessitating unwarranted excavation of the Levee.

(g)(3)(B): It is necessary to require that steel pipe installations are corrosion-proofed externally with a coating of material such as coal–tar enamel, asphalt-dipped wrap, mortar, PVC tape, or polyethylene tape wrapped to a minimum thickness of thirty (30) mils, high solids epoxy, or equivalent because the suggested coating or wrap materials, or any other material which is equivalent or better, must be applied externally to steel pipe to provide protection from the naturally occurring corrosion process. This protection extends the life span of the pipeline and, consequently, reduces the likelihood of pipe failure and forestalls the excavation of the Levee for pipeline replacement.

(g)(3)(C): It is necessary to require that, unless a continuous internal lining of cement, mortar, or equivalent is provided as appropriate for the fluid to be conveyed, new steel pipe installations may convey only non-corrosive material, and water is considered corrosive because experience has shown that water corrodes steel pipelines. Steel pipe without adequate internal lining offers little resistance to abrasion or degradation when conveying water or other corrosive liquids or materials. The interior of the steel pipe will rust, pit, corrode, and lose wall thickness. To extend the service life, reduce intrusive maintenance and ensure the safety of the Levee, internal cement or mortar lining is required in steel pipelines.

(g)(3)(D): The purpose of subdivision (g)(3)(D) is to require that the design calculations shall be submitted to the Board for approval unless the steel pipe meets certain criteria. It is necessary to require design calculations from the California registered civil engineer as required by subdivision (b) of this section to verify that the steel pipe will withstand anticipated loading conditions and not result in damage to the Levee or unnecessary Levee excavation to repair or replace the pipe. However, experience has shown that adequately thick walls for steel pipe, measured as gauge thickness, can eliminate the need to review calculations.

(g)(3)(D)(i): It is necessary to specify that the Board does not need to review design calculations for steel pipe twelve (12) inches in diameter or less that has a wall thickness of at least ten (10) gauge because this is considered to meet design criteria acceptable to the Board and experience has shown this pipe to be sufficiently strong to accommodate normal loadings by overburden fill, vehicles, and heavy equipment provided it has adequate cover as required by subdivision (d) of this section.

(g)(3)(D)(ii): It is necessary to specify that the Board does not need to review design calculations for steel pipe greater than twelve (12) inches and a maximum of thirty (30) inches in diameter that has a wall thickness of at least seven (7) gauge because this is considered to meet design criteria acceptable to the Board and experience has shown this pipe to be sufficiently strong to accommodate normal loadings by overburden fill, vehicles, and heavy equipment provided it has adequate cover as required by subdivision (d) of this section.

(g)(3)(D)(iii): It is necessary to specify that the Board does not need to review design calculations for steel pipe greater than thirty (30) inches and a maximum of forty eight (48) inches in diameter that has a wall thickness of at least three (3) gauge because this is considered to meet design criteria acceptable to the Board and experience has shown this pipe to be sufficiently strong to accommodate normal loadings by overburden fill, vehicles, and heavy equipment provided it has adequate cover as required by subdivision (d) of this section.

(g)(4): The purpose of this subdivision is to specify that electrofusion butt-welded high-density polyethylene pipe may be used for all types of pipeline or conduit installations over a Levee or through a Levee above the DWSE if certain conditions are met. Even though the pipe must be encased in concrete, the encasement does not have to contain reinforcing steel and therefore can develop significant cracking, making the pipe material important. It is necessary to use butt-welded pipe for installations crossing over or through the Levee because the pipe is flexible enough to accommodate Levee movement, except for situations where significant movement can be expected and steel pipe with bolted joints is preferable for accommodating that movement. This makes butt welded pipe a much better choice for installations that cross over or through the Levee that would have sharp angles near the Levee shoulders, by crossing the Levee has potential to create a seepage path during very high water, and would be subject to displacement and stress in the event of movement of the Levee, such as from settlement, earthquake shaking, or slope instability.

(g)(4)(A): It is necessary to require the design calculations, including consideration of Levee settlement, to be submitted to the Board for approval to ensure that all loading conditions and assumptions used in design calculations were adequate and conform to accepted design criteria. Pipes within a Levee Section must be designed to prevent permanent deformation or rupture of the pipe under anticipated loads in order to prevent subsequent damage to the Levee. The Board does not have a long history of experience with high-density polyethylene pipe within Levees that would enable the Board to specify a minimum wall thickness like for steel pipe. Even though the pipe must be encased in concrete, the encasement does not have to contain reinforcing steel and therefore can develop significant cracking, making the pipe material important. Steel pipe with bolted joints that can accommodate differential movement is preferable to high-density polyethylene pipe for pipe crossings on Levees susceptible to significant settlement.

(g)(4)(B): It is necessary to require high-density polyethylene pipe to be encased in concrete within the Levee Section because USACE guidance in EM 1110-2-2902 prohibits plastic pipe within the Levee unless specifically authorized by USACE headquarters. The specific reasons for this prohibition in EM 1110-2-2902 are not detailed, but appear to be based on the limited performance history of plastic pipe, its viscoelastic properties, and its susceptibility to damage from loading. Approval of exceptions by USACE headquarters is typically a time consuming and uncertain process, which can be inconsistent with timely Permit approval requirements under California's Permit Streamlining Act. However, the Sacramento District of USACE has developed special guidance which allows for plastic pipe in the Levee if it is encased in concrete. Concrete encasement strengthens the sidewalls of the plastic pipe and protects the pipe from being overloaded or unintentionally damaged. It is necessary to require protection from ultraviolet radiation because eventually the pipe will be damaged by prolonged exposure to ultraviolet

radiation and become weak and brittle and susceptible to failure. In almost all instances, the required concrete encasement will meet this requirement for ultraviolet radiation protection.

(g)(5): The purpose of subdivision (g)(5) is to specify that high-density polyethylene and other standard pipe materials not subject to corrosion may be used for borings under Levees, upon approval by the Board. It is necessary to specify that high-density polyethylene and other standard pipe materials not subject to corrosion may be used for borings under Levees, upon approval by the Board, because high-density polyethylene is an industry standard pipe for borings that is otherwise precluded by requirements of this section, unless encased in concrete. Other standard pipe materials not subject to corrosion may also be acceptable to the Board if demonstrated to have a history of good performance and successful installation. It is necessary to require that these other standard pipes, like high-density polyethylene, not be subject to corrosion because corrosion would eventually lead to pipe rupture that could damage the Levee and/or Levee foundation. Even if the pipe contents would not cause corrosion, the exterior of the pipe and its corrosion potential must be considered.

(h): The purpose of subdivision (h) is to specify that certain materials are not allowed within the Levee Right of Way for pipelines or conduits used to carry natural gas or fluids.

(h)(1): It is necessary to specify that aluminum pipe is not allowed for these uses because of the relatively rapid rate that aluminum deteriorates when in constant contact with soil, and because of its inability to withstand loads or impact without permanent deformation occurring.

(h)(2): It is necessary to specify that cast iron pipe is not allowed for these uses because cast iron pipe will not flex or elongate to relieve stress but instead will rupture. The loads caused by differential settlement of vehicular traffic and maintenance equipment on and near the Levee can cause cast iron pipes to fail.

(h)(3): It is necessary to specify that pipe with flanges, flexible couplings, or other mechanical couplings, except where needed for accommodating differential settlement at structures and large deflections associated with pipe settlement in a new Levee or recently enlarged Levee if approved by the Board, is not allowed for these uses because thermal forces developed by temperature change in a pipeline, or the differential settlement of a Levee, can cause movement or bending which cannot be tolerated by mechanical couplings. Such movement or bending of a pipeline can cause leakage to develop at mechanical couplings. Consequently, where mechanical couplings are specifically authorized by the Board due to concerns about differential settlement and deflections caused by Levee settlement, they must be designed to be flexible and contained in a vault if the pipeline is buried.

(h)(4): It is necessary to specify that prestressed concrete pipe is not allowed for these uses because experience has demonstrated that prestressed concrete pipe will lose much of its strength over time because the prestressed tendons are subject to corrosion and eventual failure.

CCR Title 23. Article 8. Section 124. Abandoned Pipelines and Conduits

The purpose of section 124 is to establish requirements for abandoned pipelines and conduits. Two principal causes of Levee failure are internal erosion (piping) and slides within the Levee embankment or Levee foundation soils. Contributory causes for some such Levee failures are abandoned pipelines or conduits that remain within the Levee. Leakage from pipelines or conduits, and seepage along the outer

surface of pipelines and conduits during periods of high flows can cause piping of Levee or Levee foundation material. Abandoned pipelines and conduits slowly deteriorate causing loss of strength to withstand overlying load and traffic. A collapsed pipeline or conduit within a Levee can cause differential or excessive settlement of the Levee, or can provide a seepage path that may lead to internal erosion and subsequent failure of the Levee. The structural adequacy of pipelines and conduits within a Levee must be maintained to ensure the continued stability of the Levee.

(a): The purpose of subdivision (a) is to describe the criteria for the removal of pipelines, conduits, utility lines, and appurtenances. It is necessary to specify these criteria because the improper removal of pipelines and conduits could cause potential hazards and damage to the Levee.

(a)(1): It is necessary to specify that except as provided in section 124(b) of this division, Permitted pipelines, conduits, utility lines, and all appurtenances (such as headwalls, pumps, standpipes, or positive closure structures) that are being abandoned and are located within the Levee Right of Way, shall be completely removed, and disposed of outside the Levee Right of Way and Floodway and the Permit surrendered to the Board because abandoned pipelines, conduits and appurtenant facilities must not be allowed to deteriorate to a point of becoming a potential hazard to the stability of a Levee. Pipelines within a Levee must be maintained by the owners to remain in good condition and continue to have adequate strength to withstand loads of overlying fill and loads applied by traffic. A plane of seepage or weakness can be induced within a Levee or Levee foundation by an abandoned, deteriorating pipeline or conduit. To prevent such potential hazards from developing, abandoned pipelines, conduits and appurtenant facilities must be removed from a Levee when practical.

(a)(2): It is necessary to specify that the slopes of trench walls excavated to remove an abandoned pipeline or conduit from within the Levee Right of Way shall be no steeper than 1h:1v, or flatter if required for worker's safety because serious damage to the Levee can be caused by inadequately compacting backfill material. A side slope of 1h:1v or flatter helps to ensure the bonding of the compacted material with the undisturbed side slopes of the trench. Adequate compaction and bonding of the fill material with the side slopes of the excavation is necessary to prevent a seepage path from occurring at the interface of the excavation and the backfill material. A slope stability analysis may be required where the depth of cut and soil properties indicate a potential for slope instability.

(a)(3): It is necessary to specify that after removal of a pipeline, conduit, utility line, or appurtenant structure from a Levee Section or Projected Levee Section, approved backfill shall be keyed in with each lift and compacted as per section 120(a) of this division. Soil that is very wet, coarse-grained or highly organic is not considered to be suitable backfill material because of the difficulty in placement and in obtaining adequate compaction, strength and impermeability. The placement and compaction of fill material in four (4) to six (6) inch layers ensures bonding of the fill material with the previously placed layers. Adequate compaction and keying into the Levee Section also increases the impermeability of the fill material and eliminates any potential seepage path or instability within the fill area.

(a)(4): It is necessary to require that field density testing by an Approved Soils Testing Laboratory will be required to confirm the minimum relative compaction of Levee embankment fill to verify compaction of backfill material within a Levee or within a Projected Levee Section because compaction tests verify that adequate compaction of backfill material has been achieved to ensure the strength and imperviousness

of the backfill and an Approved Soils Testing Laboratory meets stringent testing standards that produce reliable results.

(a)(5): It is necessary to specify that pipelines, conduits, and utility lines to be abandoned in the Floodway shall be removed if required by the Board for preventing interference with channel conveyance, contributing to bank erosion, or becoming exposed by bank erosion where the Board deems any of these situations is arising or may arise in the future, considering Floodway characteristics such as erosion, deposition, and Stream flow velocities because such interference with channel conveyance, contributing to bank erosion, or becoming exposed by bank erosion can reduce the flood protection provided by the Stream and/or Levee. It is necessary to specify that abandoned pipelines, conduits, and utility lines within the Waterside Berm and thirty (30) feet of the top of the streambank shall be removed if exposed by bank erosion because streambank erosion could further expose any concrete filled pipeline or conduit and cause localized eddies and accelerated erosion of the streambank or berm.

(a)(6): It is necessary to specify that after any pipeline, conduit, utility line, or appurtenance is removed from the Floodway, open trench backfill shall be placed in a manner consistent with local Floodway characteristics so as to not promote erosion or deposition because backfill compacted to at least the density of the adjacent soils reduces the likelihood of the backfill being eroded by the Stream and initiating a major erosion problem in the area. It is necessary to specify that this requirement is generally ensured by using suitable material and compacting to at least the density of adjacent undisturbed material, or ninety (90) percent as per ASTM D698 with moisture content within minus one (-1) percent to plus three (+3) percent of optimum, or eighty eight (88) percent as per ASTM D1557 with the moisture content within zero (0) percent to plus four (+4) percent of optimum, or equivalent because this provides an option for the construction to proceed without performing extensive density testing and analysis of adjacent undisturbed materials. It is necessary to require that field density testing by an Approved Soils Testing Laboratory shall be used to confirm the minimum relative compaction of the trench backfill and because an Approved Soils Testing Laboratory meets stringent testing standards that produce reliable results.

(a)(7): It is necessary to specify that details for removal of pipelines, conduits, and utility lines, including plans and profiles showing the limits and elevations of pipelines, conduits, and utility lines to be removed relative to the Levee embankment or flood control project feature, excavation and backfill details (such as backfill material and compaction), and existing soil strata shall be provided to the Board for review and approval prior to removal because this enables the Board to understand the proposed work, in extent and methods, and the site setting prior to approving the work and provides the Permittee a clear understanding of these requirements. Plans for removal of abandoned pipelines, conduits and utility lines are necessary to ensure that the activity does not interfere with flood control features, such as the integrity of the Levee and the flood carrying capacity of the channel.

(b): The purpose of subdivision (b) is to specify that this section describes the criteria for the filling of pipelines, conduits, utility lines, and appurtenances abandoned in place. It is necessary to specify criteria for filling pipelines, conduits, utility lines and appurtenances because incomplete filling leaves voids that

can create seepage paths through or under a Levee or cause settlement of the Levee, and use of the wrong filling material can leave voids or a non-permanent filling.

(b)(1): It is necessary to specify that if approved by the Board, pipelines, conduits, and utility lines penetrating the Levee foundation that have shown no history of seepage may be abandoned in place because some pipelines and conduits are so deep within the Levee that they are partly or entirely within the Levee foundation. In such cases, removal requires extensive Levee excavation that may be preferable to avoid if the pipeline or conduit has performed well. In some such cases the Board may approve that it be properly abandoned in place because it would, in the judgment of the Board, not threaten the integrity of the flood control project.

(b)(2): It is necessary to require that pipelines, conduits, and utility lines to be abandoned in place within the Floodway and the Levee Right of Way shall be completely filled with low permeability, low bleed, self-leveling, non-shrink grout or with certain types of cellular concrete (provided they can be shown to have similar properties) because low permeability, low bleed, self-leveling, non-shrink grout or certain types of cellular concrete will provide complete filling of the abandoned pipeline or conduit with a permanent low-permeability, high strength material not subject to erosion, seepage, or crushing under loads. Other materials, including conventional concrete and CLSM, are not able to meet all of these requirements.

(b)(3): It is necessary to require that in exceptional circumstances, the Board may allow some or all of a pipeline, conduit, or utility line within the Floodway to be abandoned in place without being filled, if it is determined by the Board that it is impractical or unnecessary to remove or fill the pipeline, conduit, or utility line because some Floodways, such as wide bypasses, can be very wide and an abandoned pipeline or conduit within such a Floodway and that is far from any Levee may pose no threat to the integrity of the flood control project, depending on the erosive nature of the Stream. It is necessary to specify that the Board may require conditions that retain the Board's ability to have the Permittee remove or fill the abandoned pipeline, conduit, or utility line in the future if, in the opinion of the Board, conditions change such that removal or filling becomes necessary because the Permittee should retain the risk for having to eventually remove an abandoned pipeline or conduit that is allowed to remain in place, not the Board. In exercising this provision, the Board would need to consider the likelihood that the Permittee will continue to exist in the distant future.

(b)(4): The purpose of subdivision (b)(4) is to require that in exceptional circumstances, if it is determined by the Board that it is impractical or detrimental to the Levee to remove an abandoned pipeline, conduit, or utility line from a Levee Section, the pipeline, conduit, or utility line shall be completely filled. Only pipelines, conduits, and utility lines that have shown no history of seepage and are determined to be sound by inspection or pressure testing shall be abandoned in place by filling. Factors that influence the decision to allow a pipe to be abandoned in place include, but are not limited to: pipe material, pipe depth, pipe diameter, pipe length, Levee size, presence of a railroad or State highway on Levee crown, and presence of a seepage cutoff wall.

It is necessary to specify that in exceptional circumstances determined by the Board that it is impractical or detrimental to the Levee to remove an abandoned pipeline, conduit, or utility line from a Levee Section that it shall be completely filled because filling the pipeline, conduit, or utility line prevents

seepage from flowing through the line and prevents the line from deteriorating and collapsing. When an abandoned pipeline or conduit is not removed, the line must be filled with approved material without the use of excessively high pressure which could fracture or uplift the Levee. It is necessary to specify that only pipelines, conduits, and utility lines that have shown no history of seepage and are determined to be sound by inspection or pressure testing shall be abandoned in place by filling because pipelines, conduits, or utility lines that are not sound or have performed poorly cannot be reliably abandoned by filling. An unsound pipe that is filled with grout under pressure will leak grout into the adjacent Levee and potentially fracture the Levee if enough pressure is applied. It is necessary to specify factors that influence the decision to allow a pipe to be abandoned in place as including, but not being limited to: pipe material, pipe depth, pipe diameter, pipe length, Levee size, presence of a railroad or State highway on Levee crown, and presence of a seepage cutoff wall because these factors influence the practicality of removing the existing pipe and likelihood that filling the pipe will result in an abandoned pipe that is permanent and performs well.

(b)(5): It is necessary to require that a detailed plan for filling an abandoned pipeline, conduit, or utility line shall be submitted for approval by the Board prior to start of work and the plan shall include plan and profile drawings with limits and elevations of pipes to be filled relative to the Levee embankment, referencing Figure 8.06 for illustrated details on filling abandoned pipelines and conduits, because this enables the Board to monitor techniques used to fill abandoned pipelines and conduits, to determine that all work will be in compliance with proven engineering and construction procedures, to ensure the complete filling of the pipeline, and to ensure no damage to the Levee.

(b)(6): It is necessary to require that the grout or cellular concrete mix shall be approved by the Board prior to use because an improper grout or cellular concrete mix can fail to meet the requirements for low permeability, low bleed, self-leveling, and non-shrink – possibly resulting in incomplete filling of the abandoned pipe, segregation of mix components, or use of high pressures that could damage the Levee.

(b)(7): It is necessary to require that grout or cellular concrete shall be pumped in an “upslope” direction so that the mix is first discharged into the lower end and the upper end is filled last by ponding of the mix because this method results in the pipe being completely filled without voids and without use of high pressure.

(b)(8): It is necessary to require that planned grout (or cellular concrete) pressures are to be provided to ensure that any pipe leaks do not damage the Levee or Levee foundation because even pipes that appear to be sound have the potential to leak when filled with grout under excessive pressure.

(b)(9): It is necessary to require that access points shall be provided along the pipe at sufficient intervals to fill the pipeline, conduit, or utility line because grout will set and block subsequent grout from passing that point, preventing reliable grouting along a long distance of pipe.

(b)(10): It is necessary to require that a pipeline, conduit, or utility line to be filled shall have a minimum depth of cover of three (3) feet below the waterside Levee slope because the minimum cover is required to prevent seepage along the deteriorating pipeline or conduit. It is necessary to require that if the depth of cover is less than three (3) feet, the Board shall require the Permittee to remove the pipeline,

conduit, or utility line because it lacks adequate cover and because the excavation into the Levee for removal of the pipe will be relatively shallow.

CCR Title 23. Article 8. Section 125. Retaining Walls

(a): The purpose of subdivision (a) is to specify that retaining walls within an Adopted Plan of Flood Control shall comply with certain following requirements. It is necessary to specify that retaining walls within an Adopted Plan of Flood Control shall comply with certain following requirements because retaining walls are not appropriate in certain locations and must be properly designed and constructed to provide satisfactory long term performance that does not jeopardize Levee integrity or impede flood flows.

(a)(1): It is necessary to specify that retaining walls parallel to the Levee are not allowed within the Levee Right of Way, except as floodwalls along the Levee crown to provide Freeboard and as required at gravity drains, because retaining walls parallel to the Levee within the Levee Right of Way interfere with operation and maintenance of the Levee and retaining walls within the Levee Section reduce stability of the Levee and shorten the seepage path through and under the Levee. Floodwalls may be used to raise a Levee where there is insufficient room the raise the embankment and at gravity drains to serve as headwalls for a very short distance.

(a)(2): It is necessary to specify that retaining walls within the Levee Right of Way shall be constructed as nearly at a right angle to the Levee centerline as practical because this minimizes the length of the retaining wall that is parallel to the Levee. Such retaining walls are typically constructed where roadways or railroad tracks cross a Levee crown below the Crest Elevation and provide the anchorage for emergency flashboards that are installed during high water.

(a)(3): It is necessary to require that retaining walls within the Levee Right of Way shall be designed by a California registered civil engineer to ensure an adequate design and acceptable construction methods. Numerous factors must be considered in designing and constructing a retaining wall within the Levee Right of Way. These factors vary from project to project. An improperly designed or constructed retaining wall could pose a hazard to public safety by interfering with operation and maintenance, becoming unstable, or promoting additional seepage through or under the Levee.

(a)(4): It is necessary to require that retaining walls in the Floodway greater than three (3) feet in height shall be designed by a California registered civil engineer to ensure an adequate design and acceptable construction methods. Numerous factors must be considered in designing and constructing a retaining wall within the Floodway. These factors vary from project to project. An improperly designed or constructed retaining wall could pose a hazard to public safety by interfering with operation and maintenance or becoming unstable during flood flows due to hydraulic loads or erosion.

(a)(5): It is necessary to require that retaining walls within the Levee Right of Way may be made of reinforced concrete, concrete gravity section, or of equivalent material and durability because these materials last many years with little or maintenance and deterioration of the retaining wall should be avoided.

(a)(6): It is necessary to require that retaining walls shall not cause a significant increase in Stream stage or velocities because where the effect of the retaining wall on flood stages is uncertain the Board needs

to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the retaining wall on flood stages is uncertain because the Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

CCR Title 23. Article 8. Section 126. Fences and Gates

The purpose of section 126 is to establish requirements for fences and gates. Fences and gates are installed to prevent trespassing and unauthorized traffic along flood control project facilities. Adjacent property owners, seeking protection and privacy, construct fences that encroach upon Floodways and the Levee Right of Way.

Fences that encroach upon an Adopted Plan of Flood Control must be authorized by the Board. Standards for fences and gates have been established to minimize the impact of such construction upon the maintenance and inspection of flood control facilities and upon flood fight procedures.

(a): The purpose of subdivision (a) is to establish rules for fences and specify that new fences shall not be constructed on the Levee Section, except as necessary for preventing unauthorized Levee access and protecting structures owned or operated by a public agency.

(a)(1): It is necessary to specify that new fences constructed on the waterside of a Levee that are partially or wholly under water during high water events shall be constructed so as to be removable by the Permittee in segments during times of high water as the water level rises up the Levee, if in the judgment of the Board the fence would interfere with conveyance of flood flow or misdirect flow against the Levee and cause erosion because waterside fences that would impede flood flow or misdirect flow against the Levee and cause erosion must be prevented. If not prevented, the Stream stage would raise and increase the load on the Levee, or misdirect flow that causes erosion of the Levee, reducing its integrity. Prevention can be achieved by removal of fence segments before becoming submerged. It is necessary to specify that if removal is required by the Board, the Permittee shall remove fence segments at its own expense during high water events so that no part of any fence on the waterside Levee slope is submerged because the expense of removal should not be the Board's responsibility and the removal must occur prior to submergence to avoid any impacts on channel conveyance or misdirecting of flow to cause erosion. In judging whether removal is required, the Board would consider flow velocities adjacent to the Levee slope and potential hydraulic impacts of the waterside fence.

(a)(2): It is necessary to specify that where the distance between fences would be as close as to interfere unreasonably with Levee inspection, channel inspection, Maintenance Activities, flood fight activities, and inspection or maintenance of any feature of an Adopted Plan of Flood Control, the Board may deny approval for additional fences because additional fences and gates would further delay and interfere with inspections and adequate Levee maintenance as well as promote unauthorized parallel fences on the Levee slope or at the Levee Toe. Considerable time is now expended by the need to open and close numerous consecutive gates on Levees during inspection and maintenance.

(a)(3): It is necessary to specify that if, in the opinion of the Board, a fence becomes unnecessary due to changes in location of public access points or construction of other fences, the Permittee shall remove the fence at the request of the Board because an additional fence would cause an unnecessary burden on inspection and maintenance personnel.

(b): The purpose of subdivision (b) is to specify that fences within the Floodway, or within the Levee Right of Way, but not on the Levee Section, shall conform to the following requirements:

(b)(1): It is necessary to specify that fences, walls, and similar structures may be allowed within Floodways if they do not obstruct flood flows or cause the accumulation of debris that would obstruct flood flows because fences or similar structures that obstruct flood flows or cause the accumulation of debris would decrease the Floodway capacity and increase flood flow velocities and stages. During flood flows, the accumulation of debris against a fence or similar structure could contribute to the destruction of the fence or structure. The destroyed fence or structure would then be carried downstream to the detriment of bridges and flood control facilities. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the proposed fence on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(b)(2): It is necessary to specify that fences firmly anchored and constructed parallel to the Stream flow are normally allowed because fences firmly anchored and constructed parallel to the streamflow would not obstruct flood flows or cause the accumulation of floating debris. Such fences would also have a minimal potential of being damaged or destroyed and being carried downstream causing damage to bridges or flood control structures.

(b)(3): It is necessary to specify that all fences parallel to a Levee shall be located outside of the Levee Right of Way because it provides sufficient clearance for the passage and operation of maintenance equipment and flood fight activities. In addition, boils generally occur at the landside Levee Toe, and this area must remain clear of Obstructions to expedite flood fight procedures. Such installations may be allowed where they will not interfere with Levee maintenance or flood fight activities. The Board will generally accept Endorsements of the Local Maintaining Agency as sufficient evidence that a proposed installation will not interfere with maintenance.

(b)(4): It is necessary to specify that if, in the opinion of the Board, a fence becomes unnecessary due to changes in location of public access points or construction of other fences, the Permittee shall remove the fence at the request of the Board because an additional fence would cause an unnecessary burden on inspection and maintenance personnel.

(b)(5): It is necessary to specify that debris that accumulates along the fence shall be cleared and disposed outside the limits of the Floodway by the Permittee prior to the Flood Season because the debris can impact flood channel carrying capacity and cause localized erosion.

(c): The purpose of subdivision (c) is to specify the requirements for gates crossing the Levee crown and within the Floodway. It is necessary for these gates to conform to these requirements because access to the Levee crown and along the Levee Toe road in the Floodway is necessary for the purpose of inspection, maintenance, flood fighting, and construction or reconstruction of the Levee or Levee road.

(c)(1): It is necessary to specify that the gate width on a Levee crown shall match or exceed the width of the Levee crown with a minimum gate width of fourteen (14) feet, but a gate width exceeding twenty (20) feet is normally not required, because Levee maintenance is performed with large trucks, heavy equipment, mowers, chemical sprayers, weed abatement drags and fire suppressant equipment that usually require at least twelve (12) to fourteen (14) feet of gate opening. In rural areas, farm equipment used by adjacent landowners may traverse the Levee and require at least fourteen (14) feet of gate opening. It is necessary to specify that where the Levee crown width is sufficient to accommodate a wider gate, the minimum gate width will be increased up to twenty (20) feet to provide the maximum available clearance for maintenance equipment and vehicular traffic on the Levee crown. It is necessary to specify that a gate width of less than fourteen (14) feet, but no less than twelve (12) feet, may be allowed on Levees within Urban Areas if it can accommodate the Levee maintenance equipment and equipment for responding to flood or fire emergencies which shall use the gates because wide farm equipment is unlikely to require access along the Levee crown.

(c)(2): It is necessary to specify that cable or chain gates are not authorized across a Levee crown or across a Levee Access Ramp because of visibility and safety concerns. Gates must be designed to be highly visible. For the protection of maintenance personnel and the general public, gates must be visible at distances that allow sufficient time to stop an automobile, maintenance equipment, a motorcycle, or a bicycle.

(c)(3): It is necessary to specify that gates shall be hinged, and constructed to provide for ease of operation, maximum longevity, and public safety because poorly designed or easily damaged gates often become difficult, and at times almost impossible, for one person to operate. Gates must be designed for sturdiness, maximum longevity, ease of operation and public safety. Gates must also be designed to be highly visible. For the protection of maintenance personnel and the general public, gates must be visible at distances that allow sufficient time to stop an automobile, maintenance equipment, a motorcycle, or a bicycle.

(c)(4): It is necessary to specify that gate posts shall not penetrate the Levee by more than twelve (12) inches unless encased in concrete cast in place against firm undisturbed earth because they can provide a potential seepage path into the Levee for rainfall runoff or for high water under full loading of the Levee.

(c)(5): It is necessary to specify that gates may be opened by authorized personnel representing the Local Maintaining Agency, Department, Board, or USACE because gates may be opened and be required to remain open during such times as when immediate access to the Levee road may be necessary for the purpose of inspection, maintenance, flood fighting, and construction or reconstruction of the Levee or Levee road.

(c)(6): It is necessary to specify that where the distance between gates would be so close as to unreasonably interfere with Levee inspection and maintenance, the Board may deny approval for additional gates because considerable time is required to open and close numerous consecutive gates on Levees during inspection and maintenance. Additional gates would further delay and interfere with such necessary activities.

(c)(7): It is necessary to specify that if, in the opinion of the Board, a gate becomes unnecessary due to changes in location of public access points or construction of other gates, the Permittee shall remove the gate at the request of the Board at the Permittee's expense because an additional gate would cause an unnecessary burden on inspection and maintenance personnel.

(c)(8): It is necessary to specify that at the time locks are installed, keys for the locks shall be provided to the Local Maintaining Agency, Department, Board, and USACE for all locks on gates providing access to the Floodway, Levee ramps, Levee Toe, and along the Levee crown because Levee inspections, routine maintenance, and emergency flood fight procedures require maintenance personnel and designated Department personnel to have keys for all locks to assure access to flood control facilities.

(d): The purpose of subdivision (d) is to specify that if the Board approves Proposed Work that directly or indirectly may result in future unauthorized Encroachments (e.g., approving Levee modifications associated with a new Residential Development adjacent to the Levee), the Board may require the Permittee to construct a fence parallel to the Levee at the landward limit of the Levee Right of Way and that if a fence is required, it shall conform to Board Standards. It is necessary to specify that the Board may require a Permittee to construct a fence associated new Residential Development because residences along a Levee tend to utilize the Levee slope as part of their property, installing encroachments such as steps, walls, sprinklers, and plantings without authorization. A fence will delineate the property line and discourage such activities.

(e): The purpose of subdivision (e) is to specify that no fence, wall or other barrier may interfere with or preclude legal public access because the public has the legal right to access the area beyond the fence, wall, or barrier.

CCR Title 23. Article 8. Section 127. Boating Facilities

The purpose of section 127 is to establish requirements for boating facilities. Improperly constructed boating facilities may be injurious to flood control projects. In addition, many of the activities normally associated with boating facilities, if uncontrolled, could be injurious to the flood control project.

(a): The purpose of subdivision (a) is to specify the standards for construction of wharves, piers, docks, boat houses, ramps, and similar boating facilities. It is necessary to specify these standards because they protect Levee stability and prevents buildup of debris.

(a)(1): It is necessary to specify that boat ramps may not be cut into the Levee Section, but may be cut into a Waterside Berm or placed on a fill because the stability of a Levee is diminished by the excavation and removal of the compacted Levee material. To protect the stability of a Levee, a Levee Section should not be reduced. The placement of a boat ramp on a berm or on a fill would not impair the Levee. It is necessary to specify that additional analysis may be required to verify seepage, slope stability, and erosion of the Levee Section have not been impacted because a boat ramp that is cut into the Waterside

Berm has potential to increase Levee underseepage, reduce Levee slope stability, or increase erosion of the streambank or adjacent Levee Section.

(a)(2): The purpose of subdivision (a)(2) is to require that boating facilities shall be properly anchored to prevent breakaway during flood flows. It is necessary to require that boating facilities are properly anchored because a wharf, pier or dock floating downstream during flood flows can clog flood channels and weir gates, or build up debris against bridge structures, causing increased water stages.

(a)(2)(A): It is necessary to specify that driven piling may be installed outside of the Levee Section and Projected Levee Section because driven piling has proven to be a feasible and effective method of securely anchoring boating facilities, but it needs to be beyond the Levee Section and Projected Levee Section to avoid damage to the Levee caused by the intense vibrations that occur during pile driving.

(a)(2)(A)(i): It is necessary to specify that if timber piles are used they shall be a minimum of twelve (12) inches in butt diameter and shall be pressure treated because during rising flood flows, the vertical load upon such piling remains minimal, but the bending stress from lateral loading increases considerably. To compensate for the maximum bending stress, and to maintain a sufficient safety factor, design specifications dictate the use of timber piling with a minimum diameter of twelve (12) inches. Timber piles must be sufficiently pressure treated to ensure maximum longevity.

(a)(2)(A)(ii): It is necessary to specify that the elevation of the top of each pile shall be a minimum of two (2) feet above the lower of the Crest Elevation of the Levee nearest the boat dock and the Levee directly across the Stream because in the event of Stream stage reaching the Crest Elevation, and considering wind-induced waves, floating facilities anchored to piling that extends two (2) feet above this elevation would remain anchored.

(a)(2)(A)(iii): It is necessary to specify that the driven piling shall not penetrate a waterside blanket layer that is important for Levee underseepage performance and that a geotechnical investigation will normally be required by the Board for making this determination because a waterside blanket layer can be an important horizontal cutoff for Levee underseepage that, if breached by pile driving, may result in increased Levee underseepage that leads to, or increases, boils and piping of Levee foundation material. Normally, a geotechnical investigation would be needed to determine whether this is the case.

(a)(2)(B): It is necessary to specify that cast-in-place piling may be installed within and outside of the Levee Section and Projected Levee Section because cast-in-place piling is less disturbing to the Levee than driven piling and the Board recognizes that piles are needed to secure boating facilities.

(a)(2)(B)(i): It is necessary to specify that the piling installed within the Levee Section or Projected Levee Section shall be designed by a California registered civil engineer because the bending stress exerted on the piling during high water could exceed the resistance of the soil, resulting in movement of the pile and damage to the Levee. Also, other causes for pile movement, such as overloading, could damage the Levee or Levee foundation. Design by a California registered civil engineer will ensure an adequate design and acceptable construction methods when considering the largest flood for which the Stream and facilities in the area have been designed. An improperly designed or constructed pile could be damaged during high flows and potentially cause damage to the Levee.

(a)(2)(B)(ii): It is necessary to specify that piles that penetrate the Levee Section and Projected Levee Section shall be avoided to the extent practical because the bending stress exerted on the piling during high water could exceed the resistance of the soil, resulting in movement of the pile and damage to the Levee. This risk should be avoided where practical to do so, because an improperly designed or constructed pile could be damaged during high flows and potentially cause damage to the Levee.

(a)(2)(B)(iii): It is necessary to specify that piles that penetrate the Levee Section, Projected Levee Section, or waterside blanket shall be cast against firm undisturbed earth because this provides the best bond with adjacent soils to minimize damage to the integrity of the blanket layer or the Levee.

(a)(2)(B)(iv): It is necessary to specify that the elevation of the top of each pile shall be a minimum of two (2) feet above the lower of the Crest Elevation of the Levee nearest the boat dock and the Levee directly across the Stream because in the event of Stream stage reaching the Crest Elevation, and considering wind-induced waves, floating facilities anchored to piling that extends two (2) feet above this elevation would remain anchored.

(a)(3): The purpose of subdivision (a)(3) is to require that all appurtenant facilities, including utilities and walkways, installed on or through a Levee Section to provide service to wharves, piers, or docks, shall conform to the appropriate section of the standards. It is necessary to require that all appurtenant facilities conform to the appropriate section of the standards because improperly installed facilities can cause serious Levee damage. During high water, seepage along inadequately compacted utility lines can cause piping and loss of Levee material. To protect Levees from damage, all utility lines and other amenities to a boating facility must be constructed and installed in accordance with appropriate standards.

(b): The purpose of subdivision (b) is to require that after each period of high water, all debris caught by a boating facility shall be cleared and disposed of outside the limits of the Floodway and Levee Section. It is necessary to require all debris to be cleared and disposed of because the accumulation of floating debris against a boating facility increases the potential for destruction of the facility or broken mooring cables. The loss of any boating facility during flood flows could seriously impair the Floodway, decreasing the channel capacity, and raising water levels.

(c): The purpose of subdivision (c) is to specify that in the event that Levee or bank erosion injurious to the Adopted Plan of Flood Control occurs at or adjacent to a boating facility, the Permittee of the boating facility is responsible for the repair of the eroded area, and for the placement of adequate Revetment to prevent further erosion. Revetment shall meet the standards in section 121 of this division. It is necessary to specify that the Permittee is responsible for repair of the eroded area and for the placement of adequate Revetment to prevent erosion because boating activities cause increased wave action that could initiate erosion or accelerate existing erosion. The protection needed on a riverside slope to withstand the erosional forces of waves and Stream currents varies considerably.

(d): The purpose of subdivision (d) is to specify that any existing Levee Revetment or bank Revetment damaged during the construction or operation of a boating facility shall be restored to its original condition by the Permittee of the boating facility. It is necessary to specify that the Permittee is responsible for restoring any damaged Revetment in the vicinity of the boating facility because serious

damage to Levees or streambanks having erodible soils can occur when protective Revetment is displaced or destroyed. It is imperative that damaged Revetment be repaired expeditiously to prevent advanced erosion of the Levee or streambank.

(e): The purpose of subdivision (e) is to specify that the Levee crown may not be used for parking boat trailers or motor vehicles except where there is adequate crown roadway width to provide twenty (20) feet of unobstructed clearance for two-way vehicular traffic. It is necessary to specify that the Levee crown may not be used for parking boat trailers or motor vehicles except where there is adequate crown roadway width because access along the Levee crown roadway must be maintained at all times for inspection, maintenance and flood fight purposes. Heavy mobile equipment, including mowers, Levee slope drags and chemical spray machinery, are used on the Levee crown and must have adequate clearance at all times.

(f): The purpose of subdivision (f) is to specify that boating materials, equipment or accessories may not be stored on Levee slopes. It is necessary to specify that boating materials, equipment or accessories may not be stored on Levee slopes because it prevents adequate inspection and maintenance of the Levee, and would obstruct flood fight procedures. The immediate removal of such material or equipment during a flood fight emergency would be improbable.

(g): The purpose of subdivision (g) is to specify that floatable boating materials, equipment, or accessories shall be securely anchored when stored in the Floodway during the Flood Season. It is necessary to specify that floatable boating materials, equipment, or accessories when stored in the Floodway during Flood Season must be securely anchored because they are potential debris problems during Flood Season. During high streamflows, unsecured boating materials and equipment can be carried downstream causing damage to bridges and flood control structures, diminish Floodway capacities, increase streamflow stages and misdirect flows against channel banks or Levees causing excessive erosion.

(h): The purpose of subdivision (h) is to specify that boating materials, equipment, and accessories stored on the Levee crown shall be no closer than thirty (30) feet from the waterside Levee shoulder. It is necessary to specify that stored boating materials, equipment, and accessories on the Levee crown (but not Levee slopes) may be allowed, but shall be no closer than thirty (30) feet from the waterside Levee shoulder because thirty (30) feet of unobstructed area is required to ensure access to the waterward Levee slope with heavy maintenance and flood fight equipment, and to provide for the safe operations of the equipment and for the safety of the equipment operators.

(i): The purpose of subdivision (i) is to specify that boating facilities shall not cause a significant increase in Stream stage or velocities, that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact, and that the Board may deny a Permit if the hydraulic impact is deemed significant. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the proposed boating facilities on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

CCR Title 23. Article 8. Section 128. Bridges and Low Water Crossings

The purpose of section 128 is to establish requirements for Bridges and Low Water Crossings. The flow capacity of Floodway channels can be severely restricted by the build-up of debris against a bridge structure. The debris not only restrict flood flows, but can also divert the flow toward the channel bank or Levee causing excessive erosion at the bridge site.

During past floods, bridges have been damaged and destroyed by the build-up of debris against the bridge structure increasing the force of the flood flows, and by flows that exceed the elevation of the lowest structural members of the bridge. Even if the bridge is not destroyed, debris caught against the bridge can constrict the flow and increase the Stream stage immediately upstream of the bridge.

(a): The purpose of subdivision (a) is to specify the standards for construction or modification of bridges and Low Water Crossings within an Adopted Plan of Flood Control. It is necessary to specify standards for construction and modification of bridges and Low Water Crossings because such work can damage a Levee, interfere with operation and maintenance of a Levee, and reduce the capacity of the channel to pass flood flows.

(a)(1): It is necessary to require that Embankment Materials placed as backfill within the Levee Section or near bridge supports within the Floodway shall be placed and compacted in conformance with section 120(a) of this division because this procedure is required to minimize seepage through the Levee, and to provide adequate slope stability. Within the Floodway, adequate compaction is needed to prevent erosion of the backfill adjacent to the bridge foundations.

(a)(2): It is necessary to require that driven piles shall not be placed in the Levee Right of Way or in a blanket layer on the landside or waterside of the Levee that is important for Levee underseepage performance because the pile driving can damage the blanket layer, especially if it is thin. A broken or cracked waterside blanket layer may allow more Levee underseepage to occur. It is necessary to specify that a geotechnical investigation will normally be required by the Board for making this determination because it is generally not possible to accurately determine the importance of a waterside blanket layer without having site specific soil information and modeling the Levee underseepage. But there may be exceptions, such as where there is no continuous blanket layer, where there is an extremely thick blanket layer, or where the aquifer beneath the blanket layer is directly connected to the Stream and the Waterside Berm is relatively narrow. In such cases a geotechnical investigation may not be required to show that the integrity of the blanket layer is not important for Levee underseepage.

(a)(3): It is necessary to require that driven piles shall be installed in a manner such that the driving energy does not cause cracking of the Levee because a cracked Levee is susceptible to Levee through-seepage and sloughing. It is necessary to require that the Levee condition shall be documented before and after pile driving operations to verify cracking has not developed because cracks may not be obvious and will only be detected through careful visual inspection. Only cracks that appear after the pile driving operation are the responsibility of the Permittee. It is necessary to require that all cracks that develop from the construction shall be repaired by the Permittee and the repairs are subject to Board approval because the Permittee and not the Board or Local Maintaining Agency should be responsible for repair of construction-related Levee damage.

(a)(4): The purpose of subdivision (a)(4) is to specify that cast-in-place piles, piers, and bents may be installed within and outside of the Levee Section and Projected Levee Section and shall meet certain criteria. It is necessary to specify that cast-in-place piles, piers, and bents may be installed within and outside of the Levee Section and Projected Levee Section and meet certain criteria because properly installed cast-in-place piles, piers, and bents are not damaging to the Levee and its integrity, but improperly installed cast-in-place piles, piers, and bents can damage the Levee's integrity.

(a)(4)(A): It is necessary to specify that the piles, piers, and bents shall be designed by a California registered civil engineer to ensure an adequate design and acceptable construction methods when considering the largest flood for which the Stream and facilities in the area have been designed. Numerous factors and loading conditions must be considered in design of piles, piers, and bents. Of special concern to the Board would be the potential for loss of lateral support due to channel scour, and the potential reduction in channel capacity when considering the debris loading that can occur in the Stream. An improperly designed or constructed pile, pier, or bent can be damaged, undermined, or washed away (along with the bridge it supports) during high flows. It can also reduce channel capacity and increase Stream stage immediately upstream of the bridge, causing additional flooding and possibly causing a Levee failure.

(a)(4)(B): It is necessary to specify that piles, piers, and bents that penetrate the Levee Section and Projected Levee Section shall be avoided to the extent practical because such penetrations have the potential to increase seepage alongside the pile, pier, or bent through the Levee and/or Levee foundation, resulting in damage to the Levee and potential Levee failure.

(a)(4)(C): It is necessary to specify that piles, piers, and bents that penetrate the Levee Section, Projected Levee Section, or blanket layer important for Levee underseepage performance shall be predrilled and cast in place to the bottom of the upper impermeable layer of the foundation and can be driven down from this elevation because pile driving can damage the blanket layer, especially if it is thin. A broken or cracked blanket layer may allow more Levee underseepage to occur. It is necessary to require that any cracks in the Levee due to bridge construction shall be excavated and the Levee embankment repaired to its original design grade and dimensions because a cracked Levee is susceptible to Levee through-seepage and sloughing and because the Permittee and not the Board or Local Maintaining Agency should be responsible for repair of construction-related Levee damage.

(a)(5): It is necessary to specify that bridge piers and bents within the Floodway shall be constructed in the general direction of Stream flow because it minimizes the Obstruction to Stream flow, and eliminates or decreases the potential problem of driftwood or other debris lodging and accumulating against any part of the bridge structure and obstructing the flow.

(a)(6): It is necessary to specify that bridge piers and bents placed within a Floodway to support a widened portion of an existing bridge shall be constructed in line with existing bents and piers because this design provides for the least impediment of flood flows and minimizes the potential for debris accumulation.

(a)(7): It is necessary to specify that erosion control may be required on the channel banks or Levee slopes upstream and downstream of a proposed bridge because the transition of flood flows between

bridge piers and bents usually causes increased water stages and increased erosive turbulence. Revetment or other erosion control methods may be required to prevent uncontrolled or excessive erosion of channel banks on Levee slopes adjacent to bridge sites.

(a)(8): It is necessary to specify that drainage from a bridge or highway shall not be discharged onto a Levee Section or streambank because surface drainage directly onto a Levee or streambank from a bridge or highway can cause severe erosion damage to the Levee or streambank.

(a)(9): It is necessary to specify that plans showing all construction facilities (such as temporary staging, coffer dams, and falsework) which will remain in a Floodway during Flood Season, shall be submitted to the Board for approval prior to installation of these facilities because such temporary construction facilities are not allowed to remain in a Floodway during the Flood Season if the capacity of the Floodway would be diminished or if the facilities would misdirect Stream flows causing channel bank or Levee erosion. Design plans should preclude any detrimental impact on the flood control project.

(a)(10): It is necessary to specify that all temporary construction facilities (such as staging, coffer dams, and falsework) shall be designed to prevent bank erosion and, during the Flood Season, to withstand potential hydraulic and debris loading while maintaining maximum channel capacity because any construction facility that causes bank or Levee erosion during normal Stream flows could cause extensive damage during flood flows. Construction facilities that diminish the flood flow capacity of a Stream channel or Floodway, or have other detrimental effects on a flood project, are not allowed. It is necessary that the applicant may be required to demonstrate that the temporary construction facilities are structurally adequate and neither the temporary construction facilities nor the bridge itself will create any significant hydraulic impacts because this ensures temporary facilities won't wash downstream and create a debris problem or remove necessary support for a partly constructed bridge. It is necessary to specify that the Board may require a high water safety plan identifying responsible Parties, notification procedures, available equipment, emergency protocols, and planned actions in the event of high water because temporary construction facilities are more likely than permanent facilities to be damaged or washed downstream during high water and to collect debris that develops into a significant flow blockage. Such contact information and pre-planned activities increase the likelihood of successfully addressing problems during an emergency and minimizing the risk to public safety.

(a)(11): It is necessary to specify that stockpiled material, temporary Buildings, construction equipment, and road detours that may obstruct Stream flows shall be removed from Floodways prior to the Flood Season because Obstructions within a Floodway not only diminish the flood flow capacity, but can also cause excessive accumulation of debris which can misdirect flows causing severe erosion of channel banks and Levees.

(a)(12): The purpose of subdivision (a)(12) is to specify clearance requirements for the bottom member (soffit) of a bridge. It is necessary to specify these requirements because this prevents Obstruction of the Floodway or damage to a bridge caused by driftwood, or other debris, lodging and accumulating against structural members of the bridge during high Stream flows.

(a)(12)(A): It is necessary to specify that the bottom members (soffit) of a proposed bridge on a Leveed Stream shall be no lower than the Crest Elevation of the adjacent Levee and at least three (3) feet above

the DWSE, whichever is higher because this prevents Obstruction of the Floodway or damage to a bridge caused by driftwood, or other debris, lodging and accumulating against structural members of the bridge during high Stream flows. It is necessary to specify that if the bridge spans Levees of unequal Crest Elevation, the lower of the two (2) Crest Elevations may be used because sometimes Crest Elevations are different and it should not be necessary to meet the higher Crest Elevation.

(a)(12)(B): The purpose of subdivision (a)(12)(B) is to specify that the required clearance may be reduced by the Board to two (2) feet above the DWSE at sites on Streams that meet certain requirements. It is necessary to specify that the required clearance may be reduced by the Board to two (2) feet above the DWSE because Streams that meet all of these requirements are very unlikely to lose channel capacity as a result of the reduced soffit clearance.

(a)(12)(B)(i): It is necessary to specify that the Stream is small because large Streams generally have potential to carry large debris loads, including large trees with branches that protrude several feet above the water surface and can get caught on a bridge soffit.

(a)(12)(B)(ii): It is necessary to specify that the Stream does not have a Levee because Levees are sensitive to increases in stage that can be caused by debris loading on a bridge soffit; Levee stability can decrease and/or Levee seepage can increase, causing boils and piping of Levee or Levee foundation materials.

(a)(12)(B)(iii): It is necessary to specify that the Stream is not part of the State Plan of Flood Control because the State has potential liability for failure of facilities of the State Plan of Flood Control and the State should not take on additional risk resulting from reduced bridge soffit clearance afforded to the Permittee.

(a)(12)(B)(iv): It is necessary to specify that flooding from the Stream would not enter an Urban Criteria Area because compromising the soffit clearance above the Stream could jeopardize the Urban Criteria Area's claim of two hundred (200) flood protection or ability to provide two hundred (200) year flood protection.

(a)(12)(B)(v): It is necessary to specify that significant amounts of Stream debris are demonstrated to be unlikely because significant amounts of Stream debris, especially large trees, can get caught on the low bridge soffit and increase the Stream stage immediately upstream of the bridge. Once a tree is caught on the bridge soffit, additional debris quickly attaches to it and develops into a major blockage.

(a)(12)(C): It is necessary to specify that when an existing bridge being widened does not meet the clearance requirement above the DWSE, the bottom structural members of the added section may be no lower than the bottom structural members of the existing bridge, except as may be caused by the extension of existing sloped structural members because if the lowest structural members of the added bridge section is no lower than the bottom structural members of the existing bridge, there will be no additional diminishing of the flood flow capacity, and no additional accumulation of debris against structural bridge members during high water. A minor infringement on this clearance may be necessary because of the extension of existing bridge members which slope toward the river surface. Such minor infringement may be determined to be acceptable by the Board's Chief Engineer.

It is necessary to specify that the Board may require a high water safety plan identifying responsible Parties, notification procedures, available equipment, and emergency protocols for prompt removal and disposal of debris from the bridge during high water because when clearance is lacking, the chance of a debris problem increases and needs to mitigated with an emergency plan for prompt removal of debris during the high water event. A debris problem could raise the water surface substantially and result in unnecessary Levee loading or overtopping.

(a)(12)(D): It is necessary to specify that when the clearance requirement above DWSE would result in bridge approach ramp fill in the Floodway, the clearance requirement may be reduced to the extent that reasonably balances clearance and fill that would obstruct flow, so as to maintain maximum channel capacity because ramp fill that would obstruct flow must be minimized to maintain channel conveyance capacity and this situation is a tradeoff between achieving clearance to prevent debris blockages and placing ramp fill that would directly obstruct flow. It is necessary to specify that the Board may require a high water safety plan identifying responsible Parties, notification procedures, available equipment, and emergency protocols for prompt removal and disposal of debris from the bridge during high water because when clearance is lacking, the chance of a debris problem increases and needs to be mitigated with an emergency plan for prompt removal of debris during the high water event. A debris problem could raise the water surface substantially and result in unnecessary Levee loading or overtopping. Such contact information and pre-planned activities increase the likelihood of successfully addressing problems during an emergency and minimizing the risk to public safety.

(a)(12)(E): It is necessary to specify that for arched bridges the clearance area above the DWSE shall be, at a minimum, equal to the area of clearance if the bridge had a horizontal soffit extending from the abutment three (3) feet above the DWSE because the arches of bridges provide a greater amount of cross sectional structural area below three (3) feet above the DWSE than other types of bridges and as a result can catch more debris than other types of bridges. This requirement provides for a minimum area clearance equivalent to a typical bridge, although some of that clearance under the arch, especially near the center of the arch may be useless for avoiding debris because it is far above the DWSE.

It is necessary to specify that a hydraulic study is required to demonstrate to the Board's satisfaction that with reasonable debris loading on the bridge members lower than three (3) feet above the DWSE the hydraulic impact would not be significant because the clearance area requirement alone may not be sufficient for a bridge with a significant arch that could create a lot of high clearance area that is useless. It is necessary to specify that the Board may require a high water safety plan identifying responsible Parties, notification procedures, available equipment, and emergency protocols for prompt removal and disposal of debris from the bridge during high water because when clearance is lacking, the chance of a debris problem increases and needs to be mitigated with an emergency plan for prompt removal of debris during the high water event. A debris problem could raise the water surface substantially and result in unnecessary Levee loading or overtopping. Such contact information and pre-planned activities increase the likelihood of successfully addressing problems during an emergency and minimizing the risk to public safety.

(a)(12)(F): It is necessary to specify that replacement railroad bridges shall have the soffit members no lower than those of the replaced bridge, but are not required to have a specified amount of clearance

above the DWSE because, unlike roadways, railroad tracks are not easily raised. It is necessary to specify that the Board may require a high water safety plan identifying responsible Parties, notification procedures, available equipment, and emergency protocols for prompt removal and disposal of debris from the bridge during high water because when clearance is lacking, the chance of a debris problem increases and needs to be mitigated with an emergency plan for prompt removal of debris during the high water event. A debris problem could raise the water surface substantially and result in unnecessary Levee loading or overtopping. Such contact information and pre-planned activities increase the likelihood of successfully addressing problems during an emergency and minimizing the risk to public safety.

(a)(13): The purpose of subdivision (a)(13) is to specify that vehicular access along the Levee crown at the bridge and/or beneath the bridge for inspection and maintenance shall comply with the following requirements. It is necessary to specify these requirements because inadequate clearance can interfere with the ability of the Local Maintaining Agency to maintain the Levee crown and patrol during high water.

(a)(13)(A): It is necessary to specify that vehicular access from the roadway to the Levee crown may be required at each end of a bridge because expeditious access to all Levee crowns is essential to the operation of a successful flood fight, to provide for the fast inspection of Levees during high water, and for easy ingress of heavy maintenance equipment.

(a)(13)(B): It is necessary to require vehicular and equipment clearance beneath the bridge soffit as needed by the Local Maintaining Agency for operation, maintenance, repair, replacement, and rehabilitation of the Levee crown, typically between ten (10) feet and sixteen (16) feet, if the bridge roadway is not constructed directly on the Levee crown because insufficient clearance for patrolling vehicles (usually pickup trucks with overhead light bars) and for heavy equipment required for maintaining and repairing the Levee crown would interfere with the Local Maintaining Agency's ability to meet its obligations for patrolling, operation, maintenance, repair, replacement, and rehabilitation. It is necessary to specify that provision of an alternate path for large equipment may reduce the clearance needed by the Local Maintaining Agency because the Local Maintaining Agency may determine that access for all types of vehicles and equipment is not necessary if it is provided across the roadway.

(a)(13)(C): It is necessary to specify that vehicular access from the Levee crown to the Floodway and/or the landside Levee Toe beneath the bridge may be required because the bridge or approach ramp may interfere with access along the Levee Toe in the Floodway or along the landside of the Levee. It is necessary to specify that ramps may slope upstream as necessary to provide the access required by this subdivision because the prohibition against upstream sloping ramps in the Floodway would prevent, if not waived in this situation, would prevent compliance with this requirement.

(a)(14): It is necessary to specify that gates meeting the standards in section 126 of this division shall be installed at right angles across the Levee crown at all points of access to the Levee from each end of a bridge that is a public roadway open to vehicular traffic unless the Levee crown roadway is also a public roadway open to vehicular traffic because otherwise the bridge would provide unauthorized vehicular access to the Levee crown. This standard recognizes that some bridges are for non-vehicular traffic, such

as trains or pedestrians, and that some Levee crowns are public roadways that provide for vehicular traffic that can access the bridge.

(a)(15): It is necessary to specify that any bridge abandoned or being dismantled shall be completely removed, and shall be disposed of outside the limits of the Levee Right of Way and Floodway because any structural members of a dismantled bridge remaining in a channel or Floodway would cause the accumulation of driftwood and other debris. Such accumulation would diminish the channel or Floodway capacity, and raise Stream stages. It is necessary to specify that seepage and slope stability analyses may be required to ensure the removal of the bridge will not be detrimental to the safety of the adjoining Levee or streambank because removal of bridge components such as abutments, piles, piers, bents, and approach ramps can adversely affect Levee stability or seepage.

(a)(16): It is necessary to specify that pilings, piers, bents, and abutments of bridges being dismantled shall be removed to at least one (1) foot below the natural ground line and at least three (3) feet below the thalweg of the mean Low Water Channel because the removal of the bridge support complex to the specified depths alleviates the possibility of debris lodging and accumulating at the site. Any structural members of a dismantled bridge remaining in a channel or Floodway would cause the accumulation of driftwood and other debris. Such accumulation would diminish the channel or Floodway capacity, and raise Stream stages.

(a)(17): It is necessary to specify that any bridge that is damaged to the extent that it may impair the channel or Floodway capacity shall be repaired or removed prior to the next Flood Season because any damaged structure that impairs the channel or Floodway capacity is a hazard to the Adopted Plan of Flood Control. Such hazards can cause increased Stream stages, inundation of adjacent lands, increased seepage through or under Levees, and additional Levee and Floodway maintenance problems. To prevent such problems, the potential hazard must be removed prior to the Flood Season.

(a)(18): It is necessary to specify that, with the exception of replacement railroad bridges, bridge replacements and new bridges shall be built at an elevation so that there is no depression in the crown of the Levee because the depression would be a location of reduced Levee freeboard, which would reduce the flood protection provided by the Levee and make Levee overtopping more likely at the bridge. Recognizing that it is extremely difficult to raise the grade of railroad tracks, an exception is provided for railroad bridges that would have to be addressed with retaining walls and emergency flashboards to match the adjacent Levee Crest Elevation.

(a)(19): It is necessary to specify that the bridge shall not cause a significant increase in Stream stage or velocities because a significant increase in stage or velocity could cause additional flooding, overload a Levee, or cause erosion problems. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the proposed bridge on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(b): The purpose of subdivision (b) is to specify the standards for construction or modification of Low Water Crossings within an Adopted Plan of Flood Control. It is necessary to specify standards for construction or modification of Low Water Crossings because improperly constructed Low Water Crossings can interfere with channel conveyance, increase Steam stages, and be dangerous for vehicular traffic during high water.

(b)(1): It is necessary to specify that Low Water Crossings shall comply with all standards for bridges described in section 128 (a) above, with the exception of subparagraph 12 because the issues addressed by the standards for bridges in section 128(a) apply equally to Low Water Crossings except that clearance requirements addressed in subparagraph 12 do not apply since Low Water Crossings are designed to be submerged during high water.

(b)(2): It is necessary to specify that Low Water Crossings have no requirement for clearance above the DWSE but shall be designed and constructed to avoid impeding flood flows because Low Water Crossings become submerged during high water and can significantly reduce channel conveyance for flood flows if not properly designed and constructed.

(b)(3): It is necessary to specify that visible markers shall be provided to alert traffic in the event the crossing is submerged because traversing the Low Water Crossing when it is submerged is dangerous. Drivers may think it is only slightly submerged and safe to traverse, but that is only true if the submergence is very shallow, which is difficult to judge.

(c): The purpose of subdivision (c) is to specify the standards for maintenance of bridges within an Adopted Plan of Flood Control. It is necessary to specify standards for maintenance of bridges within an Adopted Plan of Flood Control because this ensures maximum flood protection and retains maximum Floodway capacity.

(c)(1): It is necessary to specify that the area in and around a bridge site shall be kept clear to maintain the design flow capacity because the design flow capacity of a Floodway must be continually maintained to ensure maximum flood protection. Progressive Encroachments, induced by inadequate maintenance, can cause unexpected high water stages during flood flows.

(c)(2): It is necessary to specify that trees, brush, sediment, and other debris shall be kept cleared from the bridge site and be disposed of outside the limits of the Floodway prior to the Flood Season because all growth and debris must be kept cleared from a bridge site to maintain maximum Floodway capacity. Accumulated debris within a Floodway can diminish the Floodway capacity, increase flood flow stages and velocities, and misdirect flood flows against channel banks or Levees.

(c)(3): It is necessary to specify that continuous maintenance access shall be provided both upstream and downstream from all bridges because during construction of a bridge, access for operation and maintenance of the Levee or Floodway could be prevented. This would impact the ability of the Local Maintaining Agency to meet its obligations and adversely impact performance of the Adopted Plan of Flood Control.

(c)(4): It is necessary to specify that any accumulation of debris during high flows shall be immediately removed from a bridge site and disposed of outside the Floodway because debris accumulated against a

bridge structure can restrict flood flows and significantly add to the potential destructive forces against the bridge. The debris must be removed to retain maximum Floodway capacities, to minimize flood stages, and to prevent destruction of the bridge and damage to flood control Project Works.

CCR Title 23. Article 8. Section 129. Water, Oil, and Gas Wells

The purpose of section 129 is to establish requirements for water, oil, and gas wells. Water, oil and gas wells may require equipment and structures, such as electrical or diesel powered pumps, large diameter pipelines, storage sheds, raised pads, foundation walls, access roads and fencing. The placement of such structures or facilities within an Adopted Plan of Flood Control must be controlled to prevent impairment of the Floodway capacity.

The construction of many new water wells each year tapping ground water aquifers within a few hundred feet of the earth's surface is a growing concern as subsidence, directly related to overdraft of ground water basins, continues at a relatively rapid rate in California. Monitoring loss of Freeboard on Levees caused by underlying subsidence is a developing inspection procedure.

(a): The purpose of subdivision (a) is to specify that water wells and any appurtenant structures shall be located outside of the Levee Right of Way and a minimum distance of sixty (60) feet from the waterside Levee Toe, landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature. It is necessary to specify that water wells and any appurtenant structures shall be located outside of the Levee Right of Way because this allows for the visual inspection of the Levee slope and toe area, and for access by Levee maintenance equipment. It is necessary to specify a minimum distance of sixty (60) feet from the waterside Levee Toe, landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature because water wells can malfunction by pumping fine soils from the vicinity of the well; if this occurs too close to a Levee of flood control project feature, foundation soils will be removed from beneath the Levee or flood control project feature causing it to settle and creating a path for heavy underseepage during high water, potentially causing boils and piping of foundation materials. Around the year 2001 a water well with a corroded screen approximately thirty (30) feet from the landside Levee Toe of the Sacramento River east Levee, near and south of Interstate 5 in Reclamation District 1000, was found to have been pumping Levee foundation materials that caused about one (1) foot of Levee settlement. The Levee settlement had to be repaired at a cost to the public of more than one million dollars. This standard doubles that setback distance because, for that case, thirty (30) feet was insufficient.

(b): The purpose of subdivision (b) is to specify that a Board Permit is required for water wells within the Floodway and within one hundred (100) feet of the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature. It is necessary to require a Board Permit for water wells within the Floodway because water wells and their appurtenances within the Floodway can obstruct flood flows and catch debris and water wells within a Floodway near a Levee can, if malfunctioning, pump Levee foundation materials that result in Levee settlement. It is necessary to require a Board Permit for water wells within one hundred (100) feet of the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature because water wells near a Levee can, if malfunctioning, pump Levee foundation materials that result in Levee

settlement and create a path for heavy underseepage during high water, potentially causing boils and piping of foundation materials.

(b)(1): It is necessary to specify that the well shall be evaluated and confirmed by a California registered civil engineer as not impacting integrity of the Levee because water wells near a Levee can, if malfunctioning, pump Levee foundation materials that result in Levee settlement and create a path for heavy underseepage during high water, potentially causing boils and piping of foundation materials.

(b)(2): It is necessary to specify that use of the existing Levee Right of Way for installation or maintenance of the well is not allowed unless specifically authorized in writing by the Board because this would interfere with the ability of the Local Maintaining Agency to perform its maintenance obligations.

(b)(3): It is necessary to specify that filter pack material shall be a product of a commercial sand and gravel supplier, properly sized and graded for the surrounding soil and well screen to prevent particle infiltration, and composed of clean, round, hard, water worn siliceous material because the filter pack prevents the pump from pumping soils from the vicinity of the well and to do this needs to comprised of uncontaminated durable minerals that are properly sized and graded to be compatible with the surrounding soil and the well screen. A properly designed filter pack allows entry of water without allowing particles to migrate through the filter pack.

(b)(4): It is necessary to specify that well screen shall be extra heavy duty wire-wound stainless steel (type 304 or equivalent) because the well screen must be durable to permanently retain the filter pack from being pumped and wire-wound steel has been found to have the most quality control during fabrication as compared to mill-slotted and press-formed well screens, providing more flexibility for the filter pack gradation. It is necessary to require extra heavy duty stainless steel (type 304) or equivalent to provide the most long lasting well screen, not subject to significant corrosion and providing a cross sectional area for entry of pumped water that will not change from corrosion. Non stainless steel casings tend to corrode over time.

(b)(5): It is necessary to specify that steel screen shall be new copper bearing carbon steel, typically containing about 0.20% copper because addition of a small amount of copper to the carbon steel improves its corrosion resistance. Corrosion can increase the opening size of the screen and allow filter pack particles to be pumped, leading to pumping of surrounding soils.

(c): The purpose of subdivision (c) is to specify that a Board Permit may be required for water wells installed within three hundred (300) feet of the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature. In general, a Board Permit is not required for water wells beyond one hundred (100) feet from the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature if a written notice is provided to the Board at least two (2) weeks before installation commences and the requirements of section 129(b)(3) through (b)(5) of this division are met. It is necessary to specify that a Board Permit may be required for water wells installed within three hundred (300) feet of the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature because even water wells installed beyond one hundred (100) feet from the Levee or flood control project feature can harm the

Levee or flood control feature by pumping soils from the foundation. It is necessary to specify that in general, a Board Permit is not required for water wells beyond one hundred (100) feet from the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature if a written notice is provided to the Board at least two (2) weeks before installation commences and the requirements of section 129 (b)(3) through (b)(5) of this division are met because this notice provides the Board adequate time to confirm that the well design complies with section 129(b)(3) through (b)(5) of this division and these requirements will generally provide for a well screen and filter pack that will not allow pumping of surrounding soils.

(d): The purpose of subdivision (d) is to specify that oil wells, gas wells, and any appurtenant structures shall be located a minimum distance of thirty five (35) feet from a Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature. It is necessary that these structures are located a minimum distance of thirty five (35) feet from a Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of the flood control project feature because Levee maintenance procedures include controlled burning of Levee slopes. Because of the potential volatility of an oil or gas well, additional space between the Levee and an oil or gas well is required to ensure safety of Levee maintenance personnel. This applies even where Levee slopes are not maintained by controlled burning because oil and gas wells sometimes catch fire for other reasons.

(e): The purpose of subdivision (e) is to specify that access roads and foundation pads within a Floodway are normally limited to an elevation of three (3) feet above the natural ground and shall not cause a significant increase in Stream stage or velocities. It is necessary that these structures shall not cause a significant increase in Stream stage or velocities because an increase in Stream stage would reduce flood protection provided in the area and an increase in velocity would likely cause erosion. It is necessary to specify that normally, access roads and foundation pads are limited to three (3) feet in height above the natural ground because such structures less than this high will normally have little effect upon the Floodway capacity. However, if it is determined that a three (3) foot high structure would impair flood flows, the Permit would restrict the height of the structure to less than three (3) feet. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the proposed access roads or foundation pads on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(f): The purpose of subdivision (f) is to specify that structures and fencing at well sites within the Floodway are not allowed without approved hydraulic studies demonstrating that the proposed structure or fence would not impair the Floodway. It is necessary that these are not allowed within the Floodway without approved hydraulic studies because of the potential adverse impact upon the Floodway capacity that can be caused by structures and fencing within the Floodway. Structures, and particularly fences, cause considerable accumulation of debris which causes increased water levels. However, if studies indicate that a proposed structure or fence would have minimal or no impact upon the flood flow capacity, the Permit would be issued. It is necessary to specify that new fences shall be in

compliance with section 126(b) because this subdivision establishes the standards for fences in Floodways. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the proposed structures or fencing on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(g): The purpose of subdivision (g) is to specify that stockpiled excavated material and equipment shall be removed from the Floodway prior to Flood Season. It is necessary to specify that stockpiled excavated material and equipment shall be removed from the Floodway prior to Flood Season because Obstructions within a Floodway not only diminish the flood flow capacity, but can also cause excessive accumulation of debris which can misdirect flows causing severe erosion of channel banks and Levees.

(h): The purpose of subdivision (h) is to specify that Permits for wells require that a survey monument and a permanent bench mark shall be installed at the waterside Levee Toe (or for a Stream without a Levee, the Floodway boundary), as near to the well site as practical, to serve as a vertical control to monitor subsidence. It is necessary to require that a survey monument and a permanent bench mark shall be installed at the waterside Levee Toe because extraction of ground water, oil, and gas has caused subsidence in many areas throughout the state. The effect of subsidence upon Levees is loss of Freeboard and damage to pipelines within the embankment. To detect or monitor subsidence of a Levee, a survey monument and a permanent bench mark must be installed at the Levee Toe to serve as vertical control. Periodic surveys would disclose the development and the rate of subsidence. For a Stream without a Levee, the Floodway boundary is an appropriate place to establish a survey monument and permanent bench mark. Subsidence can adversely impact the flood conveyance capacity of a non-Leveed Stream.

(i): The purpose of subdivision (i) is to specify that a survey shall be performed for the well by the Permittee every year until the well is properly abandoned. The surveys shall be provided to the Board within sixty (60) days. If local subsidence that exceeds regional subsidence is detected, the Permittee shall determine the cause of the local subsidence, with assistance provided by the Board. If the Board determines that the well is causing or contributing to the local subsidence, the Board may require the Permittee to reduce or terminate well production. If the Board requires permanent termination of well production, the Permittee shall abandon the well pursuant to requirements of the local government well abandonment standards and procedures. Documentation of well abandonment shall be provided to the Board. It is necessary to specify that a survey shall be performed for the well by the Permittee every year until the well is properly abandoned because this is the mechanism for evaluating subsidence. It is necessary to specify that the surveys shall be provided to the Board within sixty (60) days because a long delay in transmitting the survey results can lead to undetected subsidence. It is necessary to specify that if local subsidence that exceeds regional subsidence is detected, the Permittee shall determine the cause of the local subsidence, with assistance provided by the Board because a likely cause of the local subsidence is the extraction caused by the well. It is necessary to specify that if the Board determines that the well is causing or contributing to the local subsidence, the Board may require

the Permittee to reduce or terminate well production because continued well production would likely continue to the local subsidence, further reducing the flood protection afforded to the area. It is necessary to specify that if the Board requires permanent termination of well production, the Permittee shall abandon the well pursuant to requirements of the local government well abandonment standards and procedures because local government well abandonment standards and procedures provide the appropriate requirements for well abandonment in the area. It is necessary to specify that documentation of well abandonment shall be provided to the Board because the Board needs the documentation to know what physical features remain and to verify that the well was properly abandoned.

(j): The purpose of subdivision (j) is to specify that any unused wells in the Floodway shall be abandoned by the Permittee upon Board approval and pursuant to requirements of local government well abandonment standards and procedures and that documentation of well abandonment shall be provided to the Board. It is necessary to specify that unused wells in the Floodway shall be abandoned by the Permittee upon Board approval and pursuant to requirements of local government well abandonment standards and procedures because unused wells in the Floodway will not be properly maintained and cleared of debris after high water and can pose a threat to children and local government well abandonment standards and procedures provide the appropriate requirements for well abandonment in the area. It is necessary to specify that documentation of well abandonment shall be provided to the Board because the Board needs the documentation to know what physical features remain and to verify that the well was properly abandoned.

CCR Title 23. Article 8. Section 130. Patrol Roads and Access Ramps

The purpose of section 130 is to establish requirements for Patrol Roads and Access Ramps. In order to inspect and maintain Levees and other components of a flood control project, and to conduct flood fights when needed, it is essential that Patrol Roads and Levee Access Ramps are traversable throughout the year, and particularly during periods of severe weather. A Patrol Road or Levee Access Ramp that becomes unserviceable could interrupt or suspend flood project inspections and maintenance, or delay emergency flood fight procedures.

(a): The purpose of subdivision (a) is to specify the criteria all Patrol Roads shall meet. It is necessary to specify the criteria all Patrol Roads shall meet because it ensures Patrol Roads are useable, prevents the failure of Patrol Road surfacing material, and prevents accelerated deterioration or erosion of Levees.

(a)(1): It is necessary to require that Patrol Roads on Levee crowns shall be surfaced with a minimum of four (4) inches of compacted Class 2 aggregate base (Caltrans Spec. 26-1.02A), or equivalent because the minimum allowable aggregate base will provide a serviceable Patrol Road all year long. Patrol Roads are used extensively, particularly during the Flood Season, to inspect and maintain flood control facilities. Patrol Roads having inadequate surfacing deteriorate rapidly during wet weather, becoming unusable during Flood Season. Four (4) inches is the minimum; additional aggregate base thickness may be required to match the thickness at adjacent Levee Sections or to address historic rutting problems.

(a)(2): It is necessary to require that aggregate base surfacing for Patrol Roads on Levee crowns shall be compacted to a minimum one hundred (100) percent of Standard Proctor dry density according to ASTM D698 or ninety five (95) percent of Modified Proctor dry density according to ASTM D1557, or

equivalent because without sufficient compaction of the aggregate base road surfacing material, a Patrol Road can become impassable during the winter months. It is necessary to specify that moisture control limits are to be within minus one (-1) percent to plus three (+3) percent of optimum and zero (0) percent to plus four (+4) percent of optimum for ASTM D698 and ASTM D1557, respectively, or equivalent, because moisture contents outside of these limits will prevent compaction to the required density. It is necessary to specify that alternatively, the Permittee may opt to provide relative compaction sufficient to withstand a load of sixty-eight thousand (68,000) pounds from two consecutive sets of tandem axles without significant rutting during periods of seasonal precipitation because this provides an acceptable alternative performance specification that some Permittees may choose to implement.

(a)(3): It is necessary to require that the top twelve (12) inches of subgrade supporting the aggregate base on Levee crown Patrol Roads shall be compacted to the same relative compaction standard as the aggregate base surfacing because this subgrade provides critical support to the aggregate base surfacing material and must not yield from tire loads and result in rutting that prevents vehicular travel.

(a)(4): It is necessary to require that field density testing by an Approved Soils Testing Laboratory shall be required to confirm the minimum relative compaction because compaction tests ensure adequate compaction to prevent the failure of Patrol Road surfacing material and an Approved Soils Testing Laboratory meets stringent testing standards that produce reliable results.

(a)(5): It is necessary to require that any gravel added on top of the aggregate base for Levee crown roadways shall be rolled until it provides a firm and unyielding surface for vehicle travel because unrolled gravel that is loose is easily moved and dispersed by the tires of vehicles.

(a)(6): It is necessary to require that paved Patrol Roads shall meet the design requirements for paved bicycle trails as per section 132 of this division because it provides adequate support for heavy maintenance vehicles and equipment, preventing accelerated deterioration and potholes that pond rainfall on the Levee crown, which can result in hazardous conditions for vehicular travel.

(a)(7): The purpose of subdivision (a)(7) is to specify the requirements Patrol Road surfacing shall meet. It is necessary for Patrol Road surfacing to meet these requirements because this allows for adequate drainage and safe travel under adverse weather conditions.

(a)(7)(A): It is necessary to specify that where the Levee crown width is less than sixteen (16) feet, the minimum surfacing width shall be ten (10) feet with a smoothly tapered transition to the edge of the Levee shoulder because this provides for the minimum practical crown width that is safe for vehicular travel under adverse weather conditions.

(a)(7)(B): It is necessary to specify that where the Levee crown width is sixteen (16) feet or more, the minimum surfacing width shall be twelve (12) feet with a two (2) foot wide taper at each edge of the surfacing because this provides an optimal crown width for vehicular travel under adverse conditions.

(a)(7)(C): It is necessary to specify that Patrol Road surfacing on a Levee crown shall be sloped a minimum of two (2) percent because this provides adequate drainage.

(a)(7)(D): It is necessary to specify that whenever possible the minimum surfaced width should allow two vehicles to pass side by side because this provides enough space for safe travel under adverse weather conditions.

(a)(8): It is necessary to require that landside Levee Toe Patrol Roads may not be constructed by cutting into the landside Levee slope to provide access because cutting into the Levee Section would reduce the stability of the Levee.

(a)(9): It is necessary to require that any Patrol Road which has been excavated or damaged shall be restored to its original condition because excavated or damaged Patrol Roads must be restored to an acceptable condition to ensure the durability of the road. Patrol Roads must be serviceable at all times, and particularly during severe winter conditions.

(b): The purpose of subdivision (b) is to specify the criteria Access Ramps, head-on or side approach, shall meet. It is necessary to specify the criteria Access Ramps shall meet because it prevents erosion and ensures that adequate compaction of the Access Ramp material has been acquired to ensure the stability of the Access Ramp and of the surfacing material.

(b)(1): It is necessary to specify that Access Ramps shall be constructed of approved imported material because reducing the dimensions of a Levee Section would lower the designed margin of safety. A Levee Section may not be cut or shaped to form a ramp. It is necessary to specify that all Access Ramps must be constructed with approved imported material because use of imported fill does not reduce the size of the Levee Section and because unsuitable material, such as organic or hazardous material, would reduce public safety.

(b)(2): It is necessary to specify that the surfacing for all Access Ramps shall be the same as for Patrol Roads on Levee crowns because Levee Access Ramps are subjected to the same traffic and loads as are Patrol Roads and must be as functional and as durable. It is necessary to specify that subdivisions (a)(1) through (a)(5) of this section also apply to Access Ramps to provide clear direction to the Permittee regarding surfacing of Access Ramps.

(b)(3): It is necessary to specify that any excavation made in a Levee Section to key the Access Ramp into the Levee shall be backfilled in maximum six (6) inch layers with approved material and compacted to a relative compaction as per section 120(a) of this division because this provides a homogenous, well-compacted Access Ramp with good bonding between the Access Ramp and the Levee slope. It is necessary to specify that the Access Ramp is to be constructed without cutting into the Levee except as required for keying the fill into the Levee because cutting an Access Ramp into the Levee Section would reduce the Levee Section and the flood protection provided by the Levee.

(b)(4): It is necessary to specify that field density testing by an Approved Soils Testing Laboratory shall be required to confirm the minimum relative compaction of Levee embankment subgrades and/or Access Ramps because this verifies that adequate compaction of the access ramp material has been achieved to ensure the stability of the Access Ramp and an Approved Soils Testing Laboratory meets stringent testing standards that produce reliable results.

(b)(5): It is necessary to specify that all Access Ramps shall be constructed in such a manner so as to direct all surface drainage away from the Levee Section because surface drainage must not be allowed to drain toward a Levee Toe and cause, or add to, the saturation of a Levee Section or Levee foundation. A saturated Levee Toe can prevent access along the toe for inspection and flood fighting. A saturated Levee Section can cause loss of Levee stability, leading to possible Levee failure.

(b)(6): It is necessary to specify that all Access Ramps shall be constructed with a grade that is no more than ten (10) percent because overly steep Access Ramps are difficult for loaded gravel trucks to and heavy equipment to climb. It is necessary to specify that waterside Access Ramps shall be constructed with a grade that is no less than five (5) percent because a grade less than five (5) percent results in an overly long Access Ramp that unnecessarily constricts flood flow capacity.

(b)(7): It is necessary to specify that approved gates pursuant to section 126 of this division shall be installed across Levee Access Ramps at locations where vehicular access by the public is possible because Gates are necessary to control unauthorized vehicular traffic on Levee Access Ramps. The gates must also be of sufficient width to provide easy ingress for large maintenance and flood fight equipment.

(b)(8): It is necessary to specify that side approach ramps shall be used on the waterside Levee slope because this minimizes the intrusion into the flood channel or Floodway and cause a minimum loss of flood flow capacity.

(b)(9): It is necessary to specify that side approach ramps on the waterside slope of the Levee shall slope downstream because high velocity flood flows directed against the surface of a side approach ramp that slopes upstream would climb up the ramp and spill over its edge, causing erosion and impairment of the Access Ramp.

(b)(10): It is necessary to specify that side approach ramps on the waterside slope of the Levee shall not cause a significant increase in Stream stage or velocities because a significant increase in stage or velocity could cause additional flooding, overload a Levee, or cause erosion problems. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the proposed side approach ramp on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(b)(11): It is necessary to specify that typical plans for each type of Access Ramp with restrictions and requirements are shown on Figures 8.07 and 8.08 because this helps clarify acceptable design and construction procedures for Levee Access Ramps.

CCR Title 23. Article 8. Section 131. Vegetation

The purpose of section 131 is to establish requirements for Vegetation in an Adopted Plan of Flood Control. Vegetation occupies a somewhat ambivalent position in Levee maintenance. Beneficial effects of Levee vegetation include protection from rain-caused surface erosion on both Levee slopes and to a limited extent from wavewash and current erosion on the waterside slope. The roots of some

vegetation may reduce density in the soil while reinforcing the soil. It is noted that vegetation can provide these benefits only where it can establish and survive. Vegetation on the Levee itself is generally not sufficient protection against wavewash during prolonged high water or against high velocity current. A wooded area on a berm generally can provide added protection to the adjacent Levee against both wavewash and current erosion, and should be encouraged in areas susceptible to wavewash. Native vegetation can also provide environmental values.

Vegetation can have an adverse effect on Levee safety in several ways; by reducing Levee stability, by obscuring the view of other problems, or by preventing access for maintenance or flood fight. Loss of stability could be caused by large trees uprooting in a wind and removing soil from the Levee. On the waterside, uprooting can create eddies resulting in erosion. On the landside this can shorten the path for Levee seepage and underseepage near the Levee Toe, resulting in material being carried from the Levee or its foundation. Depending on soil type, dead trees have the potential to create seepage paths along the space occupied by decayed roots. These seepage paths can have the potential of carrying material from within the Levee during high water which could result in Levee failure. In addition, dense vegetation on Levee slopes makes it difficult to detect rodent burrows and other structural problems. Fruits and nuts from trees on or near a Levee can attract burrowing rodents to the Levee.

On revetted banks, the major concern is larger trees that become top-heavy and lean out over the water or are uprooted by wind and/or the force of water flowing around them. If they uproot rather than break off, the concern is that they would disrupt the thin rock covering, triggering a general shifting of the rock and erosion of the bank material. In channels, the concern is uncontrolled vegetation can obstruct the passage of flood flows.

(a): The purpose of subdivision (a) is to define the terms used in section 131. It is necessary to define terms that are frequently used in section 131, but not elsewhere.

(a)(1): It is necessary to define Oversize Levee to distinguish it from a Levee. Oversize Levee means a Levee which encompasses the minimum Oversized Levee cross-section which has a width of thirty (30) feet at design Freeboard elevation and standard Levee slopes. (See Figure 8.09.)

(a)(2): It is necessary to define Standard Size Levee to distinguish it from an Oversize Levee. Standard Size Levee means a Levee which does not meet the requirements for an Oversize Levee.

(a)(3): It is necessary to define Standard Levee Slopes to distinguish a Levee with these slopes, or flatter, from a Levee with one or both slopes being steeper. Standard Levee Slopes means the landside Levee slope is two (2) horizontal feet to one (1) vertical foot and the waterside Levee slope is three (3) horizontal feet to one (1) vertical foot.

(b): The purpose of subdivision (b) is to specify that suitable vegetation, if properly maintained, is allowed within an Adopted Plan of Flood Control. It is necessary specify that vegetation allowed on Levees, within the Levee Right of Way, or within a Floodway is limited to types that do not, as determined by the Board, present a hazard to Levee or Floodway safety, do not impede flood fight procedures, and do not obstruct flood project maintenance or obscure inspection of Levees.

(c): The purpose of subdivision (c) is to specify that vegetation must not interfere with the integrity of the Adopted Plan of Flood Control, or interfere with maintenance, inspection, and flood fight procedures. It is necessary to specify that vegetation must not interfere with the integrity of the Adopted Plan of Flood Control, or interfere with maintenance, inspection, and flood fight procedures because unsuitable vegetation or improperly maintained vegetation not only encourages the habitation of a Levee by burrowing rodents, but will also obscure developing problems such as rodent burrows, erosion, seepage and other undetected problems which are detrimental to Levees.

(d): The purpose of subdivision (d) is to specify that with the exception of naturally occurring vegetation which the owner of the underlying land has no responsibility to maintain, any vegetation which negatively impacts the structural integrity of the Adopted Plan of Flood Control, interferes with the successful execution, functioning, maintenance or operation of the Adopted Plan of Flood Control, must be removed by the owner. If the owner does not remove such vegetation upon request, the Board reserves the right to have the vegetation removed at the owner's expense. It is necessary to specify that property owners are considered to be responsible for the maintenance of planted vegetation because vegetation can interfere with flood fight procedures or with the inspection, maintenance or operation of a flood control project.

(e): The purpose of subdivision (e) is to specify that Tables 8.3 through 8.6 indicate common types of vegetation considered suitable and unsuitable for planting on Levees. Other types of vegetation, not listed in Tables 8.3 through 8.6, may be approved if determined to be similar to listed suitable species or not detrimental to the integrity, operation, or maintenance of the Adopted Plan of Flood Control. It is necessary to indicate the common types of vegetation considered suitable and unsuitable for planting on Levees because in general, plants or ground covers having thorns or which attract burrowing rodents, obscure the Levee slope, prevent or impede inspection, maintenance or flood fight activities are not allowed on a Levee.

(f): The purpose of subdivision (f) is to specify vegetation and vegetation maintenance standards for Levees. It is necessary to specify vegetation and vegetation maintenance standards for Levees because Levees must be adequately maintained to ensure Levee stability and to ensure vehicular access and passage during flood fight events, maintenance and inspections.

(f)(1): It is necessary to specify that vegetation is not allowed on the Levee crown roadway, but properly maintained grasses or suitable ground covers are allowed on other portions of the Levee crown because Levee crown roadways must be adequately maintained to ensure vehicular access and passage during flood fights, maintenance, and inspections. Such activities can be adversely affected by vegetation that precludes access or safe passage, obscures visibility, or physically prevents grading of the Levee crown. Properly maintained grasses on other portions of the Levee would have no adverse effects on operations, maintenance, inspections and flood fight procedures.

(f)(2): It is necessary to specify that vegetation growing on Levee slopes but infringing onto the Levee crown must be trimmed or sprayed to prevent interference with flood fight, maintenance, or inspection activities because Levee crown roadways must be adequately maintained to ensure vehicular access and passage during flood fights, maintenance, and inspections. Such activities can be adversely affected by vegetation that precludes access or safe passage, obscures visibility, or physically prevents grading of

the Levee crown. Properly maintained grasses on other portions of the Levee would have no adverse effects on operations, maintenance, inspections and flood fight procedures.

(f)(3): It is necessary to specify that tree branches extending above the Levee crown or above the area within ten (10) feet of the Levee Toe, must be pruned to maintain a minimum of twelve (12) feet vertical clearance above the Levee crown and above the area within ten (10) feet of the Levee Toe because this clearance is required to safely operate construction and maintenance equipment used on Levee crowns and adjacent to the Levee Toe. The clearance is necessary to protect operating personnel and equipment, and to provide sufficient area for access of equipment to adequately maintain Levees and conduct flood fights.

(f)(4): It is necessary to specify that tree branches above Levee slopes must be pruned and maintained so that the distance from the Levee slope to the lowest branches, measured normal to the Levee slope, is a minimum of five (5) feet because a minimum of five (5) feet of clearance is required to adequately inspect and maintain Levee slopes, and to conduct emergency flood fights.

(f)(5): It is necessary to specify that trees are not allowed on the crown or slopes of a Standard Size Levee or within ten (10) feet of the Levee Toe of a Standard Size Levee or Oversize Levee because loss of Levee stability could be caused by trees on Levees or within ten (10) feet of the Levee Toe being uprooted and removing large areas of soil. Planted trees must be set back a sufficient distance from the Levee Toe to conform with the requirements of subdivision (f)(3) of this section throughout the life of the tree. On the waterside of Levees, uprooting of trees could create eddies resulting in accelerated erosion of the Levee slope. Decayed tree roots within the Levee or Levee foundation can provide seepage paths leading to internal erosion of the Levee. Planted trees must be set back a sufficient distance from the Levee Toe to provide sufficient clearance to safely operate construction and maintenance equipment on the Levee and adjacent to the Levee Toe.

(f)(6): The purpose of subdivision (f)(6) is to specify the criteria of the trees allowed on Oversize Levee slopes. It is necessary to specify the criteria of the trees allowed on Oversize Levee slopes because it prevents loss of Levee stability and ensures the Levee is free of Obstructions.

(f)(6)(A): It is necessary to specify that trees considered suitable and unsuitable for Oversize Levees are listed in Tables 8.3 and 8.4 respectively because species of trees growing or capable of growing in California are too numerous to list. Consequently, the tables of suitable and unsuitable trees are intended to be used as guidelines for the planting of trees on Oversize Levees. Unsuitable trees include those having an unstable root system or an extensive root system that could result in seepage paths through the Levee or Levee foundation, and trees having the capability of reaching excessive height, size or weight or provide a source of food for burrowing rodents.

(f)(6)(B): It is necessary to specify that trees which will exceed fifty (50) feet in height when mature are not allowed because the loss of Levee stability could occur when large trees are uprooted in a wind causing the removal of soil from the Levee slope. An eddy may occur at the site of an uprooted tree causing additional erosion of the damaged Levee.

(f)(6)(C): It is necessary to specify that trees are allowed on the waterside Levee slope of Oversize Levees up to a point five (5) vertical feet below the DWSE because the upper slope of the Levee must be free of

Obstruction so that in times of flood emergency, protective plastic or wavewash panels can be placed to stabilize structural problems such as erosion or sloughing of the Levee slope.

(f)(6)(D): It is necessary to specify that trees that, in the judgment of the Board, threaten to disturb revetment on Levee slopes or interfere with maintenance must be removed because an uprooted tree could destroy a segment of revetment and cause a slide of a large segment of the rock protection.

(f)(6)(E): It is necessary to specify that fruit and nut trees are not allowed because fruit and nut trees provide a food source for burrowing rodents and therefore encourage their habitation in Levee slopes.

(f)(7): It is necessary to specify that trees, vines, bushes, shrubs, or any other form of woody or herbaceous vegetation that grow in a dense form and prevent visual inspection of the Levee slope and toe, produce fruit or nuts that attract burrowing rodents, or are thorny and could interfere with flood fight efforts, are not allowed on the Levee or within the Levee Right of Way because the retention of any vegetation which interferes with adequate visibility of the Levee Toe can create unacceptable problems and risks. A thicket of trees or bushy plants on a Levee can obscure the view of the Levee Toe where boils and seepage are most likely to occur. Rodents tend to have entrance holes to their burrows in Levees where plants provide cover.

(f)(8): The purpose of subdivision (f)(8) is to specify that sod, grasses, perennial flowers, and other nonwoody ground covers are allowed on Levee slopes and within the Levee Right of Way if the height of the vegetation does not exceed twelve (12) inches. Ground covers considered suitable and unsuitable on Levee slopes and within the Levee Right of Way are listed in Tables 8.5 and 8.6, respectively. It is necessary that in areas where vehicular access is maintained along the Levee Toe, ground covers are generally not allowed because it would interfere with vehicular access. Beneficial effects of suitable ground covers include protection from rain-caused erosion on both Levee slopes and, to a limited extent, wavewash and Stream flow erosion on the waterside slope. For ground covers with specific maintenance requirements (see Table 8.5) they must comply with the following criteria.

(f)(8)(A): It is necessary to specify that the Permittee is responsible for maintaining the ground cover at a height less than one (1) foot because taller ground cover interferes with inspection of the Levee slope.

(f)(8)(B): It is necessary to specify that the maintaining agency reserves the right to mow the groundcover without prior notification if the height exceeds one (1) foot because taller ground cover interferes with inspection of the Levee slope and providing notification prior to routine mowing operations would interfere with the ability of the maintaining agency to perform its maintenance.

(f)(8)(C): It is necessary to specify that any irrigation system for the ground cover must be designed to not interfere with mowing because interfering with routine mowing operations would slow down or prevent complete mowing of the Levee slope as required for adequate Levee maintenance.

(f)(8)(D): It is necessary to specify that ground covers that are required by this subdivision to be mowed are generally allowed only on the upper twenty (20) feet of Levee slope because most mowers can only reach down twenty (20) feet from the Levee crown. Exceptions may be warranted where the maintaining agency uses mowers with capability to mow beyond twenty (20) feet below the Levee

crown or where the Levee slope is flat enough that mowing is conducted beyond twenty (20) feet below the Levee crown.

(f)(9): It is necessary to specify that thick-stemmed, extremely dense or woody ground covers are not allowed on Levee slopes or within the Levee Right of Way because thick stemmed, extremely dense and woody ground covers often exhibit "mat-like" growth characteristics which make detection of erosion areas underlying these mats difficult. In addition, the ground covers present a tripping hazard to foot patrols and emergency crews during inspections or flood fight activities. Foot patrolling and flood fight crews often work under adverse conditions with minimal light.

(f)(10): It is necessary to specify that flower gardens where the height of the vegetation does not exceed twelve (12) inches, and which are compatible with flood fight procedures, maintenance, and inspection programs are allowed within the Levee Right of Way because flower gardens would not provide a food source for burrowing rodents and cultivation of the ground adjacent to the Levee Toe would not be detrimental to the Levee.

(g): The purpose of subdivision (g) is to specify vegetation and vegetation maintenance standards for Floodways and bypasses. It is necessary to specify vegetation and vegetation maintenance standards for Floodways and bypasses to ensure Revetment integrity, maintain flood channel capacities, and prevent unnecessary high water stages.

(g)(1): It is necessary to specify that vegetation is allowed within Revetment on streambanks unless, in the judgment of the Board, it becomes a threat to the integrity of the Revetment because suitable vegetation can enhance the stability of some types of Revetment. However, some trees and shrubs have the potential to displace rocks or cobbles exposing the underlying soil to erosion.

(g)(2): It is necessary to specify that invasive or difficult-to-control vegetation, whether naturally occurring or planted, that impedes or misdirects flood flows is not allowed to remain on a berm or within the Floodway or bypass because vegetation that impedes or misdirects flood flows will diminish flood channel capacities, increase flood stages, and can cause rapid erosion of a Levee slope that could lead to possible Levee failure.

(g)(3): It is necessary to specify that the Board may require clearing and/or pruning of trees and shrubs planted within Floodways in order to minimize Obstruction of flood flows because selective clearing within Floodways may be necessary to maintain Floodway capacities and prevent unnecessary high water stages.

(g)(4): It is necessary to specify that trees and brush that have been cut down must be burned or removed from the Floodway prior to the Flood Season because downed trees, brush or other floatable material remaining within the Floodway during the Flood Season could impede flood flows, diminish channel capacities, increase flood flow stages and velocities, and damage bridges and flood control structures.

(h): The purpose of subdivision (h) is to specify that orchards are not allowed within bypasses but may be planted within other Floodways in accordance with certain criteria. It is necessary to specify these criteria for orchards within Floodways to ensure Revetment integrity, minimize Obstruction of flood

flows, maintain flood channel capacities, and prevent unnecessary high water stages. The Board owns flowage easements within bypasses, and typically does not own flowage easements in other Floodways. Orchards are generally considered to be inconsistent with the Board's property rights, e.g., flowage easements which are designed to maximize conveyance of flood flows.

(h)(1): It is necessary to specify that if an orchard is abandoned, all trees must be removed and burned or disposed of outside the Floodway prior to Flood Season because abandoned orchards lead to dead trees, debris and driftwood. Debris remaining within a Floodway could impede flood flows, diminish channel capacities, increase flood flow stages and velocities, and damage bridges and flood control structures.

(h)(2): It is necessary to specify that trees or brush cut prior to planting an orchard must be removed and burned or disposed of outside the Floodway prior to Flood Season because downed trees, brush or other floatable material remaining within the Floodway during the Flood Season could impede flood flows, diminish channel capacities, increase flood flow stages and velocities, and damage bridges and flood control structures.

(h)(3): It is necessary to specify that orchard cuttings and any debris that may accumulate in the orchard during the Flood Season must be removed from the Floodway, or must be disposed of in such a manner as to leave no floatable debris within the Floodway because debris remaining within a Floodway could impede flood flows, diminish channel capacities, increase flood flow stages and velocities, and damage bridges and flood control structures. Cuttings and other debris must regularly be burned or removed and disposed of outside the Floodway throughout pruning activities so as to leave no floatable debris within the Floodway.

(h)(4): It is necessary to specify that dead trees, stumps, prunings, or other agricultural debris may not be placed on the Levee Section or within ten (10) of the Levee Toe because the depositing of such material on or hear a Levee would induce erosion, interfere with Levee inspection and maintenance, and restrict flood fight procedures.

(h)(5): It is necessary to specify that tree rows must be parallel to the direction of the overbank flow and may not direct the flow toward the Levee because tree rows in parallel to the Stream flow minimize Obstruction of flood flows. Flood flows directed toward a Levee could cause severe erosion of the Levee slope which could result in Levee failure.

(h)(6): It is necessary to specify that the spacing between rows must be a minimum of sixteen (16) feet perpendicular to the overbank flow of the Stream because this minimum is usually effective in preventing large pieces of driftwood from lodging against the trees causing a buildup of debris between rows of trees within the Floodway. The row spacing must be increased if, in the judgment of the Board, additional space is necessary for the passage of flood flows. The minimum spacing may be increased depending upon the type of orchard and the size of trees at maturity. Another factor is the size of drift expected during high water. Preventing the deposition or buildup of debris in an orchard located within a Floodway is essential in maintaining flood flows with minimum water stage levels.

(i): The purpose of subdivision (i) is to specify that vegetable gardens are not allowed on the Levee slope but vegetable gardens may be allowed within the Levee Right of Way where they will not interfere with

maintenance and inspection. It is necessary to not allow vegetable gardens on the Levee slope because vegetable gardens would become an available food source for burrowing rodents and encourage rodents to establish burrows within the Levee or adjacent to the Levee. Vegetable gardens also involve periodic excavation or cultivation of the soil cover which promotes excessive rainfall-runoff erosion. In addition, vegetable plants are often large or bushy and capable of impeding or obscuring inspection of the Levee slope and the Levee Toe area.

(i)(1): It is necessary to specify that vegetable gardens may be allowed within the Levee Right of Way if no large bushy plants such as corn, tomatoes, grapes and peas are within the Levee Right of Way because vegetable gardens would become an available food source for burrowing rodents and encourage rodents to establish burrows within the Levee or adjacent to the Levee.

(i)(2): It is necessary to specify that vegetable gardens may be allowed within the Levee Right of Way if there is not a maintenance access road along the Levee Toe because there would be no need to keep the area clear for maintenance vehicles.

(i)(3): It is necessary to specify that vegetable gardens may be allowed within the Levee Right of Way if the adjacent Levee slope is not sprayed with herbicide by the maintaining agency because the vegetable gardens would not unduly interfere with the ability of the maintaining agency to spray herbicide on the Levee slope.

(i)(4): It is necessary to specify that vegetable gardens may be allowed within the Levee Right of Way if the Levee is not experiencing burrowing rodent activity because vegetable gardens would provide a food source for burrowing rodents, but there is not currently any burrowing rodent activity at the site. It is necessary to specify that if there is burrowing rodent activity in the immediate vicinity, the vegetable garden Permittee shall control the rodents to the satisfaction of the Board or remove the garden because the burrowing rodents can burrow into the Levee and create seepage paths partly or entirely through the Levee, which can cause internal erosion of the Levee during high water.

(j): The purpose of subdivision (j) is to specify the criteria for irrigation of vegetation on Levee slopes. It is necessary to specify the criteria for irrigation of vegetation on Levee slopes because the criteria prevent erosion, reduce potential hazards to the Levee, provide for Levee stability, and reduce the risk of saturation of the Levee or Levee foundation.

(j)(1): It is necessary to specify that permanently installed irrigation systems are allowed on both Levee slopes of Oversize Levees and on the landside slope of Standard Size Levees, but not on the waterside slope of Standard Size Levees because permanent irrigation systems on the waterside Levee slope of a Standard Size Levee could be damaged by flood flows and, if pressurized at the time of damage, the water force could cause rapid erosion of the waterside Levee slope possibly undetected during flood flows and resulting in extensive damage to a Standard Size Levee. An Oversize Levee is substantially larger and, though it may experience similar damage, it would still have ample cross section to remain stable.

(j)(2): It is necessary to specify that surface low pressure drip irrigation systems may be used on either the landside or waterside Levee slope because a low pressure system poses little potential hazard to the Levee in case of a malfunction or rupture in the system.

(j)(3): It is necessary to specify that any water applied to vegetation on the Levee slope by any means must be controlled because uncontrolled irrigation water can cause erosion, sloughing, subsidence and other structural problems which could possibly result in Levee failure.

(j)(4): It is necessary to specify that ditches may not be dug in the Levee Section, within the Levee Right of Way, or within the Projected Levee Section for irrigation or drainage because it can reduce the stability of the Levee, contribute to the occurrence of boils, and increase the risk of saturation of the Levee or Levee foundation.

(j)(5): It is necessary to specify that watering basins around trees must be limited to a maximum depth of twelve (12) inches because significant excavation within a Levee Section reduces the structural integrity of the Levee.

(j)(6): It is necessary to specify that permanently installed irrigation pipes may be buried but may be no deeper than eight (8) inches into the Levee slope because the eight (8) inch limitation minimizes the potential for serious problems to develop should there be a failure in the irrigation system. A rupture in an irrigation pipe would be much more difficult, and time consuming, to locate and repair if the irrigation system was buried deeply within the Levee.

(j)(7): It is necessary to specify that a readily accessible shutoff or control valve is required in the supply line of all irrigation systems, and the valve must be located according to the requirements of section 123(d)(6) and clearly identified for Levee maintenance or flood fight personnel because access to a control valve allows maintenance or emergency personnel to immediately locate and shut off potentially damaging water flows in the event of a pipe failure. The valve must be located according to the requirements of section 123(d)(6) to provide for rapid closure in the event of leakage or rupture of the pipeline. A leaking or ruptured pipeline could cause serious erosion of a Levee and/or saturation of the Levee slope leading to sloughing of the Levee slope. A valve, or other rapid closure device, is required to prevent continued or extensive Levee damage that can be caused by a ruptured pipeline. The closure device needs to be located away from the Levee to prevent damage to the valve by maintenance equipment or flood fight equipment and to depressurize the pipeline that is within and near the Levee, but close enough to the Levee so that it is accessible.

(k): The purpose of subdivision (k) is to specify that the Board may Permit, with appropriate conditions, existing nonconforming vegetation after considering a number of factors, including but not limited to (1) age of vegetation, (2) type of vegetation, (3) location of vegetation, (4) size of vegetation, (5) physical condition of vegetation, (6) whether the vegetation was planted or is naturally occurring, (7) condition of the Adopted Plan of Flood Control, (8) environmental value of the vegetation, and (9) ability to inspect and maintain the Levee around the vegetation. It is necessary to specify that naturally occurring vegetation, and vegetation planted without prior approval from the Board may be allowed to remain within an Adopted Plan of Flood Control if, in the judgment of the Board, the vegetation is maintained according to standards and other considerations outweigh potential adverse effects upon the Adopted Plan of Flood Control.

(l): The purpose of subdivision (l) is to specify that trees removed from the Levee and from within ten (10) feet of the Levee shall have all roots larger than one and one-half (1-1/2) inches in diameter

removed for a distance of at least three (3) feet from the tree trunk at ground level and the hole filled with impervious soil compacted in four (4) to six (6) inch lifts. Compaction within the Levee Section shall be a relative compaction of not less than ninety (90) percent, per ASTM D1557-91, dated 1991, which is incorporated by reference. Outside of the Levee Section, the soil shall be compacted to at least the density of adjacent undisturbed material. It is necessary to specify that trees removed from the Levee and from within ten (10) feet of the Levee shall have all roots larger than one and one-half (1-1/2) inches in diameter removed for a distance of at least three (3) feet from the tree trunk at ground level and the hole filled with impervious soil compacted in four (4) to six (6) inch lifts because substantial tree roots left in place will rot and can allow seepage paths to develop in the decayed matter and this can be avoided by removal of roots larger than one and one-half (1-1/2) inches near the trunk and backfilling with compacted impervious soil. It is necessary to specify that compaction within the Levee Section shall be a relative compaction of not less than ninety (90) percent, per ASTM D1557-91, dated 1991, which is incorporated by reference, because this compaction is consistent with the compaction requirements for construction of Levees. It is necessary to specify that outside of the Levee Section, the soil shall be compacted to at least the density of adjacent undisturbed material because this will restore the affected area to be consistent with adjacent soils.

CCR Title 23. Article 8. Section 132. Bicycle Trails

The purpose of section 132 is to establish requirements for bicycle trails. Public use of bicycle trails located within an Adopted Plan of Flood Control can interfere with the construction, maintenance and inspection of flood control facilities and impede flood fight activities. The standards described in section 132 Bicycle Trails are necessary to prevent, or minimize, such interference or impediment, protect the general public using the bicycle trails, prevent damage to Levees and other flood control facilities, and protect the property and privacy of adjacent residents.

(a): The purpose of subdivision (a) is to specify that it is the Board's policy to allow the construction of paved and unpaved bicycle trails by public agencies on Levees and within Floodways under the Board's jurisdiction, provided that the flood control purpose of the Levees and Floodways remains primary. It is necessary to specify that paved and unpaved bicycle trails are allowed provided that the flood control purpose of the Levees and Floodways remains primary priority because recreational use of Floodways can be compatible with flood operations. However, flood control facilities are designed and maintained to provide protection of life and property, and any reduction of such protection for the benefit of a recreational facility is unacceptable.

(a)(1): It is necessary to specify that where feasible, the bicycle trail shall be located off of the Levee because extensive public use of a bicycle trail constructed on a Levee compounds the difficulties of patrolling, inspecting and maintaining the Levee. To alleviate these problems, and to promote public safety, bicycle trails will not be allowed on Levees where alternate locations are feasible.

(a)(2): It is necessary to specify that repair or replacement of the bicycle trail that is damaged during an emergency flood fight procedure, routine maintenance, or any required improvement activity within an Adopted Plan of Flood Control shall be made by, and at the sole expense of, the Permittee or in accordance with an agreement for maintenance between the Permittee and a public agency because flood protection is the primary purpose of all flood control facilities. The maintenance of secondary

facilities, such as bicycle trails, must remain the responsibility of the Permittee to preclude any unnecessary and undue burden on the State or maintaining agency.

(a)(3): It is necessary to specify that the Board and the Local Maintaining Agency retain the right to temporarily close the bicycle trail for improvement, maintenance, or emergency flood fight activities because this prevents use of the bicycle trail from significantly interfering with improvement, maintenance, or flood fight activities – protecting the integrity of the Levee and public safety.

(a)(4): It is necessary to specify that bicycle trails within an Adopted Plan of Flood Control shall be maintained to a level safe for bicycle traffic and acceptable to the Local Maintaining Agency and the Department because this standard provides for public safety and precludes any unnecessary and undue financial burden on the state that may arise out of the Permittee's use of the flood project facilities.

(a)(5): It is necessary to specify that the Permittee shall defend, hold harmless, and indemnify the State of California and the Local Maintaining Agency, and each of their Boards, elected officials, officers, employees, and agents against all damages and claims of liability of whatever nature which arise from the use of the Levee as a bicycle trail because the state has constructed Levees for the purpose of flood control. The Permittee must assume responsibility for all damages that occur and claims of liability that may arise because of allowed activities on the flood project Levees, in order to prevent undue financial burden on the state.

(b): The purpose of subdivision (b) is to specify the conditions for bicycle trails allowed on a Levee Section. It is necessary to specify the conditions for bicycle trails allowed on a Levee Section because these conditions prevent accelerated deterioration or erosion of Levees, provides maximum protection during flood emergencies, and prevents hazardous conditions.

(b)(1): It is necessary to specify that The Permittee shall submit proposed use restrictions for the bicycle trail, and a plan for enforcement of the restrictions satisfactory to the Board, prior to commencing construction because unauthorized use of bicycle trails, such as equestrian or motorized vehicular traffic, can cause the accelerated deterioration or erosion of Levees, and can possibly lead to unsafe or hazardous conditions which put employees and the general public at risk.

(b)(2): It is necessary to specify that the Permittee shall agree to bear the cost of any repairs to a flood control project facility that are made necessary by the presence or use of the bicycle trail because flood protection must remain the primary function of the facilities, and all such facilities must be maintained to provide maximum protection during flood emergencies. The Permittee is held responsible for the expense of repairs or maintenance made necessary by the presence or use of a bicycle trail to preclude any unnecessary and undue burden on the state or maintaining agency.

(b)(3): It is necessary to specify that paved bicycle trails constructed on the Levee crown shall have a minimum pavement width of twelve (12) feet and a minimum shoulder width of one (1) foot on each side of the pavement because this provides for the safe simultaneous conveyance of Levee patrol vehicles, maintenance equipment, bicycles and pedestrians. It is necessary to specify that the outer edges of the finished pavement may be no higher than the adjacent shoulders and the cross-section shall be shaped and trimmed to produce a smooth transition from pavement to shoulder because an unsmooth transition at the edge of the pavement is dangerous by bicyclists and can cause erosion of the

Levee shoulder. The shoulder width of at least one (1) foot helps to prevent erosion of the Levee crown from surface drainage, to keep the aggregate base from becoming saturated, to promote long life of the pavement, and to reduce hazards to bicyclists.

(b)(4): It is necessary to specify that paved bicycle trails on the Levee crown shall be designed to withstand a load of sixty-eight thousand (68,000) pounds from two consecutive sets of tandem axles and soil tests may be required to determine design of the trail because when a paved bicycle trail is constructed on a Levee, the structural section of the trail must be designed to withstand loadings from truck traffic weighing as much as thirty (30) tons. An insufficient structural section would result in cracked pavement, or potholes, causing hazardous conditions for bicyclists, pedestrians and vehicles.

(b)(5): It is necessary to specify that the structural section of paved bicycle trails shall consist of a minimum of six (6) inches of compacted aggregate base beneath two (2) inches of asphalt concrete pavement, or equivalent, on a subgrade compacted pursuant to section 120(a) of this division because when a paved bicycle trail is constructed on a Levee, the structural section of the trail must be designed to withstand loadings from maintenance truck traffic weighing as much as thirty (30) tons. An insufficient structural section would result in cracked pavement, or potholes, causing hazardous conditions for bicyclists, pedestrians and vehicles. It is necessary to specify that field density testing by an Approved Soils Testing Laboratory will be required to confirm the minimum relative compaction of the subgrade because improperly compacted subgrade materials may not be able to support the design wheel loading and an Approved Soils Testing Laboratory meets stringent testing standards that produce reliable results.

(b)(6): It is necessary to specify that the aggregate base shall extend beyond the pavement to allow drainage because this provides surface drainage to keep the aggregate base from becoming saturated, promotes long life of the pavement, and eliminates water hazards to bicyclists.

(b)(7): It is necessary to specify that the bicycle trail and all bicycle Access Ramps shall be sloped to drain away from the Levee crown because paved bicycle trails must be sloped to provide surface drainage to keep the aggregate base from becoming saturated, to promote long life of the pavement, and eliminate water hazards to bicyclists. Unpaved bicycle trails must be sloped to prevent ponding on the Levee crown that could lead to excessive saturation of the Levee Section, sloughing, or erosion of the Levee slope from concentrated runoff.

(b)(8): It is necessary to specify that bicycle Access Ramps on Levee slopes shall conform to the criteria set forth for Access Ramps as per section 130 of this division because vehicular and bicycle Access Ramps present identical design, construction and maintenance problems faced in providing for the protection of the structural integrity of the Levee.

(b)(9): It is necessary to specify that the bicycle trail may not be cut into the Levee Section but may be placed on fill along the Levee slope provided it will not interfere with maintenance because cutting into the Levee Section to construct the bicycle trail would reduce the stability of the Levee.

(b)(10): It is necessary to specify that the Permittee shall maintain the bicycle trail or provide evidence of agreement with a public agency to provide maintenance because this protects public safety by ensuring that the bicycle trail does not compromise the integrity of the Levee, including its crown roadway.

Requiring maintenance by a public agency ensures that long-term maintenance will be performed without the possibility of going out of business – unlike private entities.

(b)(11): It is necessary to specify that the Permittee may be required to prevent unauthorized vehicular access to bicycle trails by installing gates or physical barriers such as K-rail, which shall be removable to allow access for maintenance, inspection, and emergency vehicles because unauthorized vehicular traffic on bicycle trails presents a hazard to bicyclists, pedestrians, maintenance, and patrol personnel. The control of authorized traffic and the prevention of unauthorized traffic is essential to provide for optimum safety on bicycle trails, and to protect Levees from abuse and the resulting deterioration.

(b)(12): It is necessary to specify that the Permittee shall install permanent safety signs at all bicycle access points and at periodic intervals along the trail to inform the public that the trail is restricted to bicycle and pedestrian use by the public because unauthorized use of the trail, such as equestrian or motorized vehicles, could lead to unsafe or hazardous traffic conditions placing employees and the public at risk and possibly exposing the state or maintaining agency to liability claims.

(b)(13): It is necessary to specify that the Permittee shall install permanent signs at all bicycle access points to control unauthorized use of bicycle trails because unauthorized use of the trail by the general public, such as equestrian use, could lead to unsafe or hazardous conditions that put employees and the general public at risk. The signs are to inform the public that bicycle trails on Levees are restricted to bicycle and pedestrian traffic only.

(b)(14): It is necessary to specify that sign posts shall not penetrate the Levee by more than twelve (12) inches unless encased in concrete cast in place against firm undisturbed earth because they can provide a potential seepage path into the Levee for rainfall runoff or for high water under full loading of the Levee.

(c): The purpose of subdivision (c) is to specify the conditions for bicycle trails allowed in a Leveed Floodway. It is necessary to specify the conditions for bicycle trails allowed in a Leveed Floodway because these conditions prevent accelerated deterioration or erosion of Levees, provide maximum protection during flood emergencies, and prevent hazardous conditions.

(c)(1): It is necessary to specify that the Permittee shall submit proposed use restrictions for the bicycle trail and a plan for enforcement of such restrictions satisfactory to the Board, prior to commencing construction because unauthorized use of bicycle trails, such as equestrian or motorized vehicular traffic, can cause the accelerated deterioration or erosion of nearby Levees, and can possibly lead to unsafe or hazardous conditions which put employees and the general public at risk.

(c)(2): It is necessary to specify that the Permittee shall agree to bear the cost of any repairs to a flood control project facility that is made necessary by the presence or use of the bicycle trail because flood protection must remain the primary function of the Floodway facilities, and all such facilities must be maintained to provide maximum protection during flood emergencies. The Permittee is held responsible for the expense of repairs or maintenance made necessary by the presence or use of a bicycle trail to preclude any unnecessary and undue burden on the state or maintaining agency.

(c)(3): It is necessary to specify that bicycle trails shall be constructed as near to natural ground level as possible because this prevents the impediment of flood flows, changing the direction of flows, or causing excessive high Stream stages.

(c)(4): It is necessary to specify that the Permittee shall maintain the bicycle trail or provide evidence of an agreement with a public agency to provide maintenance because this protects public safety by ensuring that the bicycle trail does not compromise the integrity of the Levee, project facilities, or Floodway. Requiring maintenance by a public agency ensures that long-term maintenance will be performed without the possibility of going out of business – unlike private entities.

(c)(5): It is necessary to specify that the Permittee is required to prevent unauthorized vehicular access to bicycle trails by physical barriers, which shall be removable to allow access for maintenance, inspection, and emergency vehicles because unauthorized vehicular traffic on bicycle trails presents a hazard to bicyclists, pedestrians, maintenance, and patrol personnel. The control of authorized traffic and the prevention of unauthorized traffic is essential to provide for optimum safety on bicycle trails, and to protect nearby Levees from abuse and the resulting deterioration.

(c)(6): It is necessary to specify that the Permittee shall install permanent signs at all bicycle access points to control unauthorized use of bicycle trails because unauthorized use of the trail by the general public, such as equestrian use, could lead to unsafe or hazardous conditions that put employees and the general public at risk.

(d): The purpose of subdivision (d) is to specify that the bicycle trail shall not cause a significant increase in Stream stage or velocities and apply the Hydraulic Impact Evaluation Procedure for evaluating any hydraulic impact. It is necessary to specify that the bicycle trail shall not cause a significant increase in Stream stage or velocities because a significant increase in stage or velocity could cause additional flooding, overload a Levee, or cause erosion problems. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the proposed bicycle trail on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(e): The purpose of subdivision (e) is to require that whenever possible the Permittee shall consider privacy concerns of adjacent landowners and incorporate features into the trail design to mitigate these concerns. It is necessary to require that whenever possible the Permittee shall consider privacy concerns of adjacent landowners and incorporate features into the trail design to mitigate these concerns because there is often a conflict between the desire for public use of Levees and the desire of adjacent residents to have privacy and security. The Board is respectful of both desires and requires that, whenever possible, the concerns of these adjacent residents be mitigated so as to avoid conflicts that can adversely affect operation and maintenance personnel and the public.

CCR Title 23. Article 8. Section 133. Supplemental Standards for Control of Residential Encroachments in Reclamation District 1000

The purpose of section 133 is to establish requirements for supplemental standards for control of residential Encroachments in Reclamation District 1000. It is the policy of the Board to preclude home construction within the Floodway of a project Levee system. There are, however, some exceptions. Homes have been constructed along the Sacramento River on the Garden Highway in Reclamation District 1000. The land between the Garden Highway and the Sacramento River was subdivided into individual lots and sold as future home sites in the early 1930's. In the early years, homes were built below the DWSE, resulting in direct flood damages. This flood problem and related issues caused property owners to call for modification of flood operations, inconsistent with USACE requirements, to reduce the frequency of flooding of their properties. All of these home sites have the potential to be flooded, but by setting Encroachment standards, a safer living condition was promoted. Any Encroachment within a Leveed area that raises the water level increases the danger to property on the landside as well as the riverside. In 1968, formal standards were adopted for Reclamation District 1000 which, in part, set lowest finished floor elevations for Dwellings, and required the home site location to be adjacent to the Levee road. These standards were established to avoid significant hydraulic impacts, establish appropriate elevations for the lowest finished floor of new Dwellings, prevent associated Encroachments that would interfere with Levee operation, maintenance, and inspection, and expedite the application process. These standards were based on the results of the technical review of numerous applications for the construction of homes along the Garden Highway prior to 1968.

The main objectives of these standards are to control development or activity that could possibly reduce the flood flow carrying capacity of the Sacramento River, or could adversely affect the operation of flood control structures. These flood control structures provide protection for the entire Sacramento area. Also, for Dwellings within the Floodway, standards have been adopted that require such Dwellings to have the lowest finished floor level two (2) feet above the DWSE to provide a minimum level of flood protection. Dwellings must be constructed on an elevated pad or on piles, and shall be located adjacent to the Levee road that provides an escape route from the Floodway.

These standards provide as much public safety for these home sites as possible without jeopardizing the flood control project. The standards described in section 133 are required to provide continuity with the historical actuality that Dwellings have been allowed to be constructed within the Floodway of a project Levee system, but continue to control such development to prevent damage, or the impairment, of any flood control facility or Permitted Dwelling.

Earlier versions of these standards referenced the centerline of the Levee for waterward setback distances, which at the time was also the centerline of the Garden Highway. However, starting around 2010 a significant reach of this Levee was enlarged by raising and widening the embankment and creating a new Levee crown immediately landward of the Garden Highway. Therefore, to keep the same setback distances, these regulations now refer to the centerline of the Garden Highway Levee, which is defined consistent with the Garden Highway.

(a): The purpose of subdivision (a) is to define Garden Highway Levee, a term used only in section 133, to distinguish it from other Levees and the adjacent Levee which has been added to portions of the Garden Highway Levee landward of the crown of the Garden Highway Levee. “Garden Highway Levee”

means the Levee on which the Garden Highway is located along the Sacramento River between Levee miles 0.00 and 18.60, Unit 1, Reclamation District 1000.

(b): The purpose of subdivision (b) is to specify that the owner or Permittee must maintain the waterside slope of the Garden Highway Levee and the utilized area within the Floodway of the Sacramento River in the manner required by Reclamation District 1000 or any other agency responsible for maintenance. It is necessary for the owner or Permittee to maintain the waterside slope of the Garden Highway Levee and the utilized area within the Floodway of the Sacramento River because this ensures appropriate maintenance of the Levee adjacent to the residence. Normally the routine maintenance is accomplished by Reclamation District No. 1000. However, because the location of the Dwelling, driveway and other utilities make it difficult for Reclamation District 1000 to perform the maintenance, it is appropriate for the owner or Permittee to assume this responsibility. Routine maintenance is considered to be, but not limited to, vegetation and rodent control, river debris and roadside trash removal, and promptly reporting any potentially hazardous or dangerous conditions.

(c): The purpose of subdivision (c) is to specify that the area between the Garden Highway and the riverbank may be filled, provided the fill does not extend more than one hundred fifty (150) feet waterward from the centerline of the Garden Highway. It is necessary to specify that the area may be filled, provided the fill does not extend more than one hundred fifty (150) feet waterward from the centerline of the Garden Highway because the elimination of the Floodway area within one hundred and fifty (150) feet of the centerline of the Garden Highway would likely have little effect on the Floodway hydraulics, but fill farther into the Floodway, when viewed cumulatively, would raise Stream stages (purportedly based on hydraulic studies performed in the 1960's that are no longer available). Because the purported hydraulic studies from the 1960's are no longer available, and may be outdated anyway, and the effect of fill on flood stages is uncertain, it is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact and the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(d): The purpose of subdivision (d) is to specify the conditions applied to the area located between the waterside edge of the Garden Highway and a point sixty-five (65) feet waterward from the centerline of the Garden Highway. It is necessary to specify conditions for the area located between the waterside edge of the Garden Highway and a point sixty-five (65) feet waterward from the centerline of the Garden Highway because this area needs to be clear of Dwellings and types of Encroachments that would interfere with the ability to inspect the waterside Levee slope.

(d)(1): It is necessary to specify that where the area is less than one (1) foot above the DWSE, driveways and ramps may be constructed at any orientation to the Garden Highway Levee because in Reclamation District 1000, the fill for driveways and ramps constructed perpendicular to the Levee would not affect flood flows, Levee inspection, maintenance, or flood fight procedures. Usually, driveways and ramps must be constructed parallel to the Levee.

(d)(2): It is necessary to specify that where the area is less than one (1) foot above the DWSE, fences, walls and similar structures parallel to the Garden Highway Levee must be an open type and constructed to provide for unobstructed visual inspection because fences in this area must not obscure visual inspections of the Levee. Fences must be a type that allows for the visual inspection of the Levee slope and toe from the crown roadway.

(d)(3): It is necessary to specify that where the entire area is at least one (1) foot above the DWSE, no restrictions apply to fences, walls, and similar structures because where the area is at least one (1) foot above the DWSE, the probability of the area being inundated is minimal. Fences, walls or similar structures constructed in the area above the DWSE would have no adverse impact on flood flows or on Levee inspections, maintenance and flood fight procedures.

(d)(4): It is necessary to specify that fences, walls, and similar structures shall be designed to meet the requirements of Reclamation District 1000, and these requirements shall be incorporated into Board Permits when applicable because Reclamation District 1000 may have additional requirements for Dwellings and related Encroachments that facilitate efficient operation, maintenance, inspection, and flood fighting for the Garden Highway Levee due to the unique nature of allowing Dwellings and associated Encroachments within the Floodway on and/or near the waterside Levee slope.

(d)(5): It is necessary to specify that elevated walkways and driveways are without elevation restrictions because Stream flow velocities along the Garden Highway Levee are relatively low and consequently Freeboard for the passage of drift is unnecessary.

(e): The purpose of subdivision (e) is to specify the conditions applied to the area beginning at a point sixty-five (65) feet waterward from the centerline of the Garden Highway and extending waterward a maximum of one hundred and fifty (150) feet from the centerline of the Garden Highway. It is necessary to specify conditions for the area beginning at a point sixty-five (65) feet waterward from the centerline of the Garden Highway and extending waterward a maximum of one hundred and fifty (150) feet from the centerline of the Garden Highway because this prevents Dwellings and associated Encroachments from obstructing the ability of Reclamation District 1000 to perform operation, maintenance, repair, inspection, and flood fighting along the waterside Levee slope of the Garden Highway Levee. It is recognized that some interference can occur due to allowing a few certain Encroachments such as ramps, driveways, and see-through fences parallel to the Levee closer than sixty-five (65) feet from the centerline of the Garden Highway, but Reclamation District 1000 has been able to work around these Encroachments without difficulty for many years.

(e)(1): It is necessary to specify that within the area beginning at a point sixty-five (65) feet waterward from the centerline of the Garden Highway and extending waterward a maximum of one hundred and fifty (150) feet from the centerline of the Garden Highway, securely anchored fences and structures are allowed because fences and structures in this area have little effect on flood flows or channel hydraulics and would be off of most or all of the waterward slope of the Garden Highway Levee. However, it is imperative that fences and structures are securely anchored to prevent floatation during flood flows. The accumulation of floating fence materials or structures against bridges, marinas, or other channel structures could cause increased flood stages, structural damage, or accelerate erosion.

(e)(2): It is necessary to specify that within the area beginning at a point sixty-five (65) feet waterward from the centerline of the Garden Highway and extending waterward a maximum of one hundred and fifty (150) feet from the centerline of the Garden Highway, Dwellings are allowed, if the lowest finished floor level is at least two (2) feet above the DWSE because this provides flood protection for the Dwelling and additional safety for the Dwelling's residents against higher than expected flood stages, would likely prevent the Dwelling from causing a significant hydraulic impact, and prevents the Dwelling from interfering with waterside Levee slope operation, maintenance, inspection, and flood fighting. The requirement also provides clearance to minimize accumulation of debris that could damage the Dwelling.

(e)(3): It is necessary to require that within the area beginning at a point sixty-five (65) feet waterward from the centerline of the Garden Highway and extending waterward a maximum of one hundred and fifty (150) feet from the centerline of the Garden Highway, the lowest finished floor level of any addition to an existing Dwelling shall be at least two (2) feet above the DWSE because this requirement provides flood protection for the Dwelling and additional safety for its residents against higher than expected Stream stages and waves. This also provides clearance for debris that may damage the Dwelling.

(e)(4): It is necessary to specify that within the area beginning at a point sixty-five (65) feet waterward from the centerline of the Garden Highway and extending waterward a maximum of one hundred and fifty (150) feet from the centerline of the Garden Highway, Dwellings and appurtenant structures are allowed if placed no closer than fourteen (14) feet from the top of the riverbank, provided the riverbank is revetted to Board Standards because an area fourteen (14) feet wide adjacent to a revetted riverbank must remain clear and unobstructed to provide sufficient space and clearance to safely perform Revetment maintenance, should bank protection be needed to protect the Garden Highway Levee.

(e)(5): It is necessary to specify that within the area beginning at a point sixty-five (65) feet waterward from the centerline of the Garden Highway and extending waterward a maximum of one hundred and fifty (150) feet from the centerline of the Garden Highway, Dwellings and appurtenant structures are not allowed within thirty (30) feet of the top of an unrevetted riverbank because unrevetted riverbanks can be subjected to severe erosion during flood flows. Excessive erosion of a streambank could destroy the foundation of a Dwelling or appurtenant structure causing the collapse of the Dwelling or structure within the Floodway and possible loss of life. The resulting structural debris could cause an increase in flood flow stages, damage to other structures, and increased erosion due to flows being directed toward the Levee.

(e)(6): It is necessary to specify that within the area beginning at a point sixty-five (65) feet waterward from the centerline of the Garden Highway and extending waterward a maximum of one hundred and fifty (150) feet from the centerline of the Garden Highway, the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact because Dwellings and related Encroachments within one hundred and fifty (150) feet of the centerline of the Garden Highway would likely have little effect on the Floodway hydraulics, but fill farther into the Floodway, when viewed cumulatively, would raise Stream stages (purportedly based on hydraulic studies performed in the 1960's that are no longer available). Because the purported hydraulic studies from the 1960's are no longer available, and may be outdated anyway, and the effect of proposed Dwellings and related Encroachments on flood stages is

uncertain, it is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact and the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(f): The purpose of subdivision (f) is to specify the conditions applied to the area beginning at a point one hundred and fifty (150) feet waterward from the centerline of the Garden Highway and extending waterward to the top of the riverbank. It is necessary to specify the conditions applied to the area beginning at a point one hundred and fifty (150) feet waterward from the centerline of the Garden Highway and extending waterward to the top of riverbank because fill and Dwellings beyond one hundred and fifty (150) feet from the centerline of the Garden Highway would have a significant effect on the Floodway hydraulics, when viewed cumulatively, raising Stream stages (purportedly based on hydraulic studies performed in the 1960's that are no longer available). Experience has shown that one hundred and fifty (150) feet provides more than adequate space for construction of Dwellings.

(f)(1): It is necessary to specify that within the area beginning at a point one hundred and fifty (150) feet waterward from the centerline of the Garden Highway and extending waterward to the top of the riverbank, Dwellings and fences are not allowed because purportedly in the 1960's a comprehensive plan was formulated to allow for Dwellings and associated activities to occupy the area of the Floodway within one hundred and fifty (150) feet of the centerline of the Garden Highway in Reclamation District 1000. These purported studies were said to have indicated that the allowable Encroachments within the area from one hundred and fifty (150) feet from the centerline of the Garden Highway could cause an accumulated effect of causing a rise of one tenth (0.1) foot in the flood water surface elevation. To allow Encroachments to extend beyond one hundred and fifty (150) feet would cause increased flood stages beyond what is considered acceptable. Placing Encroachments further into the Floodway is not warranted nor justified based upon the resulting reduction in flood protection for the extended communities of Sacramento and Yolo Counties.

(f)(2): It is necessary to specify that within the area beginning at a point one hundred and fifty (150) feet waterward from the centerline of the Garden Highway and extending waterward to the top of the riverbank, securely anchored structures that do not protrude above natural ground level may be allowed because they would not impede flood flows or cause increased water levels.

(f)(3): It is necessary to specify that within the area beginning at a point one hundred and fifty (150) feet waterward from the centerline of the Garden Highway and extending waterward to the top of the riverbank, additions may be made to existing Dwellings if the addition extends no farther into the Floodway than the original Dwelling because any addition further into the Floodway would remove additional Floodway capacity and would adversely impact flood flows causing increased velocities and stages.

(f)(4): It is necessary to specify that within the area beginning at a point one hundred and fifty (150) feet waterward from the centerline of the Garden Highway and extending waterward to the top of the riverbank, the lowest finished floor level of any addition to an existing Dwelling shall be at least two (2) feet above the DWSE because this provides flood protection for the Dwelling and additional safety for

the Dwelling's residents against higher than expected flood stages and waves. The requirement also provides clearance to minimize accumulation of debris that could damage the Dwelling.

(g): The purpose of subdivision (g) is to specify that materials or equipment stored within the Floodway must be securely anchored or removed prior to the Flood Season. It is necessary that materials or equipment stored within the Floodway must be securely anchored or removed prior to the Flood Season because materials or equipment that are not securely anchored could be carried downstream by flood flows causing damage to bridges and flood control structures, or impede flood flows, diminish channel capacities, and increase flood stages.

(h): The purpose of subdivision (h) is to specify that downed trees or brush and other floatable material of any kind are not allowed to remain within the Floodway during the Flood Season. It is necessary that downed trees or brush and other floatable material of any kind are not allowed to remain within the Floodway during the Flood Season because downed trees, brush and other floatable material would add to debris accumulation during flood flows, causing diminished channel capacities and increasing flow velocities and stages.

(i): The purpose of subdivision (i) is to specify that the Board Permit approving the construction, reconstruction, improvement, or repair of a Dwelling shall run with the land, pursuant to a recorded document executed pursuant to section 16(f) because prospective buyers of the Dwelling should be informed, by their title search, of the conditions specified in the Board Permit. It is necessary to specify that upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner's name and address because this enables the Board to record the new owner's information and notify the new owner of the conditions of the Board Permit to ensure that the new owner remains in compliance with the provisions of the Board's Permit.

CCR Title 23. Article 8. Section 134. Supplemental Standards for Yuba River – Daguerre Point Dam to Confluence with the Feather River

The purpose of section 134 is to establish requirements for supplemental standards for Yuba River – Daguerre Point Dam to Confluence with the Feather River. As with other streams, the primary problem and interest in the lower Yuba River is to protect the project Levees from damage and to control Encroachments within the floodplain to reduce the loss of life and destruction of property. Preservation of the Floodway and protection of the project Levee is foremost. However, the Yuba River Floodway can accommodate more alternative land uses if careful planning is carried out in accordance with the conditions set for the "B" and "C" areas as delineated on Figure 8.10. The capacity of the Yuba River Levee system is well in excess of a 100-year flood. It is important to preserve this high level of flood protection for the adjoining communities. At the same time, there is a very large floodplain between the Levees that can, if properly developed and controlled, enjoy higher land uses. These unique, special zones can accommodate these higher uses without compromising the flood control system.

The need to regulate the Yuba River floodplain is critical because of the potentially destructive forces of the Yuba River, which are much greater than for most rivers. The velocity of flow is very swift causing shallow water flooding to become much more treacherous than in most rivers. To become trapped in

the middle of an expanding flood area within the Yuba River floodplain may cause some individuals to make serious errors in judgment, jeopardizing their lives.

Encroachments within the lower reaches of the Yuba River currently include sand and gravel plants, parks and recreational areas, waste disposal areas, and the planting of crops and orchards. There are few residences within the Yuba River Floodway, but the expanding population of the Marysville-Yuba City area is expected to impose an increased demand for residential development in the Yuba River Floodway.

These supplemental standards relax some of the more stringent rules contained in other sections. For example, the standards differ from section 113, Dwellings and Structures Within an Adopted Plan of Flood Control, in that Dwellings within certain areas of the Yuba River floodplain are allowed because of the large area between project Levees and the infrequency of flooding in some areas of the Floodway.

(a): The purpose of subdivision (a) is to specify that the lower Yuba River flood channel is divided into Areas A, B, and C. It is necessary to specify that the lower Yuba River flood channel is divided into Areas A, B, and C because these are three distinct areas that are used for passage of different flows and therefore have different frequencies of inundation. The extent of inundation caused by various magnitudes of flood flows are well defined for the Yuba River. Area A is the flow area required to carry one hundred fifty thousand (150,000) cubic feet per second (cfs). Area A and Area B is the flow area required to carry two hundred thirty five thousand (235,000) cfs, and Area C is the remainder of the Floodway within the flood control project Levees. To prevent loss of life, damage to property, and impairment of flood flows or the Floodway, incompatible Encroachments within the three defined areas of the lower Yuba River are restricted depending upon each area's existing flood problems or potential for being flooded.

(a)(1): It is necessary to specify that Area A is the flow area required to carry one hundred fifty thousand (150,000) cubic feet per second (cfs) because this flow area is most frequently inundated and must remain clear for passage of flood flows.

(a)(2): It is necessary to specify that Area A and B combined is the flow area required to carry two hundred thirty five thousand (235,000) cfs because this flow area has historically been similar to the area that is inundated by the 100-year flood.

(a)(3): It is necessary to specify that Area C is the remainder of the Floodway within the Adopted Plan of Flood Control because this flow area completes the entire Floodway.

(b): The purpose of subdivision (b) is to specify that a map identifying the exact locations of Areas A, B, and C, entitled “1995 Designated Floodway, Yuba River” is incorporated by reference into this division. The full-size map is available for inspection at the Board’s office in Sacramento. It is necessary to specify that a map identifying the exact locations of Areas A, B, and C, entitled “1995 Designated Floodway, Yuba River” is incorporated by reference into this division because this map shows each of the three areas and is necessary for deciding which area a particular property is in. It is necessary to specify that the full-size map is available for inspection at the Board’s office in Sacramento because this enables applicants to access the full-size map.

(c): The purpose of subdivision (c) is to specify that new Dwellings, new Dwellings for Seasonal Occupancy, and new Buildings are not allowed in Area A. It is necessary to specify that new Dwellings and structures are not allowed because Area A is the primary Floodway of the Yuba River. New dwellings or structures within Area A would potentially raise flood stages.

(d): The purpose of subdivision (d) is to specify that new Dwellings, new Dwellings for Seasonal Occupancy, new Buildings, and Mobilehomes may be allowed in substantial areas of shallow flooding (water depths not to exceed one (1) foot in a 100-year flood) in Area B if they satisfy the requirements of subdivision (e) of this section and section 113(d) of this division. It is necessary to specify that new Dwellings, new Dwellings for Seasonal Occupancy, new Buildings, and Mobilehomes may be allowed in substantial areas of shallow flooding (water depths not to exceed one (1) foot in a 100-year flood) in Area B if they satisfy the requirements of subdivision (e) of this section and section 113(d) of this division because such structures are not normally allowed in a Floodway, but due to the large width of the Lower Yuba River Floodway, its large capacity for flood flow conveyance, and the infrequency of large floods, limited construction of these structures is allowed if the flooding at the property is one (1) foot or less deep during the 100-year flood and they are elevated pursuant to section 113(d).

(e): The purpose of subdivision (e) is to specify that Area C is considered a “Zone B” as provided in section 113 of this division. Encroachments in Area C shall conform to the Board Standards, and meet certain requirements. It is necessary to specify that Area C is considered a “Zone B” as provided in section 113 of this division and that Encroachments in Area C shall conform to the Board Standards, and meet certain requirements because when flood flows reach the design level of flood protection within an Adopted Plan of Flood Control, only shallow, low velocity flooding occurs in Zone B areas. This type of flooding would have little impact on public safety and would cause only minor property damage.

(e)(1): It is necessary to specify that the DWSE for construction of new Dwellings and new Dwellings for Seasonal Occupancy shall correspond to the two hundred thirty five thousand (235,000) cfs flow line or 100-year flood elevation outside of Urban Criteria Areas, and the 200-year flood elevation in Urban Criteria Areas, whichever is higher because this preserves the flexibility of the flood control project operation which provides a high level of flood protection to the adjoining communities. Area C has historically been regulated similar to a "Zone B" because flooding in Area C during the 100-year event is not extensive. The appropriate level of flood protection for residences, Mobilehomes and associated structures within Area C is the standard project flood which has been determined by the Corps of Engineers to be 235,000 cfs in this reach of the Yuba River. Requiring the floor level of residences to be constructed at least two (2) feet above the standard project flood elevation provides for public safety.

(e)(2): It is necessary to specify that new Dwellings are not allowed in Area C unless a safe evacuation route, satisfactory to the Board, is available for the Dwelling’s residents because this ensures public safety and adequate evacuation routes for residents.

(e)(3): It is necessary to specify that roads that would be used to evacuate residents shall be constructed to at least the one hundred fifty thousand (150,000) cfs flow line elevation, 100-year flood elevation, or at natural ground elevation, whichever is highest and may not unreasonably obstruct flood flows because access roads constructed to this requirement will provide a safe evacuation route for the area's

residents. This requirement also prevents the roadway from impeding or obstructing flood flows, causing increased depths of flood flows and extending areas of inundation.

(e)(4): It is necessary to specify that the Board may require the owner of a Dwelling, pursuant to section 16 of this division, to execute an agreement in which the owner agrees to evacuate all residents and guests upon order of an authorized government official when flooding is forecasted for the area because the Board must ensure that evacuation will be carried out when necessary.

(f): The purpose of subdivision (f) is to specify that the Board Permit approving the construction, reconstruction, improvement, or repair of a Dwelling or Dwelling for Seasonal Occupancy shall run with the land, pursuant to a recorded document executed pursuant to section 16(f). Upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner's name and address. It is necessary to specify that the Board Permit approving the construction, reconstruction, improvement, or repair of a Dwelling or Dwelling for Seasonal Occupancy shall run with the land, pursuant to a recorded document executed pursuant to section 16(f) because prospective buyers of the Dwelling or Dwelling for Seasonal Occupancy should be informed, by their title search, of the conditions specified in the Board Permit. It is necessary to specify that upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner's name and address because this enables the Board to record the new owner's information and notify the new owner of the conditions of the Board Permit to ensure that the new owner remains in compliance with the provisions of the Board's Permit.

CCR Title 23. Article 8. Section 135. Supplemental Standards for Butte Basin

The purpose of section 135 is to establish requirements for supplemental standards for Butte Basin. Butte Basin is a natural depression lying between Chico Creek and the Sutter Buttes, encompassing some 170,000 acres in Butte, Sutter and Colusa Counties. The basin served as a natural overflow Floodway prior to the Sacramento River Flood Control Project. Under natural conditions, almost every year the Sacramento River overflowed into Butte Basin at the north end from Big Chico Creek down to about the Butte-Glenn County line and at several locations between there and the latitude of the Sutter Buttes. Since completion of the Sacramento River Flood Control Project, major overflows still occur between Big Chico Creek and the Butte-Glenn County line and additional river flows are diverted into Butte Basin through Moulton Weir and Colusa Weir. However, since completion of Shasta Dam in 1945, the frequency of overflow into Butte Basin has been reduced.

Butte Basin also acts as a regulatory flood control reservoir. Flood waters diverted into Butte Basin drain very slowly, arriving downstream after the Sacramento River flood crest has passed. Operation of the Butte Basin is similar to that of the Yolo and Sutter Bypasses. Farming operations may continue within the basin Floodway, as long as they do not interfere with flood control operations.

(a): The purpose of subdivision (a) is to specify that these supplemental standards apply to the Butte Basin, as delineated on Figure 8.11 and partitioned into designated Areas B, C, D, E, and Reclamation District 1004. These standards supplement and, where in conflict with, supersede the standards in sections 111 through 137 of this division. It is necessary to specify that Butte Basin has been divided into these distinctive areas because of the varying conditions of inflows and traversing flood flows, and

because of the varying effects of Encroachments within the divergent areas. The basin's west boundary is the Sacramento River east bank project Levee, and above the Ord Ferry area where there is no project Levee, the boundary is the designated Floodway of the Sacramento River approved November 29, 1988. The east boundary is based on the wetted area of the 1970 flood, which is the flood of record subsequent to construction of Shasta Dam and prior to adoption of Butte Basin Encroachment standards by the Board in 1975. The basin's north boundary is the Sacramento River designated Floodway in the proximity of Murphy Slough and Golden State Island, and the south boundary is the Sacramento River in Colusa County, a section of the Butte Slough Levee in both Colusa and Sutter Counties, and Pass Road in Sutter County which is the beginning, or northern boundary of the Sutter Bypass.

(a)(1): It is necessary to specify that the basin's west boundary is the Sacramento River east bank SPFC Levee, and above the Ord Ferry area where there is no SPFC Levee, the boundary is the Sacramento River Designated Floodway adopted November 29, 1988 because this information supplements Figure 8.11 for identifying the west boundary.

(a)(2): It is necessary to specify that the east boundary is based on the wetted area of the 1970 flood because this information supplements Figure 8.11 for identifying the east boundary.

(a)(3): It is necessary to specify that the north boundary is the Sacramento River Designated Floodway in the proximity of Murphy Slough and Golden State Island because this information supplements Figure 8.11 for identifying the north boundary.

(a)(4): It is necessary to specify that the south boundary is the Sacramento River between the city of Colusa and the Butte Slough outfall gates, a section of the Butte Slough Levee in both Colusa and Sutter Counties, and Pass Road in Sutter County because this information supplements Figure 8.11 for identifying the south boundary.

(a)(5): It is necessary to specify that a map identifying the locations of the above-named areas is incorporated by reference into this division because the map more clearly identifies the boundaries than Figure 8.11 and may be useful for deciding whether a particular property is in the Butte Basin, and if so, which area. It is necessary to specify that a large printed map is available for inspection at the Board’s Sacramento office, and is also available online from the Board website because this enables applicants to access the full-size map.

(b): The purpose of subdivision (b) is to specify that approval from the Board is required for any Proposed Work that could reduce or impede flood flows, or would reclaim any of the floodplain within Butte Basin. It is necessary to specify that approval from the Board is required for any Proposed Work that could reduce or impede flood flows, or would reclaim any of the floodplain because the basin is an intrinsic part of the Sacramento River Flood Project. Historically, peak flood flows overtop the alluvial banks at three (3) locations on the east side of the Sacramento River and enter Butte Basin through numerous natural sloughs between Big Chico Creek and the South Parrott Grant line. Additional river flows are diverted into Butte Basin through Moulton Weir and Colusa Weir. The State of California is required by the Federal River and Harbor Act of 1928 to control development in Butte Basin in such a manner as not to "reduce or impede the flood runoff". Any reduction or impediment of flows in Butte Basin could increase Sacramento River flows causing additional stress on flood project Levees.

(b)(1): It is necessary to specify that Proposed Work in Reclamation District 1004 is not regulated by the Board because Reclamation District No. 1004 was formed in 1921 and activated in 1922, prior to the Federal River and Harbor Act authorizing the State of California to control development in Butte Basin. The district is located within Area E and is completely enclosed by a Levee. Encroachments within the district would have no impact on flood operations within Butte Basin.

(b)(2): It is necessary to specify that these supplemental standards do not apply to that portion of Area E located north of the Butte-Sutter County line and its extension westward into Colusa County, and situated adjacent to the Sacramento River SPFC Levee where the natural ground level is higher than the 100-year flood elevation because the area is not subject to inundation by the 100-year flood and, therefore, the area is exempt from the supplemental standards. Any proposed Encroachments within the excluded area would have no impact on the passage of flood flows or the retention of flows within Butte Basin or on public safety.

(b)(3): It is necessary to specify that except where the activity would potentially affect an Adopted Plan of Flood Control, the standards within sections 116, 122, 123, 124, 126, 127, 129, 130, 131, 132, 137, and 139 of this division do not apply to that portion of Area E located south of the Butte-Sutter County line and its extension westward into Colusa County because the described portion of Area E is located in the southern end of Butte Basin. Flooding in the lower basin is characterized by very low velocity flows and the long duration of ponded water. Encroachments controlled by the referenced standards are allowed within the area because such Encroachments would have no impact on the flood flows or ponded water.

(b)(4): It is necessary to specify that the Proposed Work shall not cause a significant increase in Stream stage or velocities during Flood Season because a significant increase in stage or velocity could cause additional flooding, overload a Levee, or cause erosion problems. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the Proposed Work on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. The Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(c): The purpose of subdivision (c) is to specify that approval from the Board is not required for crop checks less than thirty-six (36) inches in height above the natural ground level. In Areas B, C and D, all crop checks shall be removed prior to Flood Season, unless they comply with the requirements of subdivisions (e), (f), and (g), respectively.

It is necessary to specify that approval from the Board is not required for crop checks less than thirty-six (36) inches in height above the natural ground level because Butte Basin is farmed extensively, and the Board attempts to apply as few restraints as possible on farming operations – which is an effective way of managing vegetative growth that may otherwise obstruct flood flows under natural conditions. Crop checks remaining in Area B during Flood Season could obstruct overflow from the Sacramento River, causing return flow to the river above the project Levee. Areas C and D encompass Moulton Weir overflow area and Colusa Weir overflow area, respectively. Crop checks remaining in these areas during

Flood Season could reduce or impede the free flow of flood waters into Butte Basin. Crop checks less than thirty-six (36) inches in height located within Area E would have little impact on flood flows throughout the basin.

(d): The purpose of subdivision (d) is to specify that except where the activity would potentially affect an Adopted Plan of Flood Control, approval from the Board is not required for land leveling or grading, or for drainage and irrigation improvements in Areas C, D, and E that have a localized impact only and comply with subdivisions (f), (g), and (h) of this section.

It is necessary to specify that except where the activity would potentially affect an Adopted Plan of Flood Control, approval from the Board is not required for land leveling or grading, or for drainage and irrigation improvements because Encroachments of these types that have a localized impact only would have little impact on flood flows in Butte Basin, and therefore do not require approval from the Board.

(e): The purpose of subdivision (e) is to specify that within Area B, approval from the Board is not required for any Proposed Work that is less than eighteen (18) inches in height above the natural ground level. However, any Proposed Work within a slough or swale must be approved by the Board. Area B extends southerly from Butte Basin's northerly boundary to a line located one thousand (1,000) feet southeasterly and lying parallel to the Parrott Grant line.

It is necessary to specify that within Area B, approval from the Board is not required for any Proposed Work that is less than eighteen (18) inches in height above the natural ground level because Area B extends southerly from Butte Basin's northerly boundary to a line located one thousand (1,000) feet southeasterly and lying parallel to the South Parrot Grant line. The south boundary line is located sufficiently downstream of the beginning of the project Levee on the east side of the Sacramento River (considered beginning of project Levee when facing downstream) to prevent structures less than eighteen (18) inches in height, and not located within a slough or swale, from causing flows to return to the Sacramento River. The numerous sloughs and swales in Area B must remain open and unobstructed to carry flood flows through the area. To prevent the impedance of flood flows, the Board must approve any proposed Encroachment that would affect a slough or swale within Area B.

(f): The purpose of subdivision (f) is to specify that within Area C, approval from the Board is not required for any Proposed Work less than thirty-six (36) inches in height above the natural ground level, and having a maximum elevation less than seventy two and five tenths (72.5) feet (NAVD88). Area C is the area enclosed within a three (3) mile radius measured from the center of Moulton Weir and limited by the southeasterly extensions of the north and south training Levee alignments to the three (3) mile arc.

It is necessary to specify that approval from the Board is not required for any Proposed Work less than thirty-six (36) inches in height above the natural ground level, and having a maximum elevation less than seventy two and five tenths (72.5) feet (NAVD88) because, to ensure unobstructed overflow from Moulton Weir and to prevent any impediment to flood flows through the Moulton Weir training Levees, all Encroachments must be less than thirty-six (36) inches in height and must be lower than an elevation of seventy two and five tenths (72.5) feet (NAVD88) within Area C.

(g): The purpose of subdivision (g) is to specify that within Area D, approval from the Board is not required for any Proposed Work less than thirty-six (36) inches in height above the natural ground level and having a maximum elevation less than fifty-seven and three tenths (57.3) feet (NAVD88). Area D encompasses the Colusa Weir together with its outflow channel enclosed by training Levees, and an overflow area extending to Butte Creek.

It is necessary to specify that approval from the Board is not required for any Proposed Work less than thirty-six (36) inches in height above the natural ground level and having a maximum elevation less than fifty-seven and three tenths (57.3) feet (NAVD88) within Area D because the Colusa Weir together with its outfall channel, training Levees and an overflow area extending to Butte Creek, are within Area D. To ensure unobstructed overflow from Colusa Weir and through the overflow channel, Encroachments within Area D must be less than thirty-six (36) inches in height and have a maximum elevation less than fifty-seven and three tenths (57.3) feet (NAVD88).

(h): The purpose of subdivision (h) is to specify that within Area E, approval from the Board is not required for any Proposed Work less than thirty-six (36) inches in height above the natural ground level. The northern boundary of Area E is a line located one thousand (1,000) feet southeasterly of the south Parrott Grant line, and the southern boundary is formed by the Sacramento River between the city of Colusa and the Butte Slough outfall gates, a section of the Butte Slough Levee in both Colusa and Sutter Counties, and Pass Road in Sutter County.

It is necessary to specify that within Area E, approval from the Board is not required for any Proposed Work less than thirty-six (36) inches in height above the natural ground level because Encroachments less than thirty-six (36) inches in height within Area E would not impede flood flows or modify the retention of flows within the area. The northern boundary of Area E adjoins the southern boundary of Area B, and Area E extends southerly to the beginning of the Sutter Bypass.

(i): The purpose of subdivision (i) is to specify that within that portion of Area E located south of Gridley Road, new and existing recreational structures, including Dwellings for Seasonal Occupancy, may be allowed provided the lowest finished floor level of the structure is at least two (2) feet above the DWSE.

It is necessary to specify that new and existing recreational structures, including Dwellings for Seasonal Occupancy, may be allowed provided the lowest finished floor level of the structure is at least two (2) feet above the DWSE because this ensures participant and resident safety, and provides sufficient clearance to prevent the accumulation of floating debris. The safety is mainly provided by not allowing residential use during the Flood Season. Such Encroachments within the specified portion of Area E would have no impact on the passage of flood flows or the retention of flows within Butte Basin.

(j): The purpose of subdivision (j) is to specify that the Board Permit approving the construction, reconstruction, improvement, or repair of a Dwelling for Seasonal Occupancy in Area E shall run with the land, pursuant to a recorded document executed pursuant to section 16(f). Upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner's name and address. It is necessary to specify that the Board Permit approving the construction, reconstruction, improvement, or repair of a Dwelling for Seasonal Occupancy in Area E shall run with the land, pursuant to a recorded document executed pursuant to

section 16(f) because prospective buyers of the Dwelling for Seasonal Occupancy should be informed, by their title search, of the conditions specified in the Board Permit. It is necessary to specify that upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner's name and address because this enables the Board to record the new owner's information and notify the new owner of the conditions of the Board Permit to ensure that the new owner remains in compliance with the provisions of the Board's Permit.

CCR Title 23. Article 8. Section 136. Supplemental Standards for Yolo Bypass and Sutter Bypass

The purpose of section 136 is to establish requirements for supplemental standards for Yolo Bypass and Sutter Bypass. The Board supports the multi-use concept of the Yolo Bypass and Sutter Bypass provided that the flood control purpose of the bypasses remains the primary factor. The development of additional wetlands with associated recreational and educational opportunities, the protection of existing agricultural use, and other uses of the Yolo Bypass and Sutter Bypass that are compatible with the flood control purpose of these bypasses are supported by the Board. It is the Board's policy to allow the impoundment of water and the planting of suitable vegetation to create a mixture of native marsh, riparian vegetation, and the continuation of agriculture in the Yolo Bypass and Sutter Bypass. However, this diverse use of the bypasses is closely monitored and controlled to prevent damage to flood control facilities or impairment of flood flows.

(a): The purpose of subdivision (a) is to specify that final detailed plans for all Proposed Work involving construction, grading and planting shall be submitted to and approved by the Board prior to the start of work. It is necessary to specify that final detailed plans for all Proposed Work involving construction, grading and planting shall be submitted to and approved by the Board prior to the start of work because this enables the Board to review all the information relevant to the proposed project to determine its impact upon flood control facilities and flood flows within the bypasses.

(b): The purpose of subdivision (b) is to specify that a detailed operation and maintenance plan shall be submitted to and approved by the Board prior to the start of work. It is necessary to specify that a detailed operation and maintenance plan shall be submitted to and approved by the Board prior to the start of work because this enables the Board to review the details relevant to the operation and maintenance of a proposed Encroachment within the Yolo Bypass and Sutter Bypass to make sure it will be operated and maintained consistent with the flood control purpose of the bypasses.

(c): The purpose of subdivision (c) is to specify that a profile of the existing Levee crown roadway and Access Ramps that will be utilized for access to and from the construction area shall be submitted to the Board prior to the start of work. It is necessary to specify that a profile of the existing Levee crown roadway and Access Ramps that will be utilized for access to and from the construction area shall be submitted to the Board prior to the start of work because additional traffic, including heavy construction equipment, on a Levee or Access Ramp during the construction period of a project within the Yolo Bypass or Sutter Bypass could cause settlement of the Levee embankment or Access Ramp causing loss of Levee Freeboard and damage to structures within the Levee embankment or Access Ramp. A

comparison of profiles made prior to construction and post construction would determine the amount of settlement attributable to construction traffic.

(d): The purpose of subdivision (d) is to specify that any damage to the Levee crown roadway or Access Ramps attributable to the construction or maintenance of croplands or wetlands shall be promptly repaired by the Permittee. It is necessary to specify that any damage to the Levee crown roadway or Access Ramps attributable to the construction or maintenance of croplands or wetlands must be promptly repaired by the Permittee because Levees must be maintained and protected if they are to provide the flood protection for which they were built. Damage to Levee crown roadways or Access Ramps caused by construction equipment, or due to construction traffic, must be promptly repaired by the Permittee of the construction project. Levee roads and Access Ramps must remain traversable at all times to facilitate periodic inspections and maintenance of all flood control facilities.

(e): The purpose of subdivision (e) is to specify that the planting of vegetation or the impoundment of water is not allowed within one thousand (1,000) feet of the Fremont Weir structure. It is necessary to specify that the planting of vegetation or the impoundment of water is not allowed within one thousand (1,000) feet of the Fremont Weir structure because the planting of vegetation or the impoundment of water could reduce flood flow conveyance directly or indirectly by trapping sediment and raising the channel bottom resulting in cross-section reductions changing the normal flow characteristics. This could reduce efficiency of the Fremont Weir and cause excessive flow to remain in the Sacramento River and increase the flood risk to multiple Urban Criteria Areas downstream.

(f): The purpose of subdivision (f) is to specify that the planting of vegetation or the impoundment of water shall not be allowed in any area unless a hydraulic analysis demonstrates no adverse hydraulic impact and the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact The Board may deny a Permit if the hydraulic impact is deemed significant. It is necessary to specify that the planting of vegetation or the impoundment of water shall not be allowed in any area unless a hydraulic analysis demonstrates no adverse hydraulic impact in locations where the effect of the planting of vegetation or impoundment of water on flood stages is uncertain because the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the planting of vegetation or impoundment of water on flood stages is uncertain because the Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(g): The purpose of subdivision (g) is to specify that irrigated and non-irrigated pastures and croplands are allowed without Permit from the Board when consistent with the Board's Flowage Easements. It is necessary to specify that irrigated and non-irrigated pastures and croplands are allowed without Permit from the Board because Yolo Bypass and Sutter Bypass can accommodate floodwaters during the Flood Season and still serve as an agricultural area during the growing season and other requirements of this section would otherwise trigger the need for a Board Permit. Use of these bypasses for agriculture has long been considered as compatible with occasional flooding, provided agricultural Encroachments generally remain seasonal.

(h): The purpose of subdivision (h) is to specify that the planting of vegetation is generally allowed for the development of native marsh, riparian vegetation, and wetlands. It is necessary to specify that the planting of vegetation is generally allowed for the development of native marsh, riparian vegetation, and wetlands because such vegetation can be planted and maintained compatibly with the flood control purpose of the bypasses and greater recognition is being given to the value of wetlands and riparian vegetation not only for ecological, recreational and aesthetic considerations, but also for flood mitigation in selected areas. However, the development of wetlands within the Yolo Bypass and Sutter Bypass can be done in ways that are incompatible with maintaining maximum flood flow conveyance and therefore must be designed to remain compatible with all phases of flood operations, including the unimpeded passage of major flood flows.

(i): The purpose of subdivision (i) is to specify that rooted vegetation and aquatic beds of floating (non-rooted) or submerged vegetation are generally allowed to be established in ponded water. It is necessary to specify that rooted vegetation and aquatic beds of floating (non-rooted) or submerged vegetation are generally allowed to be established in ponded water because these types of vegetation growing in ponded water cause no impediment of flood flows, and have no adverse impact upon the inspection and maintenance of the Floodway.

(j): The purpose of subdivision (j) is to specify that the depth of ponded water shall be controlled to prevent the growth of unauthorized vegetation that could adversely affect the operation of an Adopted Plan of Flood Control. It is necessary to specify that the depth of ponded water shall be controlled to prevent the growth of unauthorized vegetation that could adversely affect the operation of an Adopted Plan of Flood Control because ponded water having a depth of two and a half (2 1/2) feet or greater deters the growth of tules. Tules growing within a Floodway rapidly increase in density and area, causing increasing impediment of flood flows. Tules and other dense growth must be controlled within the bypasses to retain the design flow capacity of the Floodway.

(k): The purpose of subdivision (k) is to specify that no permanent Berms or dikes are allowed above natural ground elevation without a detailed hydraulic analysis except where otherwise expressly provided for in reservations contained in easement deeds to the Sacramento and San Joaquin Drainage District. It is necessary to specify that no permanent berms or dikes are allowed above natural ground elevation without a detailed hydraulic analysis because above-ground berms or dikes could cause loss of bypass capacity and increase the deposition of sediments. The flushing action of flows in the Yolo Bypass and Sutter Bypass must not be obstructed by dikes, berms or other structures.

(l): The purpose of subdivision (l) is to specify that required maintenance may include removal, clearing, thinning, and pruning of all vegetation directly or indirectly resulting from the Permitted Work. It is necessary to specify that that required maintenance may include removal, clearing, thinning, and pruning of all vegetation directly or indirectly resulting from the Permitted Work because the Permittee of any development or project is responsible for the effective maintenance of all vegetation directly or indirectly resulting from the Permitted project to prevent the impairment of the Floodway capacity.

CCR Title 23. Article 8. Section 137. Miscellaneous Encroachments

The purpose of section 137 is to establish requirements for miscellaneous Encroachments. Miscellaneous Encroachments are frequently associated with residences located along or within an

Adopted Plan of Flood Control, and usually adjacent to a Levee. Permits for the majority of such Encroachments are required by the Board to protect the structural integrity of the Levee and to ensure the unobstructed inspection, maintenance and operation of the flood control project.

It being impossible to list the unlimited types of miscellaneous Encroachments that can develop from long-established residents, only the more typical have been listed. However, a Permit application should be submitted to the Board for any proposed Encroachment within an Adopted Plan of Flood Control.

(a): The purpose of subdivision (a) is to specify that tanks used for storage of water or other liquids and water retention basins shall not be installed within the Levee Right of Way, or the Projected Levee Section and within twenty–five (25) feet of the Levee Toes. Tanks storing less than five thousand (5,000) gallons can be stored within the Projected Levee Section and within twenty-five (25) feet of the Levee Toes, provided the tanks are outside of the Levee Right of Way.

It is necessary specify that tanks used for storage of water or other liquids and water retention basins shall not be installed within the Levee Right of Way, or the Projected Levee Section and within twenty-five (25) feet of the Levee Toe because storage tanks pose the potential risk of developing leaks that could saturate a Levee Section to a point of causing loss of shear strength within the Levee or Levee foundation that could lead to Levee failure during high Stream flows. The permeability of the soils surrounding a water detention basin may determine that a greater than twenty-five (25) foot buffer zone will be required to prevent the saturation of the adjacent Levee Section or foundation. Additionally, sudden failure of the storage tank could erode the nearby Levee slope and Levee Toe. But tanks storing less than five thousand (5,000) gallons are unlikely to cause significant damage to the Levee if they suddenly fail and therefore may be closer to the Levee as long as they remain outside of the Levee Right of Way.

(b): The purpose of subdivision (b) is to specify that the bottom of landside storage tanks and water retention basins shall be located above a 10h:1v slope projected downward from the landside Levee Toe, Seepage Berm toe, or Stability Berm toe unless a geotechnical analysis demonstrates that the storage tank or water retention basin will not adversely impact the integrity of the Levee.

It is necessary to specify that the bottom of landside storage tanks and water retention basins shall be located above a 10h:1v slope projected downward from the landside Levee Toe, Seepage Berm toe, or Stability Berm toe unless a geotechnical analysis demonstrates that the storage tank or water retention basin will not adversely impact the integrity of the Levee because it is deep enough to intersect the 10h:1v projection from the Levee Toe or flood control project feature that is a general rule for protecting the Levee from slope instability or piping of Levee foundation material during high water.

(c): The purpose of subdivision (c) is to specify that for any storage tank or water retention basin with its bottom more than two (2) feet below ground and within four hundred (400) feet landward of the Levee Right of Way, the Board may require a geotechnical analysis with appropriate seepage modeling to demonstrate that the storage tank or water retention basin does not result in a configuration whereby the Levee and/or Seepage Berm or Stability Berm does not meet design criteria or an existing seepage problem is worsened. It is necessary to specify that for any storage tank or water retention basin with its bottom more than two (2) feet below ground and within four hundred (400) feet landward of the Levee

Right of Way, the Board may require a geotechnical analysis with appropriate seepage modeling to demonstrate that the storage tank or water retention basin does not result in a configuration whereby the Levee and/or Seepage Berm or Stability Berm does not meet design criteria or an existing seepage problem is worsened because excavation landward of the Levee deeper than two (2) feet raises to potential for damage to a thin blanket layer that is important for preventing boils and piping of Levee foundation materials during high water, even several hundred feet from the Levee Toe. Levees with underseepage problems are often repaired by constructing landside seepage berms as long as three hundred (300) feet. Even excavations beyond three hundred (300) feet could be very damaging to a Levee's underseepage performance.

(d): The purpose of subdivision (d) is to specify that in Urban Criteria Areas, the seepage modeling shall include evaluation of performance for the Stream stage at the Hydraulic Top of Levee and comply with Levee underseepage requirements of the Urban Levee Design Criteria. It is necessary to specify that in Urban Criteria Areas, the seepage modeling shall include evaluation of performance for the Stream stage at the Hydraulic Top of Levee and comply with Levee underseepage requirements of the Urban Levee Design Criteria because not doing so could jeopardize the Urban Criteria Area's claim of two hundred (200) flood protection or ability to provide two hundred (200) year flood protection.

(e): The purpose of subdivision (e) is to specify the criteria that steps for access on Levee slopes shall follow. It is necessary to specify the criteria that steps for access on Levee slopes must follow because it ensures longevity of the steps, increases safety of maintenance personnel, avoids interference with Levee maintenance, protects the stability of the Levee slope, and prevents erosion.

(e)(1): It is necessary to specify that steps for access on Levee slopes shall be constructed of material resistant to deterioration because the steps become part of the Levee surface, which can be subject to erosion where steps deteriorate. Also, steps on Levee slopes are used by Levee inspectors, maintenance and flood fight personnel. Approved construction material is required to provide for longevity of the steps which increases personnel safety and minimizes the frequency of reconstruction and resulting disturbance of the Levee. Acceptable materials include, but are not limited to, concrete, masonry, stone, iron, and steel.

(e)(2): It is necessary to specify that steps constructed on the waterside Levee slope shall be properly anchored to prevent movement during high water because movement of the steps during high water would expose an unprotected Levee slope to erosion which could potentially result in failure of the Levee.

(e)(3): It is necessary to specify that excavation in the Levee slope for construction of steps may not exceed twelve (12) inches in depth because Intrusive construction work on Levee slopes is limited to protect the stability of the slope. Excavating a Levee slope could result in erosion of the slope during high water stages or heavy rainfall.

(e)(4): It is necessary to specify that steps shall be flush with the Levee slope because raised steps can interfere with normal Levee maintenance and cause erosion alongside the steps during heavy rainfall or high water.

(e)(5): It is necessary to specify that handrails are not allowed on steps if they interfere with Levee maintenance unless they are required by law because normal Levee maintenance is a primary consideration in issuing a Permit and handrails are not allowed if they would interfere with Levee maintenance.

(e)(6): It is necessary to specify that handrails, where allowed on waterside Levee slopes, shall be removable, or debris shall be removed prior to Flood Season and after each flood event because handrails on the waterward slope of a Levee can cause the accumulation of sufficient amounts of floating debris to impede flood flows, or to direct the streamflow toward the Levee or streambank causing severe erosion.

(e)(7): It is necessary to specify that Revetment on a Levee slope or streambank that is destroyed or disturbed during the construction of steps shall be restored to its original condition by the Permittee because minor damage to Revetment, if unrepaired, can develop into large scale deterioration of the Revetment. Damaged Revetment must be repaired to protect the stability of the Levee slope or streambank. The Permittee of any construction work which adversely affects Revetment is responsible for the necessary repairs.

(f): The purpose of subdivision (f) is to specify that horizontal (elevated) access walkways, with or without handrails, may be allowed above the landside and waterside slopes of the Levee if they do not interfere with Levee maintenance and conform to certain criteria. It is necessary to specify that horizontal (elevated) access walkways, with or without handrails, may be allowed above the landside and waterside slopes of the Levee because normal Levee maintenance is a primary consideration in issuing a Permit and horizontal access walkways are not allowed if they interfere with Levee maintenance.

(f)(1): It is necessary to specify that horizontal access walkways may not exceed four (4) feet in width unless the walkway is see-through and the waterside Levee slope immediately beneath the walkway has Revetment that meets standards in section 121 of this division because horizontal access walkways are limited to four (4) feet in width to provide for required Levee maintenance directly beneath the structure. Access walkways to some degree interfere with mechanized Maintenance Activities. However, mechanized equipment can usually be maneuvered to cover a four (4) foot wide area beneath the access walkway. If the waterside Levee slope immediately beneath the access walkway is revetted to Board Standards then Levee slope maintenance concerns beneath the structure are minimized.

(f)(2): It is necessary to specify that the bottom elevation of the stringers of horizontal access walkways above the waterside Levee slope shall be a minimum of three (3) feet above the DWSE because the minimum three (3) feet of clearance not only protects the access walkway from damage by debris carried by currents, but also reduces the possibility of debris accumulation at the access walkway that could direct the streamflow toward the Levee or streambank causing severe erosion.

(f)(3): It is necessary to specify that handrails on access walkways may not extend onto the Levee crown because handrails extending toward the Levee and beyond the Levee crown would not only be in jeopardy of being damaged, but could interfere with inspection, maintenance and flood fighting equipment and activities.

(f)(4): It is necessary to specify that on a Levee where the crown is less than fourteen (14) feet in width, handrails shall be a minimum of seven (7) feet from the centerline of the Levee because to provide adequate space for maintenance equipment, and safety of employees and the general public, additional roadway clearance is required on Levee crowns that are less than fourteen (14) feet in width. An unobstructed total width of fourteen (14) feet minimum is needed for the safe passage of maintenance equipment and to reduce the risk of injury to maintenance personnel and the general public.

(f)(5): It is necessary to specify that access walkway supports, or piers, shall be constructed so as to minimize the possibility of trapping and accumulating floating debris because accumulated debris can impede flood flows, and also direct streamflows toward the Levee or streambank causing severe erosion. It is necessary to specify that accumulated debris shall be promptly removed by the Permittee and disposed outside of the Floodway and Levee Right of Way because the accumulated debris can reduce channel flood flow carrying capacity and cause localized erosion.

(f)(6): It is necessary to specify that Revetment on a Levee slope or streambank that is destroyed or disturbed during the construction of a walkway shall be restored to its original condition by the Permittee because minor damage to Revetment, if unrepaired, can develop into large scale deterioration of the Revetment. Damaged Revetment must be repaired to protect the stability of the Levee slope or streambank. The Permittee of any construction work which adversely affects Revetment is responsible for the necessary repairs.

(f)(7): It is necessary to specify that maintenance of an access walkway and the adjacent Levee Slope is the responsibility of the Permittee, and any erosion of the Levee Slope shall be promptly repaired because access walkways adjacent to the Levee slope of a Levee can cause the accumulation of sufficient amounts of floating debris to impede flood flows, or to direct the streamflow toward the Levee or streambank causing severe erosion.

(g): The purpose of subdivision (g) is to specify that mailboxes, when required by the U.S. Postal Service, are allowed on a Levee Section and shall be placed at the extreme outer edge of the Levee crown. If the Levee crown is less than fourteen (14) feet in width, the mailbox shall be a minimum of seven (7) feet from the centerline of the Levee. The maximum depth of burial into the Levee is twelve (12) inches unless encased in concrete cast in place against firm undisturbed earth.

It is necessary to specify that mailboxes are allowed on a Levee Section and must be placed at the extreme outer edge of the Levee crown and least seven (7) feet from the centerline of the Levee because this maintains the maximum available area free for vehicles and equipment. Mechanized maintenance equipment must have an adequate unobstructed area in which to be operated safely. It is necessary to specify that the maximum depth of burial into the Levee is twelve (12) inches unless encased in concrete cast in place against firm undisturbed earth because the mailbox can provide a potential seepage path into the Levee for rainfall runoff or for high water under full loading of the Levee.

(h): The purpose of subdivision (h) is to specify that traffic control signs, directional or informational signs, and signs providing for public safety are allowed on a Levee slope or on the edge of a Levee

crown. The maximum depth of burial into the Levee is twelve (12) inches unless encased in concrete cast in place against firm undisturbed earth.

It is necessary to specify that traffic control signs, directional or informational signs, and signs providing for public safety are allowed on a Levee slope or on the edge of a Levee crown because a maximum width of the Levee crown must be kept clear to provide for the safe passage of maintenance and emergency flood fight equipment, and to reduce the risk of injury to maintenance personnel and the general public. It is necessary to specify that the maximum depth of burial into the Levee is twelve (12) inches unless encased in concrete cast in place against firm undisturbed earth because the sign can provide a potential seepage path into the Levee for rainfall runoff or for high water under full loading of the Levee.

(i): The purpose of subdivision (i) is to specify that bus shelters are allowed on a Levee crown, near the shoulder, where sufficient space is available for safe operation of vehicles and the shelter is set back at least ten (10) feet from the Levee centerline, provided the shelter will not interfere with Levee maintenance, inspection, or flood fighting. The maximum depth of burial into the Levee is twelve (12) inches unless encased in concrete cast in place against firm undisturbed earths.

It is necessary to specify that bus shelters are allowed on a Levee crown, near the shoulder, where sufficient space is available for safe operation of vehicles and the shelter is set back at least ten (10) feet from the Levee centerline because this maintains the maximum available area clear to provide for the safe passage of maintenance and emergency flood fight equipment, and to reduce the risk of injury to maintenance personnel and the general public. Mechanized maintenance equipment must have an adequate unobstructed area in which to be operated safely. It is necessary to specify that the maximum depth of burial into the Levee is twelve (12) inches unless encased in concrete cast in place against firm undisturbed earth because the shelter can provide a potential seepage path into the Levee for rainfall runoff or for high water under full loading of the Levee

(j): The purpose of subdivision (j) is to specify that livestock grazing within the Levee Right of Way may be allowed if specific requirements are met. It is necessary to specify that livestock grazing within the Levee Right of Way may be allowed if specific requirements are met because livestock grazing, if properly controlled, can be done without harming the Levee. If done improperly or without proper control, livestock can cause damage to a Levee and make it vulnerable to further erosion damage during high water.

(j)(1): It is necessary to specify that grazing on Levee slopes shall not be allowed during the Flood Season or periods of prolonged rain without written approval by the Chief Engineer because during the Flood Season or periods of prolonged rain the Levee slopes generally become soft and are easily damaged by cattle hooves, especially if there are many cattle or they need to traverse the Levee frequently to access food or water.

(j)(2): It is necessary to specify that grazing shall be controlled to prevent overgrazing and the development of livestock trails on Levee slopes because overgrazing on Levee slopes reduces the protection from erosion that vegetation can provide. Livestock can also cause surface damage to Levees

by causing potholes and subsequent ponding of water, and by the formation of trails that accelerate erosion of the Levee slope.

(j)(3): It is necessary to specify that no structures, sheds, or troughs are allowed in the Levee Right of Way because such structure, sheds, or troughs would interfere with Levee operation, maintenance, inspection, and flood fight.

(j)(4): It is necessary to specify that no livestock shall be corralled or penned on the Levee Section because this would concentrate them in a particular area and very likely cause overgrazing, trails, and Levee damage.

(j)(5): It is necessary to specify that grazing shall be discontinued if it causes excessive damage to the Levee because it is possible that, even with close control of the grazing, it causes excessive Levee damage and needs to be discontinued to prevent further damage.

(k): The purpose of subdivision (k) is to specify that the storage of materials or equipment, unless securely anchored, downed trees or brush, and floatable material of any kind are not allowed within a Floodway during the Flood Season. It is necessary to specify that the storage of materials or equipment, unless securely anchored, downed trees or brush, and floatable material of any kind are not allowed within a Floodway during the Flood Season because any such material could impede flood flows, diminish channel capacities, damage bridges and flood control structures, and increase flood flow stages and velocities.

(l): The purpose of subdivision (l) is to specify that structures and the storage of material or equipment are not allowed on Levee slopes. It is necessary to specify that structures and the storage of material or equipment are not allowed on Levee slopes because the storage of materials or equipment on Levee slopes would prevent adequate inspection and maintenance of the Levee, and would obstruct flood fight procedures.

(m): The purpose of subdivision (m) is to specify that normally no materials or equipment may be placed on the Levee crown, however, materials or equipment may be temporarily placed on the Levee crown during construction if they do not prevent inspection and maintenance of the Levee, obstruct flood fight procedures, and meet additional requirements. It is necessary that normally no materials or equipment may be placed on the Levee crown because Levees require continual inspection and maintenance to ensure Levee stability. Unobstructed and timely flood fight procedures are, in times of emergency, required to prevent Levee failure and subsequent flooding.

(m)(1): It is necessary to specify that structures, materials and equipment may be placed on a Levee crown provided there is adequate Levee crown width to provide a minimum of twenty (20) feet of unobstructed clearance for two-way vehicular traffic because access along the Levee crown roadway must be maintained at all times for inspection, maintenance and flood fight procedures. Heavy mobile equipment, including mowers, Levee slope drags and chemical spray machinery, are used on the Levee crown and must have adequate clearance at all times.

(m)(2): It is necessary to specify that where a public road or highway is on the Levee crown, the design width of the roadway including the roadway shoulders shall remain clear because the roadway must

remain clear to maintain unobstructed two-way vehicular traffic, and the roadway shoulders must remain clear to accommodate stopped vehicles and for various emergency uses.

(m)(3): It is necessary to specify that materials or equipment stored on the Levee crown shall be no closer than fourteen (14) feet from the landside Levee shoulder because the designated area must remain clear to allow access to the landside Levee slope with a large assortment of maintenance and flood fight equipment.

(m)(4): It is necessary to specify that materials or equipment stored on the Levee crown shall be no closer than fourteen (14) feet from the waterside Levee shoulder provided the waterside Levee slope has Revetment that meets the standards of section 121 of this division because the designated area must remain clear to allow access to the waterward Levee slope with a large assortment of maintenance and flood fight equipment.

(m)(5): It is necessary to specify that materials or equipment stored on the Levee crown shall be no closer than thirty (30) feet from the waterside Levee shoulder if the waterside Levee slope is not protected from erosion by Revetment meeting the standards in section 121 of this division because unrevetted Levee slopes sustain more damage from the erosional forces of waves and stream currents, the unrevetted slope is frequently less stable and subject to erosion, reducing the clear area available for the operation of heavy maintenance or flood fight equipment. The thirty (30) feet of unobstructed area is required to ensure access to the waterward Levee slope with heavy maintenance and flood fight equipment, and to provide for the safe operations of the equipment and for the safety of the equipment operators.

(n): The purpose of subdivision (n) is to specify that seismic surveys near a Levee or within a Floodway shall meet certain criteria. It is necessary to specify that seismic surveys near a Levee or within a Floodway shall meet certain criteria because seismic waves must be controlled to prevent damage to adjacent Levees. Mechanical vibrators used to produce seismic waves can generate sufficient horizontal shear forces to damage a Levee Section that consists of soils susceptible to shear failure, excessive settlement, or liquefaction.

(n)(1): It is necessary to specify that seismic surveys producing horizontal shear energy sources may not be used on any Levee Section or within fifty (50) feet of the Levee Toe because any exploratory project used to evaluate the potential presence of geothermal resources must consider the safety of flood control facilities. Mechanical vibrators used to produce seismic waves can generate sufficient horizontal shear forces to damage a Levee Section that consists of soils susceptible to shear failure, excessive settlement, or liquefaction. In areas having unusual soil conditions, such as peat, loose sand, or loam, a more stringent control will be used to protect adjacent Levees.

(n)(2): It is necessary to specify that seismic surveys using energy charges for surveys shall be a minimum distance of two hundred (200) feet from the Levee Toe because seismic surveys using energy charges, such as dynamite, to produce seismic waves must be controlled to prevent damage to adjacent Levees. Any exploratory project used to evaluate the potential presence of geothermal resources must consider the safety of flood control facilities. Mechanical vibrators used to produce seismic waves can generate sufficient horizontal shear forces to damage a Levee Section that consists of soils susceptible to shear

failure, excessive settlement, or liquefaction. In areas having unusual soil conditions, such as peat, loose sand or loam, a more stringent control will be used to protect adjacent Levees.

(n)(3): It is necessary to specify that seismic surveys using energy charges for surveys shall not exceed one (1) pound of charge per one hundred (100) feet of distance from the Levee Toe because seismic surveys using energy charges, such as dynamite, to produce seismic waves must be controlled to prevent damage to adjacent Levees. Any exploratory project used to evaluate the potential presence of geothermal resources must consider the safety of flood control facilities. Mechanical vibrators used to produce seismic waves can generate sufficient horizontal shear forces to damage a Levee Section that consists of soils susceptible to shear failure, excessive settlement, or liquefaction. In areas having unusual soil conditions, such as peat, loose sand, or loam, a more stringent control will be used to protect adjacent Levees.

(n)(4): It is necessary to specify that electrical cables used in seismic surveys may not interfere with periodic inspections and maintenance of flood control facilities or with flood fighting because electrical wires interfere with periodic maintenance of flood control facilities or with flood fight procedures. Levee and Floodway maintenance requires equipment that could easily sever electrical cable, placing the operator at serious risk. An electrical method of obtaining seismic surveys measures electrical conductivity or resistivity of the strata. This procedure has no effect on adjacent Levees or the Floodway.

(o): The purpose of subdivision (o) is to specify that miscellaneous Encroachments that would remain in the Floodway during the Flood Season shall not cause a significant increase in Stream stage or velocities. The Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact. The Board may deny a Permit if the impact is deemed significant. It is necessary to specify that miscellaneous Encroachments that would remain in the Floodway during the Flood Season shall not cause a significant increase in Stream stage or velocities because where the effect of the miscellaneous Encroachment on flood stages is uncertain the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the miscellaneous Encroachment on flood stages is uncertain because the Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

CCR Title 23. Article 8. Section 138. Identification of Limits of Flood Control Works

(a): The purpose of subdivision (a) is to establish that the Board may identify the limits of an Adopted Plan of Flood Control, SPFC Facilities, Non-SPFC Facilities, other Permitted Work, and Encroachments for purposes of establishing the area of the Board's jurisdiction that it actively regulates when certain situations arise. It is necessary to establish that the Board may identify the limits of an Adopted Plan of Flood Control, SPFC Facilities, Non-SPFC Facilities, other Permitted Work, and Encroachments for purposes of establishing the area of the Board's jurisdiction that it actively regulates because there are two situations where the Board needs discretion to determine the geographical limits of project flood

control features or of the area near an Adopted Plan of Flood Control that needs to be actively regulated.

(a)(1): It is necessary to specify that the Board may establish the location of a Levee Toe when the point of intersection of the Levee slope and natural ground cannot readily be determined, and therefore the existing Levee Toe cannot otherwise be defined, because setback requirements and engineering investigation requirements for many types of Encroachments are based on distance from the Levee Toe. There can be several reasons the Levee Toe has been disturbed to the extent that its location is not clearly evident. But usually when the Levee Toe location is not clearly evident it is because erosion of the Levee slope, typically from rainfall runoff, has deposited the eroded soil near the original Levee Toe.

(a)(2): It is necessary to specify that the Board may establish the extent of its jurisdiction when features or facilities are proposed to be added that may interfere with the integrity or proper functioning of an Adopted Plan of Flood Control because some types of work, such as large excavations, can adversely impact performance of Levees even if the work is located several hundred feet landward of the Levee. In the case of a large excavation, the concern is for Levee underseepage to transport Levee foundation materials away.

CCR Title 23. Article 8. Section 139. Pools

(a): The purpose of subdivision (a) is to define terms used in section 139. It is necessary to define terms that are used repeatedly in section 139, but not elsewhere.

(a)(1): It is necessary to define Adjacent to a Levee so that a Pool that is sufficiently shallow and/or distant from a Levee may be allowed without necessarily requiring a geotechnical analysis. Pools that are deep and/or close to the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of a flood control project feature raise special concern about causing Levee slope instability and/or uplift of the Pool and piping from Levee underseepage and that could damage the Levee and possibly cause a Levee failure during high water. Per USACE guidance, a Pool is generally considered to be too close to the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of a flood control project feature if it is deep enough to intersect a line drawn at a 10h:1v slope projected downward from the landward extent of the landside Levee Toe, Seepage Berm toe, Stability Berm toe, or landward extent of a flood control project feature. Such a Pool is considered to be Adjacent to a Levee and requires a geotechnical analysis.

(a)(2): It is necessary to define Existing Pool to distinguish a new Pool from a Pool that existed prior to adoption of these regulations in 2020.

(a)(3): It is necessary to define Pool to mean a permanent structure excavated any shape in the ground more than two (2) feet deep, designed for holding water used for bathing or swimming, including but not limited to swimming pools, Jacuzzis, hot tubs, and similar structures whether full or empty, because shallow excavations pose little threat to the integrity of the Levee but excavations deeper than two (2) feet may shorten the path for underseepage through a blanket layer significantly and cause piping of Levee foundation materials and/or cause instability of the Levee slope. It is necessary to require that the term “permanent” means the structure remains in place during part or all of the Flood Season because temporary excavations outside of the Flood Season that are outside of the Levee Right of Way are highly

unlikely to cause Levee slope instability or piping from underseepage. Such excavations that remain during the Flood Season may cause slope instability or piping of Levee foundation soils during high water that can occur at any time during the Flood Season.

(b): The purpose of subdivision (b) is to establish that installation of Pools and enlargement of Existing Pools that are near the landside Levee toe or Adjacent to a Levee could cause adverse impacts to the stability of the Levee during high water.

(b)(1): The purpose of subdivision (b)(1) is to prohibit construction of new Pools and enlargement of Existing Pools within the Levee Right of Way. It is necessary to prohibit construction of new Pools and enlargement of Existing Pools within the Levee Right of Way because this would interfere with operation and maintenance of the Levee, including patrolling and flood fighting.

(b)(2): The purpose of subdivision (b)(2) is to require that a new Pool shall not be constructed Adjacent to a Levee unless a geotechnical analysis demonstrates that the Pool will not adversely impact the integrity of the Levee and a Permit is issued by the Board. It is necessary to require a geotechnical analysis for a new Pool constructed Adjacent to a Levee because it is deep enough to intersect the 10h:1v projection from the Levee Toe or flood control project feature that is a general rule for protecting the Levee from slope instability or piping of Levee foundation material during high water.

(b)(3): The purpose of subdivision (b)(3) is to require that any modification, alteration, addition, or similar activity involving an Existing Pool that is Adjacent to a Levee may at the Board's discretion trigger an engineering evaluation pursuant to section 139(c) of this division and/or issuance of a Permit with conditions. In general, modifications of an Existing Pool that are no deeper or closer to the Levee than the Existing Pool's configuration would not require an engineering evaluation if the Existing Pool has not been uplifted or damaged by Levee underseepage or allowed migration of soil from the area between the Existing Pool and the Levee. It is necessary to require that a modification, alteration, addition, or similar activity involving an Existing Pool that is Adjacent to a Levee may at the Board's discretion trigger an engineering evaluation pursuant to section 139(c) of this division and/or issuance of a Permit with conditions because these are discretionary actions by the owner of the existing Pool that could potentially cause damage to the Levee and/or Levee foundation through slope instability or piping of Levee foundation materials. It is necessary to state that in general, modifications of an Existing Pool that are no deeper or closer to the Levee than the Existing Pool's configuration would not require an engineering evaluation if the Existing Pool has not been uplifted or damaged by Levee underseepage or allowed migration of soil from the area between the Existing Pool and the Levee because for Existing Pools that have performed well, modifications that are no deeper or closer to the Levee are unlikely to cause damage to the Levee.

(b)(4): The purpose of subdivision (b)(4) is to require that in exceptional circumstances, the Board may require an engineering evaluation pursuant to section 139(c) of this division for any new Pool to be constructed, and for any Existing Pool to be enlarged, within four hundred (400) feet landward of the Levee Right of Way or Adjacent to a Levee. The evaluation shall be submitted to the Board for approval and shall be the basis for determining whether a Board Permit is required. Such exceptional circumstances may apply when there is engineering evidence that the new Pool or Existing Pool to be enlarged may create or significantly aggravate piping of soil from the vicinity of the Levee. It is necessary

to establish that in exceptional circumstances the Board may require an engineering evaluation for any new Pool to be constructed, and for any Existing Pool to be enlarged, within four hundred (400) feet landward of the Levee Right of Way or Adjacent to a Levee because excavation landward of the Levee deeper than two (2) feet raises the potential for damage to a thin blanket layer that is important for preventing boils and piping of Levee foundation materials during high water, even several hundred feet from the Levee Toe. Levees with underseepage problems are often repaired by constructing landside seepage berms as long as three hundred (300) feet. Even excavations beyond three hundred (300) feet could be very damaging to a Levee's underseepage performance. It is necessary to require that the evaluation shall be submitted to the Board for approval and shall be the basis for determining whether a Board Permit is required because the Board needs the geotechnical evaluation to determine whether a Board Permit should be required so that appropriate conditions can be placed on the Permit. It is necessary to specify that such exceptional circumstances may apply when there is engineering evidence that the new Pool or Existing Pool to be enlarged may create or significantly aggravate piping of soil from the vicinity of the Levee because it is helpful to applicants to understand what conditions may be considered exceptional circumstances that trigger an engineering evaluation.

(b)(5): The purpose of subdivision (b)(5) is to specify that, based on an engineering evaluation provided pursuant to section 139(b)(4) of this division, a Board Permit may be required for any new Pool to be constructed or installed, and for any Existing Pool to be enlarged, within four hundred (400) feet landward of the Levee Right of Way that could uplift, or crack from uplift force, or promote piping during high water if the Pool is empty; otherwise a Permit is not required for constructing a new Pool, or enlarging an Existing Pool, that is not Adjacent to a Levee. It is necessary to specify that, based on an engineering evaluation provided pursuant to section 139(b)(4) of this division, a Board Permit may be required for any new Pool to be constructed or installed, and for any Existing Pool to be enlarged, within four hundred (400) feet landward of the Levee Right of Way that could uplift, crack from uplift force, or promote piping during high water if the Pool is empty because a Pool that uplift, or crack from uplift force, or promote piping during high water if the Pool is empty presents a potential threat to Levee integrity resulting from boils or piping of Levee foundation materials during high water. It is necessary to specify that otherwise a Permit is not required for constructing a new Pool, or enlarging an Existing Pool, that is not Adjacent to a Levee because this clarifies that constructing a new Pool, or enlarging an Existing Pool, that is not Adjacent to a Levee does not require a Permit if it could not uplift, crack from uplift force, or promote piping of during high water if the Pool is empty.

(b)(6): The purpose of subdivision (b)(6) is to require that Existing Pools Adjacent to a Levee in an Adopted Plan of Flood Control shall comply with article 6, section 108 (Existing Encroachments) of this division. It is necessary to require that Existing Pools Adjacent to a Levee in an Adopted Plan of Flood Control shall comply with article 6, section 108 (Existing Encroachments) of this division because article 6, section 108 provides rules for Existing Encroachments, including nonconforming Existing Encroachments. This is referenced because section 139 and the rules for Pools did not exist prior to 2020.

(c): The purpose of subdivision (c) is to require that engineering evaluations for new Pools to be constructed and Existing Pools to be enlarged within four hundred (400) feet landward of the Levee

Right of Way, or Adjacent to a Levee in an Adopted Plan of Flood Control shall comply with certain following requirements. It is necessary to require that engineering evaluations for new Pools to be constructed and Existing Pools to be enlarged within four hundred (400) feet landward of the Levee Right of Way, or Adjacent to a Levee in an Adopted Plan of Flood Control shall comply with certain following requirements because the engineering evaluations must consider a variety of loading conditions and performance requirements.

(c)(1): It is necessary to require that the engineering evaluation shall include subsurface investigation and laboratory testing to characterize the foundation of the Pool or Existing Pool and the nearby Levee or flood control project feature because accurate characterization of subsurface conditions is essential to performing a reliable evaluation. It is necessary to require that the evaluation shall include slope stability, Levee underseepage, and Pool uplift analyses for full Pool and empty Pool conditions because the effect on Levee stability and underseepage can differ when the Pool is full and empty. Generally, the critical condition will be the Pool empty condition because of the uplift provided by underseepage at the Pool. It is necessary to require that the evaluation shall consider aquifer and blanket layer conditions and potential for piping because the permeability and location of these strata controls the resultant potential for piping at the Pool. It is necessary to require that the evaluation shall use the DWSE and, in Urban Criteria Areas, the evaluation shall also use Stream stage at the Hydraulic Top of Levee because these are the appropriate water surface elevations to use for the analysis and that are used for design of the Levee. It is necessary to specify that the Board may waive this engineering evaluation requirement for a small, shallow New Pool or Existing Pool that, in the judgment of the Board, poses no risk to the integrity of the Levee because relatively shallow and distant Pools may pose no risk to Levee integrity, especially if constructed beyond Existing Pools that are deeper and have performed well. This provides the Board with the ability to save applicants considerable expense when appropriate to do so.

(c)(2): It is necessary to require that the engineering evaluation shall also evaluate the structural adequacy of the Pool to avoid cracking by uplift forces during high water because a Pool cracked by uplift forces can allow piping of soil into the Pool.

(c)(3): It is necessary to require that the engineering evaluation shall be performed by a California registered civil engineer to ensure an adequate design and acceptable construction methods. Numerous factors must be considered in evaluating the Pool, its strength, uplift forces, and effects on the nearby Levee. These factors vary from project to project. An improperly conducted engineering evaluation could pose a hazard to public safety by allowing construction of a Pool that results in piping of Levee foundation materials during a high water event.

(c)(4): It is necessary to require that the engineering evaluation shall provide satisfactory evidence to the Board that the Pool or Existing Pool will not adversely impact the integrity of the Levee or flood control project feature; otherwise the Board will not grant a Permit for the Pool or Existing Pool. This is because without evidence that the Pool or Existing Pool will not adversely impact the integrity of the Levee or flood control project feature issuing a Permit for the Pool would put the Levee and the people and area protected by the Levee at too much risk for Levee failure from piping of Levee foundation soils or possibly Levee slope instability.

(c)(5): It is necessary to specify that the Board Permit shall require the owner of the Pool or Existing Pool to maintain the Pool or Existing Pool full of water during Flood Season because the water in the Pool counteracts uplift forces from Levee underseepage to help prevent it from being lifted, creating a bigger seepage path and piping of soil. A Pool that is demonstrated by the engineering evaluation to not be uplifted even when empty would not normally require a Board Permit.

(c)(6): It is necessary to require that the Board Permit shall require conditions associated with access, inspection, and enforcement to ensure that the Pool or Existing Pool is full of water during Flood Season because these conditions enable the Board to verify that the Pool is not empty and a potential hazard during high water.

(d): The purpose of subdivision (d) is to specify that new Pools to be constructed and Existing Pools to be enlarged within a Floodway shall comply with certain following requirements. It is necessary to specify that new Pools to be constructed and Existing Pools to be enlarged within a Floodway shall comply with certain following requirements because Pools within a Floodway can create a new seepage path through a blanket layer that is important for Levee underseepage or obstruct flood flows.

(d)(1): It is necessary to require that in a Leveed Floodway, a Pool or Existing Pool within three hundred (300) feet of the waterside Levee Toe shall be evaluated by a California registered civil engineer to ensure an adequate evaluation. Numerous factors must be considered in evaluating the Pool, its strength, potential impact on waterside blanket layer integrity, effects on the nearby Levee(s), and potential impact on flood flow conveyance. These factors vary from project to project. An improperly conducted evaluation could pose a hazard to public safety by allowing construction of a Pool that results in piping of Levee foundation materials during a high water event or raises flood stages.

It is necessary to require that the engineering evaluation shall include subsurface investigation and laboratory testing to characterize the foundation of the Pool or Existing Pool and the nearby Levee or flood control project feature because the subsurface investigation and laboratory testing of sampled soils enables the engineer to properly characterize the soil strata for the evaluation, normally performed by seepage modeling.

(d)(2): It is necessary to require that a Pool or Existing Pool and appurtenances shall not cause a significant increase in Stream stage or velocities because where the effect of the Pool or Existing Pool on flood stages is uncertain the Board needs to be able to require a hydraulic analysis to make a determination about the hydraulic impacts. It is necessary to establish that the Hydraulic Impact Evaluation Procedure shall apply for evaluating any hydraulic impact in locations where the effect of the Pool or Existing Pool on flood stages is uncertain because the Hydraulic Impact Evaluation Procedure is the rule for how the hydraulic analysis is to be performed. It is necessary to provide the Board with the ability to deny a Permit if the hydraulic analysis shows that a significant increase in flood stage will occur.

(e): The purpose of subdivision (e) is to specify that the Board Permit approving a Pool or Existing Pool shall run with the land, pursuant to a document executed pursuant to section 16(f) of this division. Upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner's name and address. It is necessary

to specify that the Board Permit approving the Pool or Existing Pool shall run with the land, pursuant to a recorded document executed pursuant to section 16(f) because prospective buyers of the property that includes the Pool or Existing Pool should be informed, by their title search, of the conditions specified in the Board Permit. It is necessary to specify that upon transfer of title of the land, the land owner relinquishing title is responsible to provide written notification to the Board of the title transfer and the new land owner's name and address because this enables the Board to record the new owner's information and notify the new owner of the conditions of the Board Permit to ensure that the new owner remains in compliance with the provisions of the Board's Permit.

(f): The purpose of subdivision (f) is to specify that additional Permit conditions may be required by the Board for ensuring a Pool or Existing Pool does not adversely impact the Adopted Plan of Flood Control. It is necessary to specify that additional Permit conditions may be required by the Board for ensuring a Pool or Existing Pool does not adversely impact the Adopted Plan of Flood Control because the Board has little experience issuing Permits for Pools and may determine from experience that additional Permit conditions should be required.