



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY

LOS ANGELES DISTRICT CORPS OF ENGINEERS
P.O. BOX 532711
LOS ANGELES, CALIFORNIA 90053-2325

December 3, 2012

Office of the Chief
Planning Division

TO INTERESTED PARTIES:

The U.S. Army Corps of Engineers, Los Angeles District (Corps) requests your review and comment on the Draft Supplemental Environmental Assessment (SEA)/Mitigated Negative Declaration (MND) Addendum for the Santa Maria River (SMR) Levee Improvement Project (Levee Improvement Project Features: Vegetation Free Zone), Santa Barbara and San Luis Obispo Counties, California. This document is a Supplement/Addendum to the 2009 Final Environmental Assessment (EA)/Mitigated Negative Declaration (MND) for the construction of the SMR Levee Improvement Project. This Draft SEA/MND focuses on a modification to the project associated with creating and maintaining a vegetation free zone at the toe of the levee. Specifically, this Draft SEA/MND documents a proposed plan to keep a 15-foot wide, 6.5-mile long area along both the land-side and river-side of the levee free of vegetation for maintenance access and levee inspection purposes. The 2009 EA/MND had committed to restoring vegetation up to the toe of the levee on the river side; the current proposal is to maintain a 15'-wide strip closest to the structure free of vegetation, while extending the northern edge of the restoration area another 15' into the floodplain. Prior to levee/sheet pile construction, a maintenance road already existed on the land side along the entire project area as discussed in this document; the current proposal is to continue maintaining that area free of vegetation.

The proposed action avoids impacts to sensitive riparian and wetland habitat by leaving vegetation that has developed adjacent to the constructed and buried sheetpile in Reaches 1, 2, and 3. A Vegetation Free Zone is not required on the river-side of the embankment in this area.

The project remains in compliance with all applicable federal and state laws and statutes and the proposed modification will not have a significant impact upon the existing environment or the quality of the human environment.

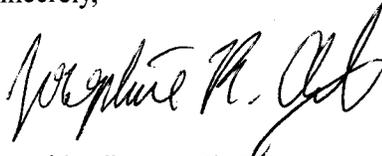
In an effort to conserve paper and resources, this Draft SEA/MND Addendum may be downloaded at the enclosed web address. Please respond with comments on the Draft SEA/MND by Thursday, January 10, 2013. Correspondence may be sent to:

Josephine R. Axt, Ph.D.
Chief, Planning Division
U.S. Army Corps of Engineers
Los Angeles District
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Los Angeles, California 90053-2325
OR
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If you have any questions regarding the project or would like to request the document in hard copy or on CD, please contact Mr. Naeem Siddiqui, Project Environmental Coordinator, at (213) 452-3852.

Thank you for your attention to this document.

Sincerely,

A handwritten signature in black ink, appearing to read "Josephine R. Axt". The signature is fluid and cursive, with a large, stylized initial "J" and "A".

Josephine R. Axt, Ph.D.
Chief, Planning Division

Enclosure

U. S. ARMY CORPS OF ENGINEERS
LOS ANGELES DISTRICT

DRAFT
**SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT
AND MITIGATED NEGATIVE DECLARATION ADDENDUM**

SANTA MARIA RIVER LEVEE (SMR) IMPROVEMENT PROJECT

Levee Improvement Project Features: Vegetation Free Zone

Santa Barbara and San Luis Obispo Counties, California



December 2012

FINDING OF NO SIGNIFICANT IMPACT
SANTA MARIA LEVEE IMPROVEMENT PROJECT
Levee Improvement Project Features: Vegetation Free zone
Santa Barbara and San Luis Obispo Counties, California

I have reviewed the attached Supplemental Environmental Assessment that has been prepared for the Santa Maria Levee Improvement Project. This SEA focuses on a modification to the project associated with creating and maintaining a vegetation free zone at the toe of the levee. Specifically, this SEA documents a proposed plan to keep a 15-foot wide, 6.5-mile long area along both the land side and river side of the levee free of vegetation for maintenance access and levee inspection purposes.

The Corps has already incorporated a vegetation free zone for the Bradley Canyon extension section in its SDDR Addendum. The vegetation free zone for this reach will be consistent with the Bradley Canyon reach, and will result in no significant impacts to habitat. The proposed action avoids sensitive riparian and wetland habitat by leaving the vegetation that is adjacent to the buried sheetpile in Reaches 1, 2, and 3, construction of which has been completed.

The project remains in compliance with all applicable federal and state laws and statutes. I have determined that the proposed modification will not have a significant impact upon the existing environment or the quality of the human environment. Therefore, preparation of an Environmental Impact Statement is not required.

“Building Strong and Taking Care of People”

Date

R. Mark Toy
Colonel, US Army
District Engineer

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SMR Levee Improvement:
Vegetation Free Zone

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**SUPPLEMENTAL ENVIRONMENTAL ASSESSMENT AND MITIGATED NEGATIVE
DECLARATION ADDENDUM
SANTA MARIA LEVEE IMPROVEMENT PROJECT
LEVEE IMPROVEMENT PROJECT FEATURES: VEGETATION FREE ZONE**

INTRODUCTION

Scope of Analysis

This document is a Supplement/Addendum to the 2009 Final Environmental Assessment (EA)/Mitigated Negative Declaration (MND) for the Santa Maria River levee improvement project located in Santa Barbara and San Luis Obispo Counties, California. Specifically, this SEA/Addendum documents a proposed plan to create and maintain a 15' wide vegetation-free zone (VFZ) along the toe of the 6.5 mile long levee and sheet pile wall to accommodate future inspection and maintenance needs. The 15' -VFZ will be maintained on both the land side and the river side of the levee and sheet pile wall. The slopes of the levees will also be kept clear of vegetation. The proposed VFZ within the river side was cleared of vegetation and compacted during recent levee and sheet pile construction. The 2009 SEA had committed to restoring vegetation up to the toe of the levee on the river side; the current proposal is to maintain a 15' -wide strip closest to the structure free of vegetation, while extending the northern edge of the restoration area another 15' into the floodplain. Prior to levee/sheet pile construction, a maintenance road already existed on the land side along the entire project area (as shown in the photo below); the current proposal is to continue maintaining that area free of vegetation. The levee slopes are mostly barren, although scattered areas of non-native grasses, Russian thistle (tumbleweed) and mustard would be cleared as part of this project.



Photo depicts the proposed VFZ within the previously existing maintenance road and adjacent non-native vegetation on the land side of the levee (left side of photo)



Photo depicts the proposed VFZ and the levee slope within the river side that would be maintained (left side of photo)

This SEA/Addendum provides the required National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) documentation for a proposed modification to the originally proposed and constructed project (42 United States Code [U.S.C.] §§ 4321 et seq.; California Public Resources Code [PRC] 21000 et seq.). This SEA/Addendum has been prepared, specifically, to assess potential environmental impacts and benefits associated with the proposed modification and feasible alternatives.

The scope of this Addendum includes approximately 11.8 acres of non-wetland waters of the U.S on the river side of the levee, and a similar acreage of upland area on the land side abutting the toe. Impacts from the proposed modification would be permanent, but fully mitigated.

Purpose and Need

The primary purpose of the vegetation-free zone is to provide a reliable corridor of access to, and along, the levee and sheet pile wall. This corridor must be free of obstructions to assure adequate access by personnel and equipment for surveillance, inspection, maintenance, monitoring, and flood-fighting. In the case of flood fighting, this access corridor must also provide the unobstructed space needed for the construction of temporary flood-control structures. Access is typically by four-wheel-drive vehicle, but for some purposes, such as maintenance and flood-fighting, access is required for larger equipment, such as tractors, bulldozers, dump trucks, and helicopters. Accessibility is essential to the reliability of flood damage reduction systems.

Maintenance of the VFZ will also prevent establishment of deep-rooted plants on or near the slope of the structure. Deep, extensive root systems have the potential to affect the structural integrity of the levee, in part by providing pathways for water to seep into the inner core and

SMR Levee Improvement:
Vegetation Free Zone

reduce soil strength.

Project Location

The proposed Project site is located in the city of Santa Maria, Counties of Santa Barbara and San Luis Obispo, California. The proposed Project modification (the vegetation free zone (VFZ)) extends along a 6.5-mile reach of the improved southern Santa Maria River Levee. This feature extends from the terminus of Bradley Canyon to the north end of Blosser Road (see Figure 1).

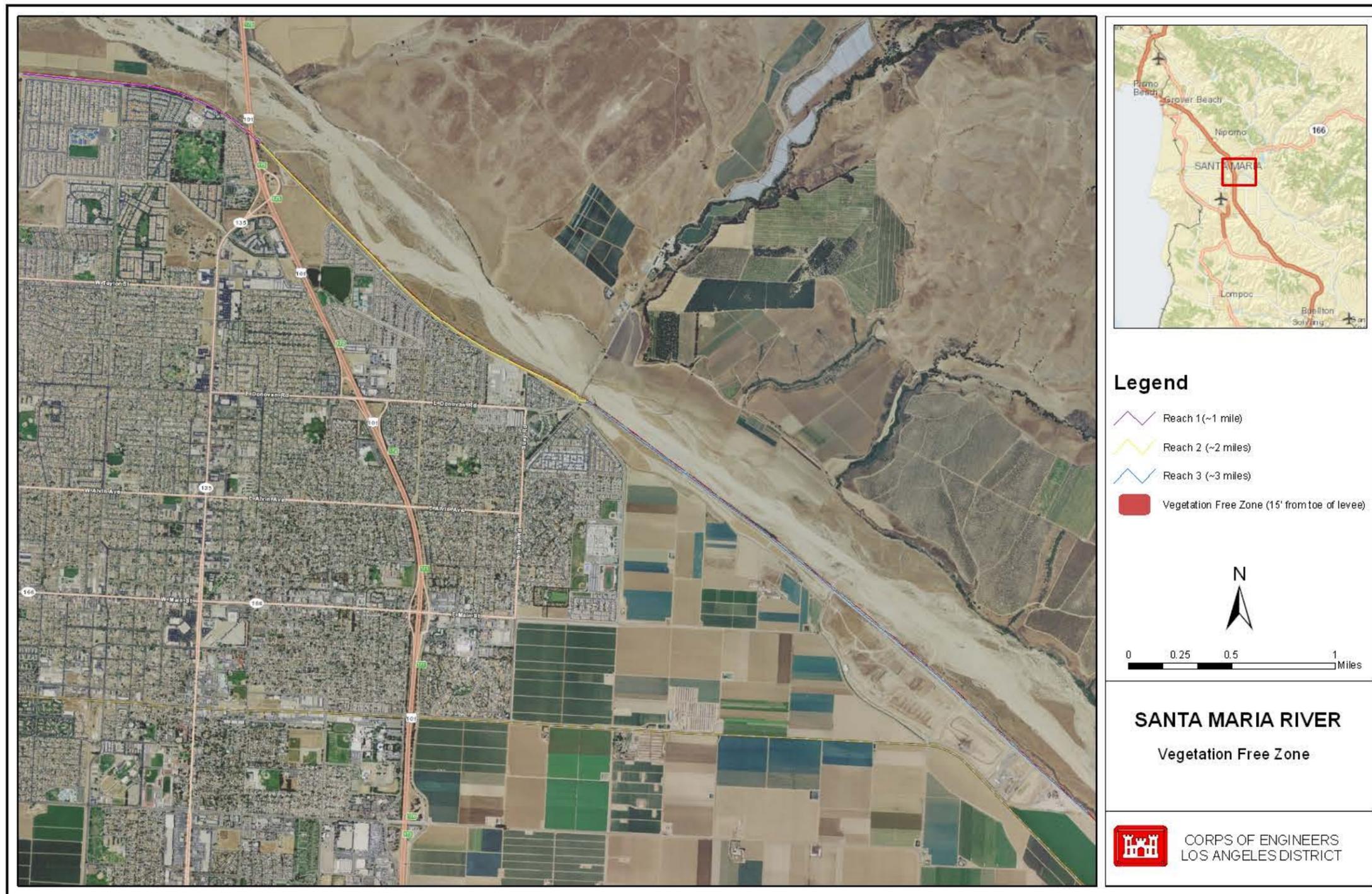


Figure 1 Project Location

Project Setting

Adjacent land uses on the land side of the levee include residential, commercial, agricultural, recreational, and industrial. Agricultural activities also take place on the river side of the levee, especially in Reach 1 west of United States Highway 101 (US-101) bridge overpass and Blosser road as shown in figure 2 below. The proposed Project site is bordered by urban development within the city of Santa Maria to the southwest and the Santa Maria River to the northeast. Urban development includes a maintenance road/bike path with a safety rail along the top of the levee, residential neighborhoods, a concrete company, and the Santa Maria Landfill. Agricultural land and undeveloped property are located north of the proposed Project site and across the Santa Maria River. The levee and proposed Project site are traversed by the United States Highway 101 (US-101) bridge overpass and Suey Road.

Existing structures within the project area include the above mentioned crossings, the levee itself, rocks along the levee face, soil cement, metal training fence, station markers, and ramps leading from the top of the levee to the VFZ maintenance road in the river bed. The proposed Project area consists of the levee and adjacent river bed. The top of the levee is approximately eight feet above the river bed, which is generally level.

Stormwater and urban runoff drainage within the urban areas to the south and west (city of Santa Maria) flows towards the river, and drains into the riverbed via floodgates that traverse the levee. Flow within the river is generally confined within the levee system, but during large events flows may spread into unprotected agricultural property. Habitat communities outside of the VFZ (proposed project area) include riparian scrub, non-native grassland, coastal sage scrub, ruderal/disturbed, riverwash, freshwater marsh, and landscaped/developed vegetation.

PROJECT BACKGROUND

In 2005, the Federal Emergency Management Agency (FEMA), responsible for administering the National Flood Insurance Program, asked the Corps to certify that the Santa Maria Levee Project met the Corps criteria for levee systems. Based on hydraulic and geotechnical analysis and review of several documented failures, the Corps was not able to certify that the levee system that existed at the time could contain a “100- year” flood event (or an event that has a 1% chance of occurring within any given year). The Corps identified a deficiency in the original levee design. The levee revetment had originally been designed to handle 150,000 cfs in bank to bank flow (i.e., flow path parallel to the levee system), but did not address the potential for failure resulting from directly impinging flows.

In 2009, following an extensive alternatives analysis, the Corps strengthened approximately 6.5 miles of the south levee with sheet pile and soil cement revetment in order to address this deficiency. Soil cement was applied to the levee face and levee toe along the majority of the proposed Project reach (approximately 6.2 miles), and

transitioned to sheet pile for the remaining 1,700 feet of the Project area (the upstream extent of the Project area at Bradley Canyon).

The 2009 project was addressed in an EA/MND and Design Deficiency Report (DDR) which documented the environmental impact and design deficiency investigation, alternatives to correct the deficiency, and the recommended corrective action to resolve the deficiency. The 2009 EA/MND and DDR are on file at the Corps, Los Angeles District Office.

Construction began in January 2010 and was completed in September 2011. Restoration of disturbed areas within the riverbed is ongoing, through December 2014 as shown in figures 2, 3 and 4. A supplemental Environmental Assessment and Mitigated Negative Declaration (SEA/MND) was completed in November 2011 for the Reach 3 extension (also known as Santa Maria River Levee Improvement Bradley Canyon Levee Extension Project) to evaluate the environmental effects of the proposed Project, alternatives thereto, and associated mitigation measures. The 2009 SEA/MND was a supplement to the Final Environmental Assessment/Mitigated Negative Declaration (EA/MND, August 2009) for the repair of 6.5 miles of the original Santa Maria River Levee Project. The proposed VFZ addressed in this SEA/MND, however, only applies to the main levee work described in the 2009 EA/MND. VFZ required along Bradley Canyon is already addressed in the 2011 SEA/MND along with other environmental effects.

The mitigation commitment from the 2009 EA/MND to restore disturbed habitat (approximately 85.31 acres) was initially envisioned to begin at the toe of the existing structure and extend out approximately 120 feet on the river side of the levee. As discussed below, the Corps has since determined the need to maintain a clear or mowed 15' wide path along the toe. Vegetation in this zone would be limited to low-growing perennial grasses. As a result, under the proposed change, the vegetation planting/hydroseeding would be shifted by an additional 15' beyond the original footprint (into a previously unvegetated area) as shown in the figures 2, 3, and 4. The same 85.31 acres, minimum of native vegetation () will therefore be restored. (The area on the land side of the levee is currently only sparsely vegetated with non-native habitat and barren land, and was not included in any previous restoration commitment.)

Authorization

The flood control improvements in the Santa Maria River Basin, California, as set forth in House Document 400, Eighty-third Congress, second session, was approved 3 September 1954 by Act of Congress, Public Law 780, Eighty-third Congress, second session. Based on the criteria in ER 1165-2-119 (Modifications to Completed Projects), the construction required for this federal Proposed Action is authorized under the existing project authority from 1954.

SMR Levee Improvement:
Vegetation Free Zone

This project, and this proposed action under it, are authorized under Public Law 91-190, NEPA of 1969, as amended; Engineer Regulation (ER) 200-2-2, Procedures for Implementing NEPA; Endangered Species Act (ESA) of 1973 (c) (4); and the Clean Water Act (CWA), as amended.

In accordance with Section 1.06 of the Operation and Maintenance Manual for Santa Maria Valley Levees and Channel Improvements, the Santa Barbara County Flood Control and Water Conservation District is responsible for the operation and maintenance of completed flood control levees and channel improvements.

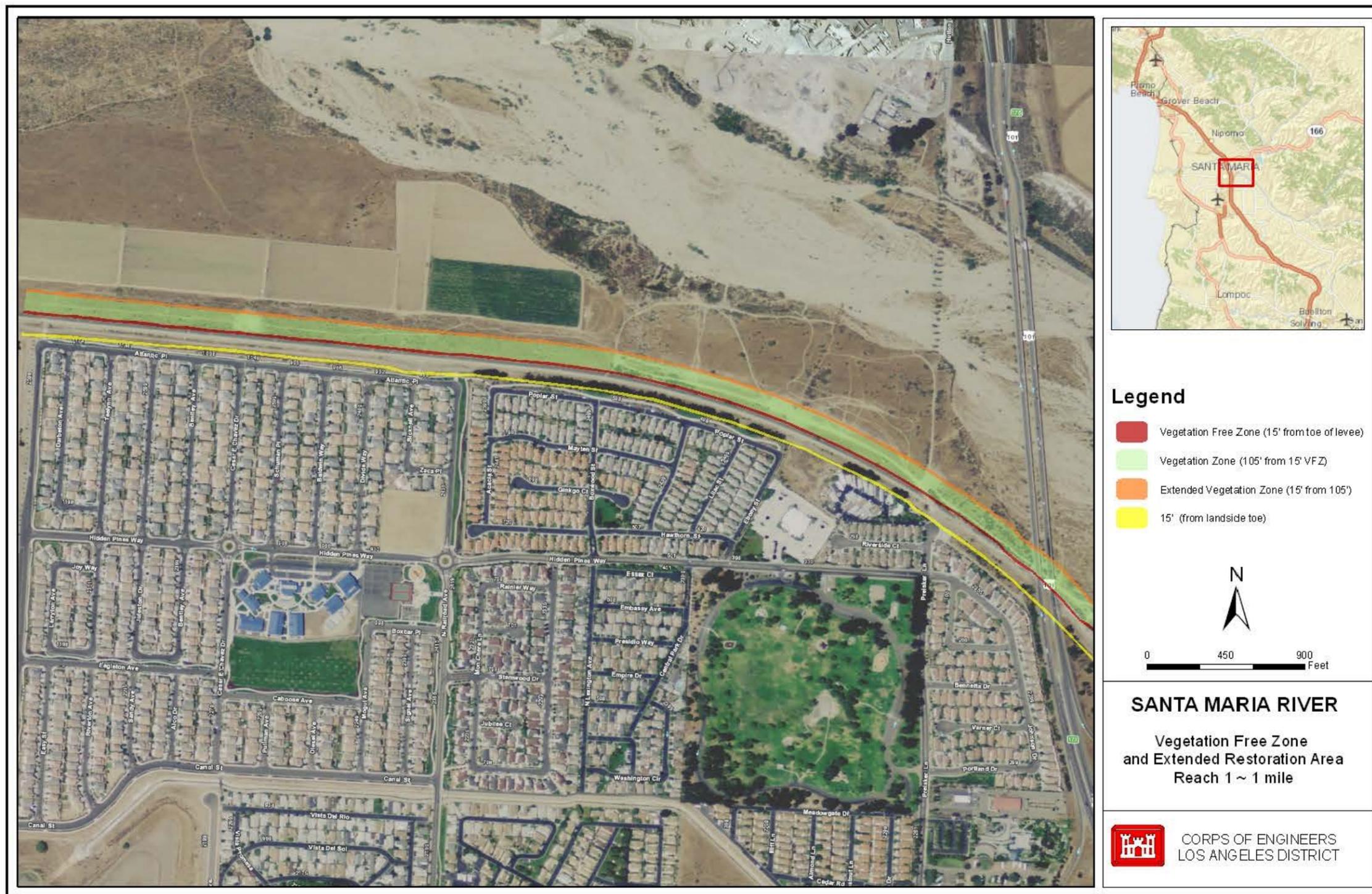


Figure 2

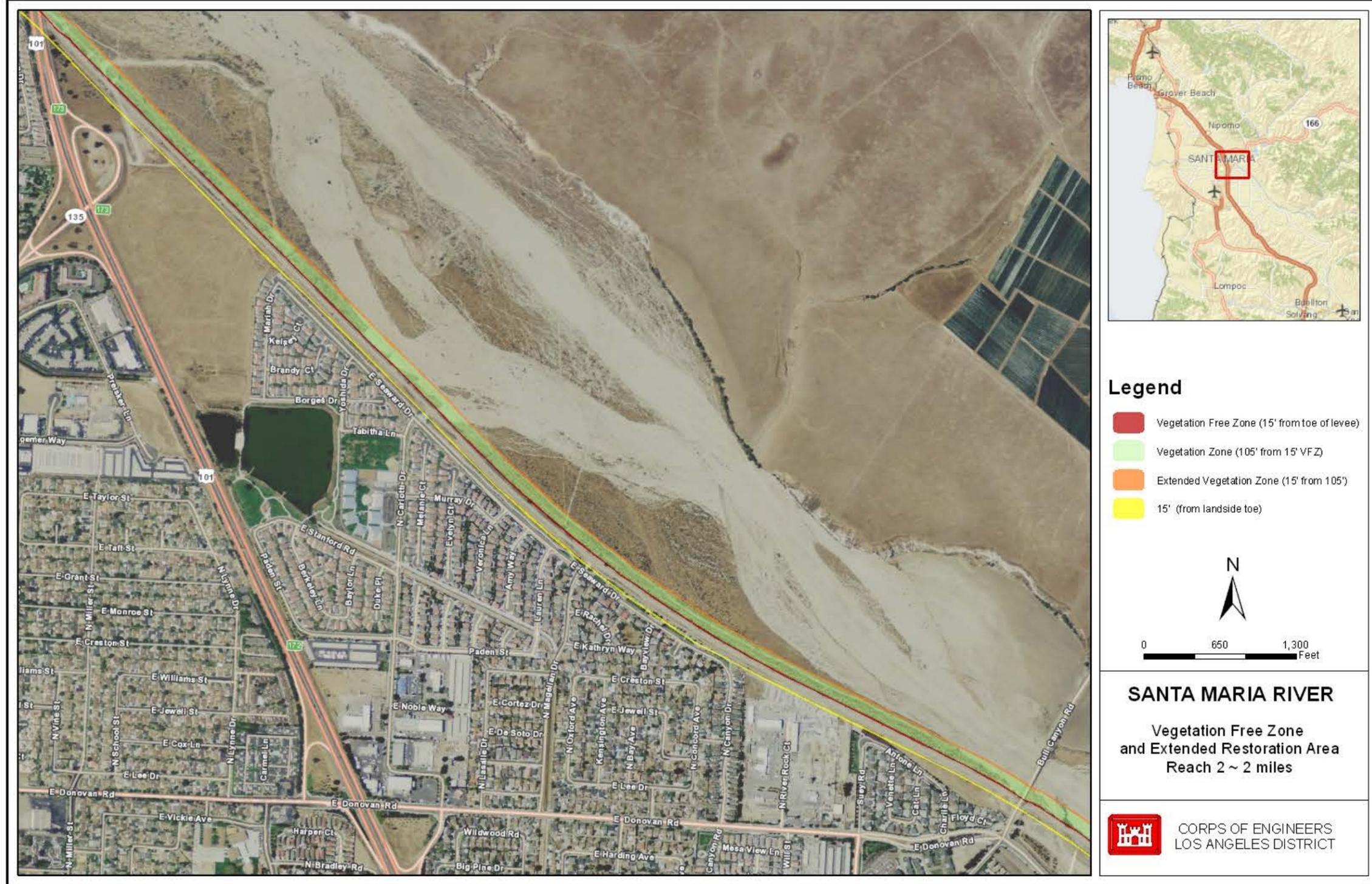


Figure 3



Figure 4

PROJECT DESCRIPTION AND ALTERNATIVES

The proposed action for Reaches 1, 2, and 3 (construction of which has already been completed) addresses only the impacts of incorporating a vegetation free zone along the Santa Maria Levee. The 2009 SDDR Addendum already addressed impacts within the Bradley Canyon section. This proposed action avoids impacts to sensitive riparian and wetland habitat by leaving the vegetation that is adjacent to the buried sheetpile. It maintains the same commitment to re-vegetate a minimum of 85.31 acres along the approximately 6.5 mile length of Reaches 1, 2, and 3 of the levee.

Alternative 1: No Action

Under the No Action alternative, the Santa Maria Levee Improvement Project would remain in place, but the vegetation-free zone would not be constructed or maintained. Vegetation would be allowed to grow up to the levee toe, potentially jeopardizing the levee.

Alternative 2: Construction and Maintenance of a Vegetation Free Zone

This alternative will consist of modifying the Santa Maria Levee Project to include a 15' wide vegetation-free zone on both the river side and land side of the levee, and also includes maintaining the slopes of the levees free of vegetation. The VFZ would extend along the entire 6.5-mile length of the improved levee as shown in cross-section in Figures 5 and 6 below. The vegetation-free zone would be constructed by clearing, grading and compacting the existing native material, which would allow for the safe passage of maintenance vehicles for levee safety and inspection. Vegetation would continue to be removed or mowed on a regular basis as needed by hand crews or by mechanical means. VFZ maintenance, weed control and subsequent mowing will be done outside of the bird breeding season or after a qualified biologist documents the absence of nesting.

a) Sheet Pile VFZ

The vegetation free zone in the sheet pile area is located along the easternmost 1,700 feet of "Reach 3" (the upstream extent of the Project area at Bradley Canyon). The proposed VFZ would extend 15 feet on both sides of the sheet pile, as shown in Figure 5. The VFZ on the land side would extend 15' from the toe of the levee, within an existing maintenance road. The VFZ limit on the river side is within the slope of the existing levee (rather than 15' from the toe); therefore, the VFZ will be maintained without impacting any vegetation within the riverbed. This avoids direct disturbance of adjacent riparian habitat in this reach and minimizes impacts to sensitive biological resources. Due to the close proximity of these sensitive resources, de-vegetation of the levee and VFZ shall be accomplished by mechanical means or by targeted application of non-toxic herbicides that have been approved by the Environmental Protection

Agency (EPA) for use in aquatic environments (such as Round-up or Rodeo). Inspections of the sheet pile walls shall be conducted as needed to ensure that the flood risk management facilities are maintained in a properly functioning condition. Routine inspections of the sheet pile will not normally require access beyond the VFZ on the river side, as long as the sheet pile remains buried (is not exposed). However, in the event that the river side embankment scours after a major flow event, then an inspection of the sheet pile, to include a visual inspection of the exposed face, will be performed. If a problem with the sheet pile wall arises, it shall be addressed by the sponsor in a timely manner. This may include repair or reinforcement of the sheet pile due to erosion. Once the sheet pile is deemed to be structurally sound, the sponsor will be required to reconstruct the earthen-filled embankment, not for flood risk management purposes, but to address fall hazard concerns and eliminate obstacles to wildlife movement. The sponsor will be required to coordinate with the appropriate resource agencies to obtain the required permits and prepare additional environmental documentation prior to performing such work.

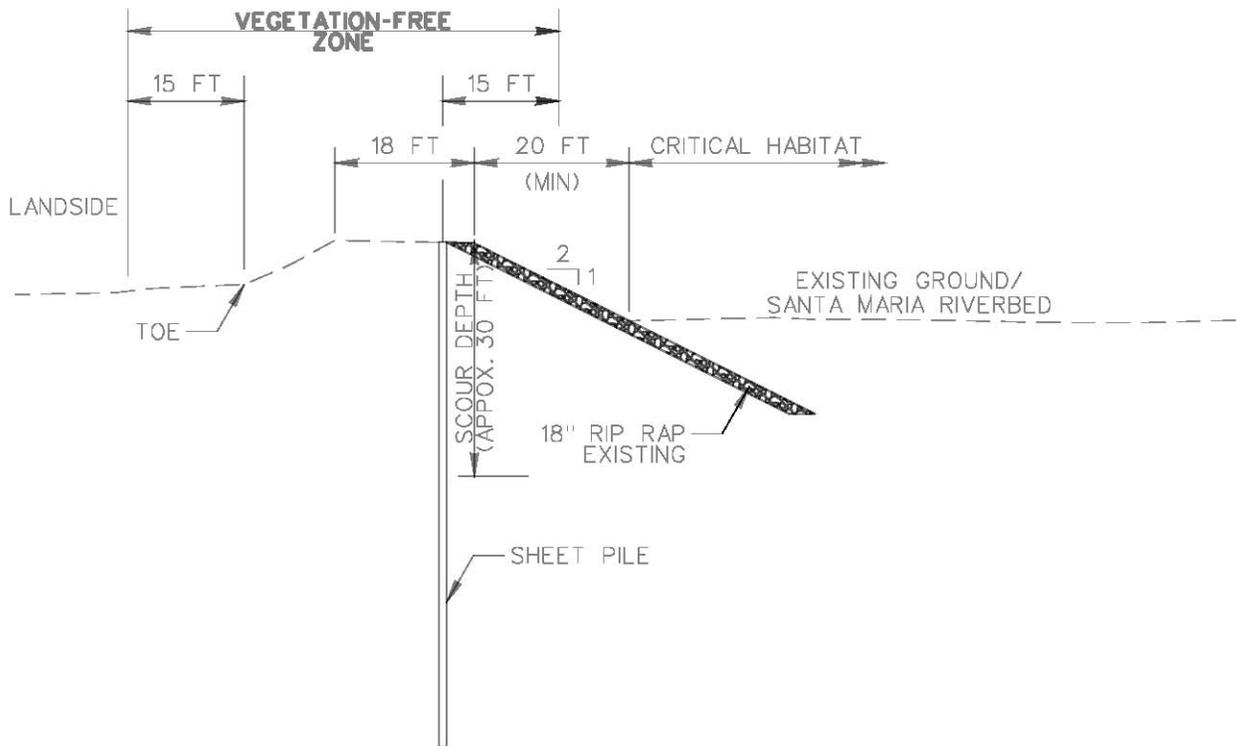


Figure 5: Vegetation-Free Zone along Sheet Piling

b. Soil Cement VFZ

In this section of the levee, the VFZ includes the width of the levee plus an additional 15 feet on both sides of the levee (See Figure 6). On both the river side and land side of the levee, the VFZ will extend 15' from the toe at the existing ground surface as shown in figures 1 -4. Only native perennial grasses shall be permitted to grow within the VFZ. All other woody vegetation will be removed when found using mechanical means and/or targeted application of non-toxic herbicides that have been approved by the EPA for use in aquatic environments. The perennial grasses within the VFZ would be maintained as needed to a height of 3 to 6 inches. Maintenance will not encroach on the adjacent restoration area, which is being extended an additional 15 feet along its northern boundary (further into the floodplain) to compensate for the VFZ along the toe.

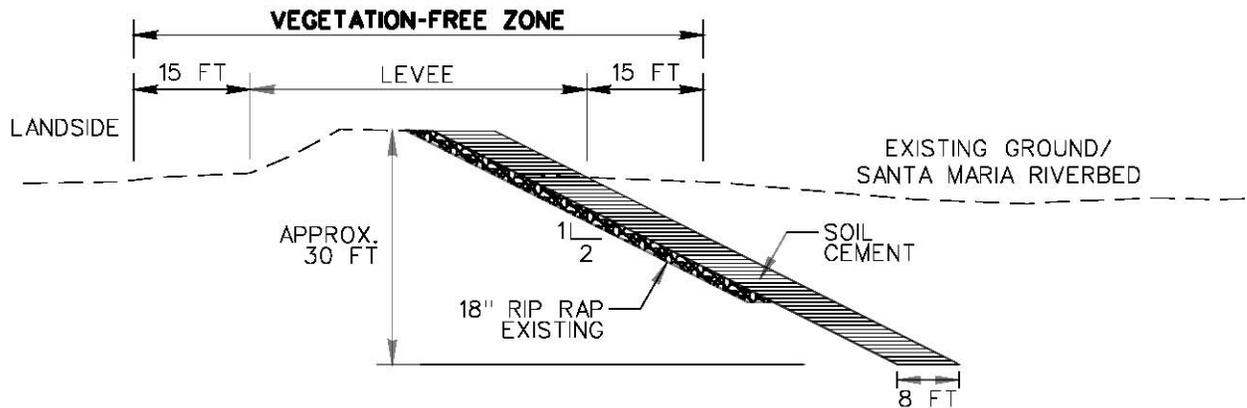


Figure 6: Vegetation-Free Zone along Soil Cement Revetment

AFFECTED ENVIRONMENT

This section summarizes existing and anticipated future “without-project” conditions within and immediately adjacent to the proposed VFZ. See previous environmental documents referenced above for a more complete description of the entire SMR Levee project area. The proposed Project encompasses a 6.5-mile reach of the southern Santa Maria River Levee, extending from the terminus of Bradley Canyon to the north end of Blosser Road (Figure 1). The area is divided into Reaches 1, 2, and 3. Much of the land on both sides of the levee and adjacent to the Project area has experienced changes in land use and habitat over the years, including prior to the Corps’ flood damage reduction project.

Land side (General): Existing features on or near the south side (land side) of the levee include an existing County maintenance dirt road that runs along the toe of the

levee (the proposed VFZ is within this area); some non-native grasses and weeds on the levee slope and on the opposite side of the maintenance road; the nearby Santa Maria Landfill; a nearby concrete batch plant; a recreational bike and walking path that runs along the top of the levee; and residential communities within the vicinity. Dominate weeds within the existing maintenance road (and proposed VFZ) include low growing grasses, Russian thistle (tumbleweeds) and mustard, with some ruderal and sparse native vegetation growing adjacent to the road. Agricultural fields are present adjacent to the north side (river side) of the levee, but none are within the VFZ. At several points both dirt and paved roads cross the Project area including the overpass bridge for highway 101/166 and the “Suey crossing” at Bull Canyon Road.

Future conditions on the land side of the levee (with or without the proposed VFZ) are expected to remain similar.

River side (General): The area adjacent to the proposed VFZ includes the restoration site for the Corps’ levee construction project. The Santa Maria River in the proposed project area and its vicinity supports a variety of native and non-native plant communities. These vegetation communities are in large part dependent on the hydrologic cycle of the river. In areas subject to routine scour from winter storms, the area supports more early seral stages of riparian or pioneering vegetation. For example, older high elevation stream terraces located within the streambed that have not experienced recent inundation contain more established vegetation including more drought tolerant species such as coyote bush (*Baccharis pilularis*), scalebroom (*Lepidospartum squamatum*), and buckwheat (*Eriogonum parvifolium*). These areas also support biotic crusts that have developed over many years. Where disturbance from scour is more common, early successional native and non-native plants are common and include sandbar willows (*Salix exigua*), mule fat (*Baccharis salicifolia*), and the weedy annual white sweet clover (*Melilotus alba*). Areas with less disturbance that retain access to ground water support larger woody vegetation such as arroyo willow (*S. lasiolepis*), California bay laurel (*Umbellularia californica*), and the exotic blue gum (*Eucalyptus globulus*). As previously stated, vegetation closer to the levee and in more disturbed areas also includes non-native grasses and mustard.. Agricultural activities also occur within the floodplain in some areas.

In the future, if the VFZ is not maintained, then either native habitat would be established within this zone per the commitments from the 2009 SEA, or the various native or non-native habitats that occur within adjacent areas of the river would eventually spread up to the toe of the structure.

Land side of Reach 1

Reach 1 begins approximately 500 feet west of Blosser Road and runs eastward approximately 1.2 miles to the Highway 101 bridge crossing. The habitat on the south

side (land side) of the levee is limited by an existing access road along the toe of the levee. Residential housing occurs adjacent to the project area along this entire reach. A bike path runs between the residential area and the levee. Habitat consists of disturbed annual non-native grasses, and ruderal habitat with some landscaped areas. Ornamental plantings of oaks are present along the residential area south of the project site (outside of the proposed VFZ).

River side of Reach 1

This reach is separated from the active river channel by large agricultural fields which occur on the adjacent flood plain. The levee structure consists of soil cement or compacted earth, and is unvegetated. The area immediately adjacent to the proposed VFZ includes the restoration site for the Corps' levee construction project, which is dominated by coastal sage scrub and coyote bush scrub communities. Weedy annuals including brome grasses (*Bromus* sp.), summer mustard, dove weed (*Eremocarpus setigerus*), and tree tobacco (*Nicotiana glauca*) occur in the vicinity (outside of the restoration area). Most of the vegetation that occurs within the confines of the channel (outside of the proposed VFZ and outside of agricultural fields) consists of a mosaic of upland plant communities. Non-native grassland, coastal sage scrub, and coyote bush scrub communities dominate the majority of Reach 1.. These communities continually transition from one to another for most of this reach. For example, large areas of annual grassland transition into more disturbed coastal scrub communities. At some locations, pure stands of coyote bush scrub transition into mulefat scrub and annual grassland. The vegetation identified on these terraces suggests that with the exception of major floods, these areas remain dry for extended periods.

Most of the upland habitat in this area is degraded, and dominated by non-native annual grasses and weedy herbaceous plants.

Land side of Reach 2

Reach 2 includes a 2.2 mile stretch between the Highway 101 bridge and Suey crossing. Features along the south side (land side) of the levee in this area include an existing maintenance road along the toe of the levee; non-native grasses and weeds; a concrete batch plant in the vicinity; and a recreational bike and walking path that runs along the top of the levee. Dominate weeds are low growing grasses and mustard with some ruderal and sparse native vegetation within the vicinity. On the upstream end of this reach, between the Highway 101 bridge and the Suey Road crossing, a vacant lot dominated by non-native annual grasses and residential housing occurs immediately south of the project area.

River side of Reach 2

As in Reach 1, the area adjacent to the proposed VFZ includes the restoration site for the Corps' levee construction project. Habitat outside of the restoration area in this reach is somewhat degraded. Agricultural fields occur adjacent to and within some

sections of the floodplain (on the river side of the levee). At several points both dirt and paved roads cross the project area including the overpass bridge for highway 101/166 and the “Suey crossing” at Bull Canyon Road. In other areas, the riverbed within this Reach includes a wide alluvial floodplain where the active channel abuts the existing levee in several locations. Evidence of historic scour is common and two higher elevation stream terraces dominated by coastal scrub and riparian scrub extend into the active channel. Habitat within this Reach consists of various scrub communities. On higher elevation terraces, coastal scrub dominated by golden bush, scale broom, golden yarrow, wild tarragon, and phacelia is present. Riparian scrub is also a common element in this area and consists of dense patches sandbar willow, mulefat, and coyote bush. Weedy non-native species are common in this area and occur across the Reach. White sweet clover, tocalote (*Centaurea melitensis*), tree tobacco, and fennel (*Foeniculum vulgare*) are locally dense in many areas.

Land side of Reach 3

Reach 3 includes a 3.3 mile section between the Suey crossing and Bradley Canyon confluence. The habitat on the south side (land side) of the levee includes an existing maintenance road along the toe of the levee; a levee access road; non-native grasses and weeds; agricultural fields; and the nearby Santa Maria Landfill. Ruderal habitat is common in these areas.

River side of Reach 3

Habitat within the floodplain in this Reach includes open channel, various riparian scrub communities, annual grasslands, and disturbed ruderal habitat. The active channel is very close to the toe of the levee through much of Reach 3. This is especially true at the western end of the reach where most of the vegetation is at the toe of the levee and the active channel is extremely sparse. Most of the active channel has either been scoured of vegetation from previous storms or subject to clearing from previous construction activities by the County. The area adjacent to the proposed VFZ includes the restoration site for the Corps’ levee construction project, and large areas of open sandy channel supporting scattered willows, mulefat, and ragweed. Ambrosia (*Ambrosia chamissonis*), mugwort (*Artemisia douglasiana*), and horseweed (*Conyza canadensis*) are also present. In many areas, weedy annuals including white sweet clover, rip gut brome (*B. diandrus*), summer mustard (*Brassica* sp.), fennel, and Russian thistle (*Salosa tragus*) are common. Further east, the habitat is more xeric with coyote bush scrub and non-native annual grasses.

ENVIRONMENTAL CONSEQUENCES

AIR QUALITY

Construction of the proposed vegetation-free zone would require the use of only a few pieces of equipment , typically a grader, smaller dozer or a Kubota

to keep that area vegetation free for a short duration (from a few days to a week), and therefore is not expected to increase the amount of air pollutants above *de minimis* levels (see 2009 Final EA/NMD Appendix B). Use and maintenance of the proposed vegetation-free zone would be infrequent and would not measurably affect air quality.

BIOLOGICAL RESOURCES

Impacts of the proposed modification to biological resources in the aquatic environment are discussed in the 404 (b) (1) analysis section below. The proposed action avoids sensitive riparian and wetland habitat by leaving the vegetation that is adjacent to the buried sheetpile. It maintains the same commitment to re-vegetate a minimum of 85.31 acres along the same length of the levee.

WATER RESOURCES AND HYDROLOGY

Impacts of the proposed modification to water resources and hydrology are discussed in the 404 (b) (1) analysis section below.

LAND USE

Construction and use of the vegetation free zone would not require the conversion of existing land use.

RECREATION

The Santa Maria Levee project site is not used for water-related recreation. Inclusion of a vegetation-free zone would have no impact on recreation after concluding the brief period of construction. During construction, use of paths on the levee for biking and walking would be temporarily closed. There would be no impact on biking or walking for recreation after construction of the proposed modification.

NOISE

Construction of the proposed vegetation-free zone would require the use of only a few pieces of equipment (identified above) for a short duration (from few days to a week), and therefore is not expected to substantially increase noise levels in the area. Because the access would be typically used only for inspections, future use and maintenance of this area would not require frequent vehicle trips or the regular use of heavy equipment, and would not cause significant noise-related impacts.

SOCIOECONOMICS

There would be no change to regional socioeconomics due to the adoption of the modification. Socioeconomics would benefit in the sense that maintenance of the VFZ would allow easier access to the levee for inspections and maintenance, thus improving its reliability in providing flood damage reduction.

TRANSPORTATION

Initial clearing, and future maintenance and use of the vegetation free zone would require only a small number of maintenance vehicles. This is not expected to have any significant effect on transportation.

HAZARDOUS MATERIALS & WASTE HANDLING AND DISPOSAL

Grading, maintenance and use of the proposed vegetation-free zone would have little potential to generate hazardous materials. Equipment and vehicles used for grading, compaction, mowing, or levee inspections may occasionally spill or leak fluids, but this material and any contaminated soil would be removed and disposed of at an appropriate waste handling facility. Fueling and maintenance would not be done within the VFZ.

SAFETY

Grading, future maintenance and use of the vegetation-free zone would have a positive effect on safety, as it would allow for a clear inspection of the levee and sheet pile walls and quick repair of any discovered deficiencies.

CULTURAL RESOURCES

No cultural resources were identified during pre-project surveys during the original construction of Reaches 1, 2, and 3. Construction and use of the vegetation-free zone is unlikely to uncover previously unidentified resources. The proposed project modification would therefore have no effect on cultural resources.

PUBLIC SERVICES AND UTILITIES

Construction of the vegetation-free zone would not require public services and utilities in addition to those required of the levee project. Use of the vegetation-free zone is not expected to require any public services or utilities. The proposed project modification would therefore have no adverse effect on public services and utilities. Benefits would occur in the sense that maintenance of the VFZ would allow easier access to the levee for inspections and maintenance, thus improving its reliability in providing flood damage reduction.

404(B) (1) EVALUATION

Physical and Chemical Characteristics

(X) **Substrate**

The Project site is located within an area of alluvial deposits and imported fill material (i.e., the Santa Maria River Levee and adjacent street network). Soils on the Project site are characterized as riverwash, with sandy alluvial lands comprising the surrounding area. These “undeveloped” soil types are generally susceptible to erosion by wind and water. The section of the river within the study area is a broad meandering alluvial streambed with a mosaic of riparian vegetation and sandy terraces barren of vegetation. Vegetative cover generally consists of riparian scrub, mulefat scrub, coyote bush scrub, central coast scrub, non-native grasslands, disturbed/ruderal, and active agriculture. (See Section 3.2 Biological Resources of the 2009 EA/MND for a more detailed description of the habitat communities present within the Project Area.)

The vegetation-free zone would be composed of compacted native material. Regular maintenance of this area would be done by hand or by mechanical grading. Erosion of the vegetation-free zone due to large storm events would be repaired using native fill from the adjacent riverbed. Because the vegetation-free zone would be composed of native-materials and would not require import of materials for repair, there would be no effect to substrate from the proposed modification.

(X) **Currents, Circulation or Drainage Patterns**

Creation of the vegetation-free zone would not significantly alter currents, circulation or drainage patterns, as no new drainages would be created within this zone. In addition, the vegetation-free zone is not expected to have any impact on currents or circulation, as it is highly unlikely to influence the flow of water. For these reasons the proposed modification would have no effect on currents, circulation or drainage patterns.

(X) **Suspended Particulates; Turbidity**

Construction of the vegetation-free zone may result in temporary increases in suspended particulates and turbidity in the project area, as well as downstream in the Santa Maria River, particularly during the wet season. However, most watercourses within this region exhibit naturally-elevated levels of suspended sediment load and turbidity due to unconsolidated, coarse substrate, minimal vegetation and a short, intense wet season. The proposed vegetation-free zone would be compacted and would not be expected to increase flow velocities or downstream erosion. The proposed modification would therefore have no significant effect on suspended particles or turbidity.

- (X) **Water Quality (Temperature, Salinity Patterns and Other Parameters)**
The Santa Maria River is currently listed on the 2006 CWA Section 303(d) List of Water Quality Limited Segments Requiring Total Maximum Daily Loads (TMDL) for the following pollutants: nitrate, fecal coliform, and pesticides (ammonia, chlorpyrifos, Dichloro-Diphenyl-Trichloroethane (DDT), dieldrin, endrin). These pollutants most likely originate from agricultural sources that commonly occur throughout the watershed.

Impacts to water quality from the overall levee construction project were addressed in the Final 2009 EA/MND. Inclusion of the proposed vegetation-free zone feature would have no additional impacts. It would not increase flow velocities or downstream erosion and would not likely result in significant changes to water quality in the Santa Maria River or the underlying Santa Maria River Groundwater basin. For these reasons there would be no significant impact to water quality due to the inclusion of the proposed project modification.

- (X) **Flood Control Functions**
The vegetation-free zone would not affect the ability of the levee to act as a flood control structure. The proposed modification would function as access for maintenance and inspection and would therefore improve inspection visibility. No adverse effect would occur to flood control functions.

- (X) **Storm, Wave and Erosion Buffers**
Not applicable. The vegetation-free zone would not have the potential to affect coastal hydrology. Actions under the proposed modification would include improvements to the existing Santa Maria River Levee and would not alter existing conditions relevant to storm, wave, and erosion buffers.

- (X) **Erosion and Accretion Patterns**
The soils on the project site are designated as “riverwash” (within the riverbed), and sandy alluvial land (along and adjacent to the levee). Soil characteristics are variable. The riverbed materials are generally sandy, and will likely scour at relatively low stream flow velocities (possibly as low as 1 to 2 feet per second). In addition, various gravel mining operations along the river (outside of the project limits) remove sediment from the riverbed. Stream bank erosion and scouring below the toe of the existing rock slope protection have impacted the levee during past storm events, and are likely to again in the future.

The proposed project modification would involve disturbance of substrate and compaction in order to create a vegetation-free zone which would function as a maintenance road. During construction of the vegetation-free zone, increased

erosion and accretion may occur. BMPs implemented to reduce erosion and accretion for the overall levee improvement project would also reduce impacts due to construction of the vegetation-free zone. The proposed modification is not expected to increase flow velocities or erosion within or downstream of the project area. After completion of the proposed vegetation-free zone, erosion and accretion patterns would be similar to existing conditions; therefore there would be no effect to erosion and accretion patterns.

(X) **Aquifer Recharge**

The reduction in potential infiltration area associated with a vegetation-free zone is considered negligible when considering the remaining available area for groundwater recharge within the Santa Maria River. The reduction of potential infiltration associated with the proposed modification would be minimal, and therefore, any potential effects on aquifer recharge would be insignificant.

(X) **Baseflow**

The level of groundwater in the Santa Maria Groundwater Basin is strongly connected to the flow levels in the Sisquoc, Cuyama, and Santa Maria Rivers, as well as Orcutt Creek (DWR, 2004). These waterways are “losing” systems, which means that surface water flow rapidly infiltrates to recharge the underlying groundwater. Surface and shallow subsurface flow in the subject reaches of the Santa Maria River is characterized by stormflow and is not expected to include baseflow from the underlying groundwater system. As described above, under present conditions, baseflow along the proposed Project alignment has been evaluated between 70 and 80 feet below ground surface. (See discussion of aquifer recharge in the 2009 Final EA/MND Section 4.3). The proposed vegetation-free zone would not affect groundwater supply or groundwater recharge conditions; therefore there would be no effect to baseflow.

(X) **Mixing zone, in light of the depth of water at the disposal site; current velocity, direction and variability at the disposal site; degree of turbulence; water column stratification; discharge vessel speed and direction; rate of discharge; dredged material characteristics; number of discharges per unit of time; and any other relevant factors affecting rates and patterns of mixing:**

Not applicable; this Project does not include a mixing zone.

Biological Characteristics

(X) **Special aquatic sites (wetlands, mudflats, coral reefs, pool and riffle areas, vegetated shallows, sanctuaries and refuges, as defined in 40 CFR 230.40-45)**

The proposed vegetation-free zone would be constructed/maintained on both sides of the Santa Maria River Levee . The project area (on the river side) contains non-wetland waters of the U.S. Because no special aquatic sites as defined in 40 CFR 230.40-45 have been identified, the proposed project modification would have no effect on special aquatic sites.

(X) **Habitat for fish and other aquatic organisms**

Stream gauge data collected by the California Department of Water Resources verify that surface flow trends in the Santa Maria River are highly variable and are directly connected to releases from Twitchell Reservoir (DWR, 2002). The Santa Maria River and its tributaries in the Santa Maria Valley are “losing” systems, which means that surface water flow rapidly infiltrates into underlying permeable layers (DWR, 2008). Surface flow will generally remain for several days following the cessation of the rain event during an average wet year, with surface water (e.g., ponded) sustaining for longer periods. This flow occurs for extended periods of time and provides surface flow connectivity from downstream areas to upper portions of the watershed. This connectivity of surface flow provides periodic habitat conditions for the upstream passage of Federally endangered southern steelhead (*Oncorhynchus mykiss*), and other aquatic organisms.

The vegetation-free zone would not impact habitat which would be suitable for fish or other aquatic organisms. Potential adverse impacts from the overall levee construction project were addressed and fully mitigated in the Final 2009 EA/MND. Inclusion of the proposed vegetation-free zone feature would have no additional, significant impacts with the implementation of the environmental commitments identified in this SEA/MND. The proposed project modification would have no significant long-term effect on habitat for fish and other aquatic organisms.

(X) **Wildlife habitat (breeding, cover, food, travel, general))**

Prior to levee construction, the area within and surrounding the proposed VFZ supported a wide variety of habitat conditions ranging from barren sandy areas subject to routine scour to riparian scrub communities. Vegetation communities identified in the general project area include: arroyo willow riparian, riparian scrub, mulefat scrub, coyote bush scrub, central coast scrub, non-native grasslands, ruderal, and active channel. Habitat quality in the vicinity of the VFZ on the river side would be considered good and typical of an intermittent stream channel in southern California. The Initial Study prepared by the SBCFCWCD also noted that several migratory bird species have the potential to nest in habitats within the project site. (See the 2009 Final EA/NMD Section

3.2-Biological Resources, for a complete list of the plants and wildlife observed in the Project area).

Effects of the vegetation-free zone would result in the loss of a limited area for use of the area for foraging, cover or dispersal. This habitat however, would be relocated adjacent to the vegetation-free zone, closer to the river channel. With the relocation of habitat there would be no long-term significant impacts to wildlife habitat.

(X) **Endangered or threatened species**

The federally endangered tidewater goby (*Eucyclogobius newberryi*) is present within the Santa Maria River, but its presence is limited to the lagoon at the mouth of the river, and is not expected to be found within the fill area. The proposed project would have no effect on the tidewater goby.

The Santa Maria River is a known migration corridor for the federally endangered Southern steelhead trout (*Oncorhynchus mykiss*). Most of the time, this species is highly unlikely to be present near the project site due to low flow conditions and lack of suitable habitat. Steelhead may migrate through the area (but not spawn) during high flow events. VFZ maintenance activities would not be conducted during periods of extreme flow when the water surface elevation may encroach within the proposed maintenance footprint. Therefore, the proposed Project would have no affect on this species.

The least Bell's vireo has not been reported within the proposed Project area but has been observed in riparian areas near the Cuyama River. There is also potential least Bell's vireo habitat in riparian areas near the far upstream reaches of the Project. As this species range continues to expand it is likely to occur along portions of the Santa Maria River. Through the implementation of environmental commitments described in this SEA/MND, effects of the Proposed Action to this species would be avoided. The proposed project modification would have no affect on this species.

The California red-legged frog (*Rana draytonii*), CRLF, has been observed in the vicinity of the proposed Project outside of the project footprint near the upstream terminus of the project area within the Bradley Canyon Channel where the sheet pile is installed. However, the proposed project modification (inclusion of a narrow vegetation free-zone) would have no affect on this species as it does not encroach within potentially occupied habitat.

(X) **Biological availability of possible contaminants in dredged or fill material**, considering hydrography in relation to known or anticipated sources of contaminants; results of previous testing of material from the vicinity of the project; known significant sources of persistent pesticides from land runoff or percolation; spill records for petroleum products or designated (Section 311 of the CWA) hazardous substances; other public records of significant

introduction of contaminants from industries, municipalities or other sources.

The vegetation-free zone would be constructed by clearing, grading and compacting the existing native material which would allow for the safe passage of maintenance vehicles for levee safety and inspection. Vegetation would continue to be removed or mowed on a regular basis as needed by hand crews or by mechanical means. VFZ maintenance, weed control and subsequent mowing will be done outside of the bird breeding season (or after a qualified biologist documents the absence of nesting).

A government records search was conducted during preparation of previous environmental documents to identify hazardous materials sites listed pursuant to Government Code Section 65962.5. According to the Department of Toxic Substances Control's Hazardous Waste and Substances site "Cortese" List (http://www.dtsc.ca.gov/SiteCleanup/Cortese_List.cfm), no hazardous waste facilities subject to corrective action are located within the proposed Project site. The Geotracker database (<http://geotracker.swrcb.ca.gov/>), maintained by the State Water Resources Control Board, tracks regulatory data about leaking underground fuel tanks, Department of Defense, Spills-Leaks-Investigations-Cleanups and Landfill sites. The database (accessed on August 20, 2008) lists 12 sites that currently undergoing assessment, remediation or monitoring. None of the sites are located within or adjacent to the proposed Project site. There is no evidence of any type of hazardous substance contamination in the Santa Maria River Levee materials or surrounding area.

Cumulative Effects

SUMMARY OF INDIRECT AND CUMULATIVE EFFECTS

Section 5 of the 2009 Final EA/MND provides a full discussion of the cumulative scenario in the Project Area, including as relevant to past, present, and reasonably foreseeable future projects. Implementation of the proposed project modification is not expected to result in increased impacts due to construction, as these impacts are already being mitigated for as discussed in Section 4 of the 2009 Final EA/MND. It is anticipated that no impacts to wildlife habitat would result from the permanent clearing of vegetation from the vegetation-free zone, since the vegetated/restored area will be expanded beyond the original footprint.

OTHER CUMULATIVE EFFECTS NOT RELATED TO THE PROPOSED PERMIT ACTION

Section 5 of the EA/MND provides a full discussion of the cumulative scenario in the Project Area, including as relevant to past, present, and reasonably foreseeable future projects.

Environmental Commitments

- 1) VFZ construction and maintenance, including weed control and mowing, shall be performed outside of the bird breeding season (or after a qualified biologist documents the absence of nesting).
- 2) The VFZ will be maintained without impacting any vegetation within the adjacent restoration area.
- 3) Due to the proximity of sensitive biological resources, VFZ maintenance shall be accomplished by mechanical means, and/or with the use of non-toxic herbicides that are approved by EPA for use in aquatic environments.
- 4) At the end of each day of VFZ construction or maintenance, all trash and debris that may attract predators shall be properly contained, removed from the work site, and disposed of regularly. Following mowing and clearing, all trash and debris shall be removed from work areas.
- 5) Operations shall remain in compliance with local noise ordinances.
- 6) A fire extinguisher or water truck shall be available at all times when heavy equipment is operating.
- 7) All VFZ construction and maintenance vehicles shall be equipped with the appropriate spark arrestors and functioning mufflers.

COMPLIANCE WITH ENVIRONMENTAL REQUIREMENTS

Federal Laws and Regulations

This project remains in compliance with applicable laws, regulations, and Executive Orders, including (but not limited to) the following:

National Environmental Policy Act of 1969 - The project is in compliance. This Environmental Assessment Addendum has been prepared in accordance with NEPA.

AIR QUALITY

Clean Air Act (Amendments 42 USC § 7401–7671)- The project is in compliance. The contractor will continue to be responsible for complying with all applicable Federal, State, and local laws and regulations concerning air quality.

BIOLOGICAL RESOURCES

Endangered Species Act of 1973, 1988 Amendments (16 USC § 1531 et seq.)- No change from the 2009 Final EA. The project is in compliance.

Fish and Wildlife Coordination Act, as amended- No change from the 2009 Final EA. The project is in compliance.

Migratory Bird Treaty Act of 1972- No change from the 2009 Final EA. There will be no impacts resulting from the project modification that will directly affect migratory birds. The project is in compliance.

WATER RESOURCES AND HYDROLOGY

Clean Water Act of 1977 (33 USC § 1251 et seq.)- No change from the 2009 Final EA. The project is in compliance.

Executive Order 11988, Floodplain Management (42 CFR 26961)- No change from the 2009 Final EA. The project is in compliance. There will be no impacts resulting from the project modification that will directly affect or Floodplain Management.

NOISE

Noise Control Act of 1972 (42 USC § 4901-4918)- No change from the 2009 Final EA. This project is in compliance.

U.S. Department of Labor Occupation Safety & Health Administration (29 CFR 1910.95)- No change from the 2009 Final EA. The project is in compliance.

SOCIOECONOMICS

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations- There will be no impacts resulting from the project modification that will directly affect or displace areas of low-income population. This project is in compliance.

HAZARDOUS MATERIALS AND WASTE HANDLING AND DISPOSAL

Resource Conservation and Recovery Act of 1976 (42 USC § 6901) –There is no change from the 2009 Final EA. This project is in compliance.

Hazardous Waste and Solid Waste Amendments Act of 1984 (42 USC § 6901)- There is no change from the 2009 Final EA. This project is in compliance.

SMR Levee Improvement:
Vegetation Free Zone

Comprehensive Environmental Response, Compensation and Liability Act of 1980 (42 USC § 9601)- There is no change from the 2009 Final EA. This project is in compliance.

Emergency Planning and Community Right-to-Know Act of 1986 (42 USC § 11001)- There is no change from the 2009 Final EA. This project is in compliance.

Toxic Substances Control Act of 1976 (15 USC § 2601, et seq.)- No change from the 2009 Final EA. This project is in compliance.

CULTURAL RESOURCES

National Historic Preservation Act of 1966 (16 USC § 470) - There is no change in compliance from the Final EA. The project is in compliance.

State Laws and Regulations

California Environmental Quality Act (CEQA) (California Public Resources Code section 21000 et seq.)- This Environmental Assessment Addendum has been prepared in accordance with CEQA. Pursuant to Section 15164 of the CEQA Guidelines, an addendum to an approved EA shall be prepared if “none of the conditions described in Section 15162 of the Guidelines calling for the preparation of a subsequent EA have occurred,” “only minor technical changes or additions are necessary to make the EA under consideration adequate under CEQA,” and “the changes to the EA made by the addendum do not raise important new issues about significant effects on the environment.”

The Environmental Assessment Addendum indicates that none of the conditions described in Section 15162 have occurred. The proposed modification will not significantly impact any resources other than those described in the previously prepared environmental documents. Preparation of an Environmental Impact Statement/Environmental Impact Report, therefore, is not required.

Air Quality –This project is in compliance. The contractor will continue to be responsible for complying with all applicable Federal, State, and local laws and regulations concerning air quality

Noise- This project is in compliance. There is no change from the 2009 Final EA.

Local Laws and Regulations

Air Quality -The project is in compliance. The contractor will continue to be responsible for complying with all applicable Federal, State, and local laws and regulations concerning air quality.

Noise- This project is in compliance. There is no change from the 2009 Final EA.

FINDINGS

I. Findings

- A. Evaluation of Compliance with 404(b)(1) guidelines (restrictions on discharge, 40 CFR 230.10). (A check in a block denoted by an asterisk indicates that the Project does not comply with the guidelines.)

1) Alternatives Test

- | | | |
|--------------------------|-------------------------------------|---|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | a) Based on the alternatives discussion, above, are there available, practicable alternatives having less adverse impact on the aquatic ecosystem and without other significant adverse environmental consequences that do not involve discharges into “waters of the United States” or at other locations within these waters? |
| Yes | No | |

Discussion:

Conclusion: The screening process described above has yielded no alternatives that would allow the project to meet the guidelines set by FEMA.

2) Special restrictions. Will the project:

- | | | |
|--------------------------|-------------------------------------|---|
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | a) Violate state water quality standards? |
| Yes | No | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | b) Violate toxic effluent standards (under Section 307 of the Act) |
| Yes | No | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | c) Jeopardize endangered or threatened species or their critical habitat? |
| Yes | No | |
| <input type="checkbox"/> | <input checked="" type="checkbox"/> | d) Violate standards set by the Department of Commerce to protect marine sanctuaries? |
| Yes | No | |

SMR Levee Improvement:
Vegetation Free Zone

Yes No e) Evaluation of the information in II C and D above indicates that the proposed discharge material meets testing exclusions criteria for the following reason(s)

(X) Based on the above information, the material is not a carrier of contaminants

() The levels of contamination are substantially similar at the extraction and disposal sites and the discharge is not likely to result in degradation of the disposal site and pollutants will not be transported to less contaminated areas

() Acceptable constraints are available and will be implemented to reduce contamination to acceptable levels within the disposal site and prevent contaminants from being transported beyond the boundaries of the disposal site.

3) Other restrictions. Will the discharge contribute to significant degradation of “waters of the U.S.” through adverse impacts to:

Yes No a) Human health or welfare, through pollution of municipal water supplies, fish, shellfish, wildlife and special aquatic sites?

Yes No b) Life states of aquatic life and other wildlife?

Yes No c) Diversity, productivity and stability of the aquatic ecosystem, such as the loss of fish or wildlife habitat, or loss of the capacity of wetland to assimilate nutrients, purify water or reduce wave energy

Yes No d) Recreational, aesthetic, and economic values?

Yes No **4) Actions to minimize potential adverse impacts (mitigation).** Will all appropriate and practicable steps (40 CFR 23.70-77) be taken to minimize the potential adverse impacts of the discharge on the aquatic ecosystem?

SMR Levee Improvement:
Vegetation Free Zone

Discussion: Best Management Practices (BMPs) proposed to minimize impacts to aquatic resources can be found in Section 8 of the 2009 Final EA/MND.

LIST OF PREPARERS

The following people were primarily responsible for preparing or reviewing this Environmental Assessment Addendum:

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APPENDICES

Appendix A

Engineering Technical Letter (ETL) 1110-2-571 – *Guidelines for Landscape Planting and vegetation Management at Levees, Floodwalls, Embankment Dams and Appurtenant Structures*. Applies to all flood damage reduction projects within the USACE program or project authority. Rehabilitation and Inspection Projects (RIP)

REFERENCES

2009 EA/MND for Santa Maria River Levee Repair (SMR) Project

2011 SDDR Addendum (Addendum to Supplemental Design Deficiency Report)

2011 DDR (Design Documentation Report) for SMR Project

ETL 1110-2-571 Guidelines for landscape planting and vegetation management at levees, floodwalls, embankment dams, and appurtenant structures

EC 1110-2-6061

Engineering and Design, Safety of Dams – Policy and Procedures, 30 April 2004 (Transmits Draft ER 1110-2-1156, *Engineering and Design, Safety of Dams – Policy and Procedures*, 30 April 2004).

EM 1110-2-38

Environmental Quality in Design of Civil Works Projects, 3 May 1971.

EM 1110-2-1205

Environmental Engineering and Local Flood Control Channels, 15 Nov 1989
(Sections 4-8.d (4) and 5-1).

EM 1110-2-1601

Hydraulic Design of Flood Control Channels, 1 July 1991, with Change 1, 30 June 1994 (Sections 3-3 and 3-5).

EM 1110-2-1913

Design and Construction of Levees, 30 Apr 2000 (Sections 4-4 and 8-17).

EM 1110-2-2300

General Design and Construction Considerations for Earth and Rock Fill Dams, 30 July 2004.

EM 1110-2-2502

Retaining Walls and Floodwalls, 29 Sept 1989 (Section 7-16).

EP 500-1-1

Emergency Employment of Army and Other Resources. Civil Emergency Management Program – Procedures, 30 Sep 2001 (Section 5.8.k and Appendix E).

ER 200-1-5

Policy for Integrated Application of U.S. Army Corps of Engineers (USACE) Environmental Operating Principles (EOP) and Doctrine, 30 Oct 2003.

ER 500-1-1

Emergency Employment of Army Resources, Civil Emergency Management Program, Chapter 5,

Rehabilitation and Inspection Program, 30 Sept 2001

ER 1110-1-12

Quality Management, Change 1, 30 Sept 2006.

ER 1110-2-1150

Engineering and Design for Civil Works Projects, 31 August 1999.

ER 1130-2-530

Project Operations - Flood Control Operations and Maintenance Policies, 30 October 1996.

ETL 1110-2-570

Certification of Levee Systems for the National Flood Insurance Program (NFIP), draft.

U.S. Army Corps of Engineers

Levee Owner's Manual for Non-Federal Flood Control Works, March 2006.

U.S. Army Corps of Engineers

Policy and Procedural Guidance for the Approval of Modification and Alteration of Corps of Engineers Projects, CECW-PB Memorandum, 23 Oct 2006.

FEMA 473

FEMA (2005a) *Technical Manual for Dam Owners, Impacts of Animals on Earthen Dams*, FEMA 473, Sept 2005.

<http://www.fema.gov/plan/prevent/damfailure/publications.shtml>

FEMA 534

SMR Levee Improvement:
Vegetation Free Zone

FEMA (2005b) *Technical Manual for Dam Owners, Impacts of Plants on Earthen Dams*, FEMA 534, Sept 2005.

<http://www.fema.gov/plan/prevent/damfailure/publications.shtm>

APPENDIX

ENGINEERING TECHNICAL LETTER (ETL) 1110-2-571

CECW-CE

Technical Letter
No. 1110-2-571

10 April 2009

EXPIRES 10 April 2014
Engineering and Design

**GUIDELINES FOR LANDSCAPE PLANTING AND
VEGETATION MANAGEMENT AT LEVEES, FLOODWALLS,
EMBANKMENT DAMS, AND APPURTENANT STRUCTURES**

1. Purpose. This ETL provides guidelines to assure that landscape planting and vegetation management provide aesthetic and environmental benefits without compromising the reliability of levees, floodwalls, embankment dams, and appurtenant structures. It is important to note that all minimum guidelines presented herein are just that—minimums. The dimensions of the vegetation-free and root-free zones defined in this document provide the minimum acceptable buffer between vegetation and flood damage reduction structures. For each individual project, the design team must consider whether or not these minimums are adequate to the specific needs and conditions of the project.

2. Applicability. This ETL applies to all USACE Commands having Civil Works responsibilities and to all flood damage reduction projects for which USACE has responsibility for design, operation, maintenance, inspection, or certification. Applicability to non-federal projects is as follows: under the Rehabilitation and Inspection Program (RIP), the USACE performs inspections of non-federal projects (i.e. projects built by local communities then incorporated into the RIP) under ER 500-1-1 and the provisions of Public Law 84-99.

3. Distribution. Approved for public release, distribution is unlimited.

4. General. Levees, floodwalls, embankment dams, and their appurtenant structures serve a common purpose in that they are designed to contain water and prevent flooding for varying lengths of time. They must also be readily accessible by equipment and personnel essential to reliable operation and maintenance. The possibility for long-term saturation of levee materials or levee and floodwall foundations, together with their specific operation and maintenance requirements, makes it necessary to exercise caution in the design of landscape planting and

This ETL supersedes:

EM 1110-2-301, *Guidelines for Landscape Planting and Vegetation Management at Floodwalls, Levees, and Embankment Dams*, 1 January 2000.

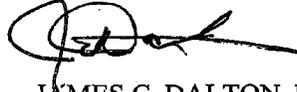
Memorandum, Headquarters, United States Army Corps of Engineers (HQUSACE) (CECW-HS), MG Don T. Riley, Subject: Interim Vegetation Guidance for Control of Vegetation on Levees, 12 June 2007.

ETL 1110-2-571
10 Apr 09

vegetation management at these structures. This ETL describes important characteristics of levees, floodwalls, embankment dams, and their appurtenant structures.

5. Future Guidance. Planned research is intended to complement this guidance: future editions will include field studies of vegetation impacts to flood damage reduction structures and helpful information on the root system characteristics of various plant species.

FOR THE COMMANDER:



JAMES C. DALTON, P.E.
Chief, Engineering and Construction
Directorate of Civil Works

CECW-CE

Technical Letter
No. 1110-2-571

10 April 2009

EXPIRES 10 April 2014
Engineering and Design
**GUIDELINES FOR LANDSCAPE PLANTING AND
VEGETATION MANAGEMENT AT FLOODWALLS, LEVEES,
EMBANKMENT DAMS, AND APPURTENANT STRUCTURES**

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CHAPTER 1

INTRODUCTION

1-1. Purpose. This ETL provides guidelines to assure that landscape planting and vegetation management provide aesthetic and environmental benefits without compromising the reliability of levees, floodwalls, embankment dams, and appurtenant structures. It is intended as a guide for safe design and not as a restriction to the initiative of designers. These guidelines should be used with reasonable judgment and practicality, tailored to the specific requirements and conditions of each individual project. The integrated design of landscape plantings and vegetation management at flood damage reduction systems requires a coordinated, interdisciplinary effort involving the local sponsor and the following disciplines: civil engineer, landscape architect, levee and/or dam safety engineer, environmental engineer, geologist, biologist, and additional related disciplines, as appropriate.

1-2. References.

a. USACE publications

EC 1110-2-6061

Engineering and Design, Safety of Dams – Policy and Procedures, 30 April 2004 (Transmits Draft ER 1110-2-1156, *Engineering and Design, Safety of Dams – Policy and Procedures*, 30 April 2004).

EM 1110-2-38

Environmental Quality in Design of Civil Works Projects, 3 May 1971.

EM 1110-2-1205

Environmental Engineering and Local Flood Control Channels, 15 Nov 1989 (Sections 4-8.d (4) and 5-1).

EM 1110-2-1601

Hydraulic Design of Flood Control Channels, 1 July 1991, with Change 1, 30 June 1994 (Sections 3-3 and 3-5).

EM 1110-2-1913

Design and Construction of Levees, 30 Apr 2000 (Sections 4-4 and 8-17).

EM 1110-2-2300

General Design and Construction Considerations for Earth and Rock Fill Dams, 30 July 2004.

EM 1110-2-2502

Retaining Walls and Floodwalls, 29 Sept 1989 (Section 7-16).

EP 500-1-1

Emergency Employment of Army and Other Resources. Civil Emergency Management Program – Procedures, 30 Sep 2001 (Section 5.8.k and Appendix E).

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ER 200-1-5

Policy for Integrated Application of U.S. Army Corps of Engineers (USACE) Environmental Operating Principles (EOP) and Doctrine, 30 Oct 2003.

ER 500-1-1

Emergency Employment of Army Resources, Civil Emergency Management Program, Chapter 5, Rehabilitation and Inspection Program, 30 Sept 2001

ER 1110-1-12

Quality Management, Change 1, 30 Sept 2006.

ER 1110-2-1150

Engineering and Design for Civil Works Projects, 31 August 1999.

ER 1130-2-530

Project Operations - Flood Control Operations and Maintenance Policies, 30 October 1996.

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Certification of Levee Systems for the National Flood Insurance Program (NFIP), draft.

U.S. Army Corps of Engineers

Levee Owner's Manual for Non-Federal Flood Control Works, March 2006.

U.S. Army Corps of Engineers

Policy and Procedural Guidance for the Approval of Modification and Alteration of Corps of Engineers Projects, CECW-PB Memorandum, 23 Oct 2006.

b. FEMA publications

FEMA 473

FEMA (2005a) *Technical Manual for Dam Owners, Impacts of Animals on Earthen Dams*, FEMA 473, Sept 2005. <http://www.fema.gov/plan/prevent/damfailure/publications.shtm>

FEMA 534

FEMA (2005b) *Technical Manual for Dam Owners, Impacts of Plants on Earthen Dams*, FEMA 534, Sept 2005. <http://www.fema.gov/plan/prevent/damfailure/publications.shtm>

44 CFR Chapter 65.10, 1 Oct 2006

Mapping of Areas Protected by Levee Systems

c. Other publications

Association of State Dam Safety Officials (2002)

Association of State Dam Safety Officials (ASDSO) (2002) *A Technical Manual on the Effects of Tree and Woody Vegetation Root Penetrations on the Safety of Earthen Dams*, December 2002.

1-3. Policy.

a. Where the safety of the structure is not compromised, and effective surveillance, monitoring, inspection, maintenance, and flood-fighting of the facility are not adversely impacted, appropriate landscape planting (trees, shrubs, vines, forbs, and grasses) may be incorporated into the design of all flood damage reduction projects, subject to the limitations set forth in this document. Because landscape plantings enhance the environment, with respect to both natural systems and human use, they are to be considered in all flood damage reduction project planning and design studies and will be fully presented in design documentation reports. For projects in which the maintenance of the completed facility will be the responsibility of the local sponsor, the landscape planting will be fully coordinated with the local sponsor during planning and design to determine the sponsor's desires and to obtain assurances that the sponsor is capable of, and committed to, the proper maintenance of the vegetation.

b. In certain instances, to further enhance environmental values or to meet state or federal laws and/or regulations, the local sponsor may request a variance from the standard vegetation guidelines set forth in this ETL. Vegetation variances for either federal or non-federal flood damage reduction systems may be permitted. The vegetation variance must meet the following two criteria:

(1) The variance must be shown to be necessary, and the only feasible means, to (a) preserve, protect, and enhance natural resources and/or (b) protect the rights of Native Americans, pursuant to treaty and statute.

(2) With regard to flood damage reduction systems, the variance must assure that (a) safety, structural integrity, and functionality are retained, and (b) accessibility for maintenance, inspection, monitoring, and flood-fighting are retained. Note that, as used here, the term "retained" assumes a pre-variance condition that is fully consistent with the requirements set forth in this ETL, and any other applicable criteria.

Periodic clearing of some types of vegetation, both woody (trees, shrubs, and vines) and non-woody (grasses and forbs), will be performed, as needed, to maintain the conditions described in the second criterion. The variance will not be a substitute for poor maintenance practices. See the following references regarding variances to levee vegetation standards: ER 500-1-1, for policy; EP 500-1-1, for the request and approval process; and, any other applicable guidance issued subsequent to this document.

c. Any addition of landscape plantings to existing flood damage reduction systems must comply with the project's O&M manual. New plantings may not be approved without an appropriately detailed and documented engineering evaluation to ensure that design intent and safety criteria are maintained as originally authorized.

1-4. Environmental Quality and Aesthetics. Environmental quality and aesthetics are of special concern. The design and maintenance of flood damage reduction systems must fully consider the environmental implications of the proposed actions and ensure that they are

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consistent with the doctrine outlined in the Corps' Environmental Operating Principles. Project design should respond appropriately to the visual character of the project context with respect to the characteristics of both the natural and built landscapes. Landscape planting design should consider both human use and the environmental processes and characteristics of the entire area influenced by the project. While it is seldom feasible to preserve the natural setting intact, design techniques and careful construction methods can protect and perhaps enhance local environmental and aesthetic values.

CHAPTER 2 LANDSCAPE PLANTING: OBJECTIVES AND ENGINEERING REQUIREMENTS

2-1. Background. In flood damage reduction projects, the goal of landscape planting is to minimize and/or mitigate negative impacts to aesthetic, environmental, and ecological conditions, such that post-project conditions are equal to, or better than, pre-project conditions. Landscape planting objectives include the following: provide cover to prevent dust and erosion; provide ecological benefits, such as improved water quality and wildlife habitat; integrate the flood damage reduction system with the surrounding natural and human environment; separate activities; define zones of use; provide privacy; screen undesirable features or views; accentuate positive features or views; and create a pleasant environment for human use and recreation. These and any other project-specific landscape planting objectives must be consistent with both the policy set forth in Paragraph 1-3 and the engineering requirements detailed in this chapter.

2-2. Vegetation-Free Zone.

a. The vegetation-free zone is a three-dimensional corridor surrounding all levees, floodwalls, embankment dams, and critical appurtenant structures in all flood damage reduction systems. The vegetation-free zone applies to all vegetation except grass. Grass species are permitted, as described in Paragraph 4-8, for the purpose of erosion control.

b. The primary purpose of the vegetation-free zone is to provide a reliable corridor of access to, and along, levees, floodwalls, embankment dams, and appurtenant structures. This corridor must be free of obstructions to assure adequate access by personnel and equipment for surveillance, inspection, maintenance, monitoring, and flood-fighting. In the case of flood-fighting, this access corridor must also provide the unobstructed space needed for the construction of temporary flood-control structures. Access is typically by four-wheel-drive vehicle, but for some purposes, such as maintenance and flood-fighting, access is required for larger equipment, such as tractors, bulldozers, dump trucks, and helicopters. Accessibility is essential to the reliability of flood damage reduction systems.

c. The vegetation-free zone must be wide enough, and tall enough, to accommodate all likely access requirements. The minimum allowable vegetation-free zone dimensions are based on lessons learned from flood-fighting experience and are illustrated in Chapter 6, for a variety of flood damage reduction system configurations. The general rule is as follows:

(1) The minimum height of the corridor shall be 8 feet, measured vertically from any point on the ground.

(2) The minimum width of the corridor shall be the width of the levee, floodwall, or embankment dam, including all critical appurtenant structures, plus 15 feet on each side, measured from the outer edge of the outermost critical structure. In the case of a planting berm (Figures 13, 14, and 15), the 15 feet is measured from the point at which the top surface of the planting berm meets the levee section.

(3) No vegetation, other than approved grasses, may penetrate the vegetation-free zone, with two exceptions, as illustrated in Figure 2:

(a) Tree trunks are measured to their centerline, so one half of the tree trunk may be within the vegetation-free zone.

(b) Newly planted trees, whose crowns can be expected to grow, or be pruned, clear of the vegetation-free zone within 10 years.

d. The minimum vegetation-free zone dimensions may not be diminished without a formal variance (see Paragraph 1-3b). Due to specific site conditions and project requirements, many levees, floodwalls, embankment dams, and appurtenant structures will be determined, by the project design team, to require a vegetation-free zone larger than the minimum described here.

e. Paragraph 2-2 has established the minimum acceptable width of the vegetation-free zone at 15 feet. Other than by variance, as described above, the single exception to this 15-foot minimum requirement arises in the case of an existing project where the width of the existing real estate interest for the project is less than 15 feet. In such a case, the vegetation-free zone width shall be the maximum attainable within the existing real estate interest.

2-3. Vegetation-Management Zone. A recommended alternative to enlarging the vegetation-free zone is the addition of an adjacent *vegetation-management zone* (see Figure 22). A vegetation-management zone provides greater opportunity to include vegetation by reserving the option to manage it selectively, as needed. Two of many possible scenarios are presented below.

a. Several trees, just outside the vegetation-free zone, are inhibiting grass growth, through light deprivation and/or the production of their own natural herbicides that limit competition for moisture and nutrients. These trees should be either removed or modified, as appropriate, to assure that grasses thrive and continue to provide effective erosion control.

b. A large tree, outside the vegetation-free zone, becomes a *hazard tree* when its root system is severely damaged by construction activity, thereby increasing its susceptibility to windthrow and the associated risk of damage to a floodwall. This tree should be removed.

2-4. Root Impacts. As stated in Paragraph 2-2, the primary purpose of the vegetation-free zone is access. However, it also serves a secondary purpose: it provides distance between root systems and levees, floodwalls, embankment dams, and appurtenant structures, thereby moderating reliability risks associated with the following two situations: potential piping and seepage due to root penetration; and structural damage (a hole in the ground, surrounded by an area of disturbed earth) resulting from a wind-driven tree overturning. Though not adequate for all situations, this 15-foot zone does provide a measure of risk reduction, as follows:

a. Root size and numbers diminish with distance from the tree trunk.

b. The hole and its surrounding area of disturbed earth, created by a tree overturning, typically has a radius ranging from 6 to 12 feet. This secondary effect of the vegetation-free

zone is important to the reliability of flood damage reduction systems; it is not a root-free zone but it is a zone of reduced root impact.

2-5. Root-Free Zone. Planting design must consider the possible implications to foundation strength and performance. The integrity of the foundation could be compromised if potential seepage paths were created by root penetration and/or root decay. The root-free zone provides a margin of safety between the greatest expected extent of plant roots and the beginning face of any structure that is critical to the performance and reliability of the flood damage reduction system. The list of such structures includes levees, floodwalls, embankment dams, seepage berms, seepage drains, toe drains, pressure relief wells, and cut-off trenches. These critical structures must be root-free, as illustrated in Figures 13, 14, 15, 17, and 19. The rooting habit of each plant selected for use near a root-free zone must be predictably understood with respect to its potential to invade the root-free zone and compromise the reliability of the flood damage reduction system. Landscape planting plans will reflect full recognition of the importance of selecting appropriate plant species and varieties. Root barriers may be used to provide an added measure of assurance, but they should not be a substitute for adequate distance between plantings and root-free zones. Root barriers shall not retard groundwater or seepage flow. Some root barriers include herbicides to enhance effectiveness; in every case, these shall be evaluated prior to use to assure against negative environmental impacts.

2-6. Water-Current and Wave-Action Barrier. The use of suitable vegetation, such as shrub forms of *Salix* (willow), riverward of the vegetation-free zone is encouraged as an environmentally beneficial means to moderate the erosive potential of water currents and wave action.

CHAPTER 3
TREATMENT OF LEVEES, FLOODWALLS,
EMBANKMENT DAMS, AND APPURTENANT STRUCTURES

3-1. General.

a. The integrity of levees, floodwalls, embankment dams, and appurtenant structures is paramount to the public health, safety, and welfare. The presence of undesirable vegetation can undermine that integrity and lead to failure if not corrected.

b. Trees and other woody vegetation, such as shrubs and vines, can create both structural and seepage instabilities, prevent adequate inspection, and create obstacles to maintenance and flood-fighting/flood-control activities. Vegetation must be controlled for the following reasons:

(1) To allow proper inspection, surveillance, and monitoring of all structures and adjacent areas for seepage, cracking, sinkholes, settlement, displacement, and other signs of distress.

(2) To allow access for normal and emergency Operations and Maintenance activities.

(3) To prevent root-related damage to structures, such as shortened seepage paths through embankments and/or foundations; voids in embankments and/or foundations due to decayed roots or fallen trees; clogged seepage collector systems; and expansion of cracks or joints in concrete walls, spillway floors, and canal linings.

(4) To limit those habitat characteristics that encourage the creation of animal burrows.

(5) To allow full design-discharge capability of waterways, spillway inlet and outlet channels, outlet-works discharge channels, and other open conveyance channels.

(6) To avoid any incidental growth and subsequent presence of endangered species that might prohibit activities necessary for operations, maintenance, or access.

c. This document establishes minimum dimensions for both vegetation-free zones and root-free zones; however, for any specific project, those minimum dimensions may be increased by levee and/or dam-safety engineering personnel due to site-specific considerations such as topography, phreatic surfaces within the structure and abutments, geological features, historical embankment and/or foundation seepage or issues, stability issues, and foundation characteristics.

3-2. Levees.

a. Levees are usually constructed of compacted earth fill. In some cases, internal drainage or under-seepage treatment is incorporated into the levee. When a planting berm is used to allow vegetation nearer to the levee centerline, the internal blanket drain and/or toe drain must be extended, as shown in Figures 14 and 15. Any such extension must be assessed by the design team for impact to the seepage control system.

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b. All levees must have effective and reliable erosion protection; the appropriate use of grasses is described in Paragraph 4-8. Where opportunities exist, environmental improvements should be considered. Project design shall address the following criteria:

(1) Urban levees. Because levee projects have the potential to dominate these high-visibility landscapes, planting is often desirable, particularly in high-visibility locations, such as at and along major thoroughfares, parks, and waterfront developments.

(2) Rural or agricultural levees. Although these are typically not high-visibility areas, both human use and environmental needs should be considered during design. Plantings are particularly appropriate for the following areas, provided they are consistent with site-specific engineering requirements: high-visibility pumping installations, public road crossings, near residences, and at other project locations where landscape plantings could protect or restore valued environmental characteristics.

c. Minimum vegetation-free and minimum root-free zones are established for levees, as illustrated in Chapter 6.

3-3. Floodwalls.

a. Floodwalls are most often used in urban areas, where land or access is constrained. These walls are subject to hydraulic forces on one side, which may be resisted by little or no earth-loading forces on the other side. Landscape planting should be addressed in floodwall design, particularly where walls encroach on, or change, existing scenic values, e.g., where the wall becomes a visual barrier along a street or near dwellings, parks, and existing or anticipated commercial developments.

b. The minimum vegetation-free zone provides for access, but there are two additional areas of concern with respect to floodwalls.

(1) Large trees can be a threat to project reliability. Planting design and maintenance must take into account the potential for overturning trees to damage floodwalls. The following factors can be used, alone or in combination, to limit potential for such damage:

(a) Distance between a tree and the wall.

(b) Tree species selection, favoring trees with a low potential for breaking and overturning.

(c) Tree monitoring and maintenance to address hazard trees.

(d) Intervening obstacles, such as other trees, that would reliably restrain a falling tree. Where other factors are unreliable, the distance between a tree and the wall must be adequate: e.g. a minimum distance of one-half of the mature tree height.

(2) Planting design and maintenance must also take into account the three potential means by which tree roots may damage floodwalls:

(a) Large tree roots can damage concrete structures by jacking (lifting) them, which can cause cracking and separation at joints. Further, if a floodwall is lifted, a seepage path could form along the structure/foundation contact. Smaller (lighter) floodwalls are more susceptible than larger (heavier) structures.

(b) Roots may also grow into and through wall joints, loosening and eroding wall-joint seals, thus damaging the water-proof characteristics.

(c) A floodwall may have a toe drainage system to check and control piping and boils; to control seepage that may result from roofing, where piles are used; and to control uplift pressures. These drainage systems must be protected from invasion by roots, which could clog them.

c. Although there are several types of floodwalls, the two most common are the inverted-T type reinforced concrete wall and the cantilever-I type sheet piling wall. The vegetation impact concerns are similar for both types. For all the reasons cited above, minimum vegetation-free and minimum root-free zones are established for floodwalls, as illustrated in Figures 16–19.

3-4. Embankment Dams and Appurtenant Structures.

a. *Purpose.* “Tree and woody-vegetation penetrations of earthen dams and their appurtenances have been demonstrated to cause serious structural deterioration and distress that can result in failure of earthen dams” (Association of State Dam Safety Officials 2002). Proper establishment and control of vegetation is critical to dam safety. This Paragraph establishes minimum requirements for landscape planting and vegetation management at embankment dams (earth fill, rock fill, or earth and rock fill), including multipurpose projects with both concrete and embankment dam structures (wing dams) and perimeter saddle dams (dikes); abutments; and appurtenances, such as spillways, outlet works, and inlet and/or outlet channels.

b. *Policy.* The following five areas are vegetation-free zones:

- (1) The dam or the dam-toe area.
- (2) In or around seepage monitoring systems or critical downstream areas where seepage observation must be vigilant and continuous.
- (3) Groin abutments and areas immediately adjacent.
- (4) Spillways and spillway channels, including spillway slopes and approaches to spillways where vegetation could, in any way, impede the efficient operation of the spillway.
- (5) The outlet-works discharge channel.

c. *Vegetation-Free Zones.* Vegetation-free zones shall, when dry, be mowed to a height of 3–6 inches at any time the grass reaches a height of 12 inches. Mowing shall be triggered by grass heights of less than 12 inches if important to the health maintenance of the particular grass

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species. The maximum height of grasses shall be 12 inches. The minimum vegetation-free zone requirements for specific structures are described below.

(1) Embankment Dams. At a minimum, for “dry” reservoirs, the entire dam embankment surface, including upstream impervious blankets and the upstream and downstream areas within 50 feet of the embankment toe, shall be a vegetation-free zone (see Figure 20). For “normal pool” conditions, the entire embankment surface from the upstream toe of the dam or from the upstream limit of the impervious blanket, as applicable, to a minimum distance of 50 feet from the downstream toe shall be a vegetation-free zone (see Figure 21).

(2) Dam Abutments. The dam abutment is defined as the part of a natural valley side-wall against which a dam is constructed. At a minimum, the vegetation-free zone shall extend for a horizontal distance of 15 feet beyond the embankment/abutment contact line (i.e. groin).

(3) Spillways. The safety of embankment dams requires the unobstructed operation of spillways. The minimum vegetation-free zone shall include the spillways and spillway channels, including spillway slopes and approaches.

(4) Outlet-Works Discharge Channels. The minimum vegetation-free zone shall include the entire outlet channel, outlet structure headwalls and wingwalls, and surrounding areas to a distance of 50 feet from the top of the bank of the outlet channel.

CHAPTER 4 DESIGN CONSIDERATIONS

4-1. Feasibility Analysis. During design, an analysis shall be made of the flood damage reduction system to determine if and where landscape planting can be permitted. Not all projects will have a satisfactory combination of conditions to permit planting of trees, shrubs, vines, forbs, and grasses. In some cases, only shrub planting may be feasible, while in other cases planting may be limited to grasses. Site conditions, engineering design criteria, and operation and maintenance requirements should determine the appropriate planting scheme. However, environmental objectives shall be considered in all projects, and the engineering design should seek to accommodate appropriate plantings. Some important site considerations are described below.

a. Types of Construction Material. The type of construction material is an important factor in determining suitability for landscape planting. Rock, sand, and many types of compacted clay embankments are examples of poor plant-growing media. The roots of some plant species, under some conditions, may penetrate a great distance into a sand levee, potentially providing a path for piping through the structure. Plants must be selected very carefully with regard to the type of construction materials used to ensure survival of the plant and prevent damage to the structure.

b. Project Alignment. Project alignment can be a complex exercise involving multiple, often conflicting criteria and requiring a coordinated effort by the project delivery team. The role of the landscape architect is to identify opportunities and constraints to human use relative to project alignment. For example, in an urban area, a relatively minor adjustment to a proposed alignment might allow for plant screening between residences and the structure or provide space for a park or other community green space. Often, those segments of the alignment that are otherwise arbitrary may be turned to advantage with respect to human use.

c. Environmental Factors. The types of vegetation suited to a site are a function of a number of environmental factors. Local climate (precipitation, temperature, dates of earliest and last frost, etc.) can limit the types of vegetation that survive in a particular region. Soil type, pH, nutrient character, exposure to sunlight, flood and drought duration, and depth to groundwater are additional conditions that can influence the potential for a site to support vegetation. Because one important functional characteristic of vegetative groundcovers is the ability to provide erosion control, it is necessary to confirm that the proposed cover can withstand the energy environment under flood conditions. This may require an assessment of local velocities and shear stresses and comparison of predicted values under flood conditions against thresholds for various types of vegetation.

4-2. Planting Berms.

a. Beyond the minimum section needed to satisfy stability requirements, it is sometimes desirable to add additional earth fill to a levee or embankment dam to create a planting berm, in order to better accommodate differing types of public use and related landscape planting approaches (see Figures 13, 14, and 15). The appropriate dimensions of the planting berm

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should be determined by the landscape architect in consultation with the design team. Additional rights-of-way may be necessary to accommodate the additional fill material and flatter slopes. Except in approved planters, vegetation is not permitted on any overbuild that has a system-reliability function. Planting berms may be considered for use on the land side only.

b. Planting layout and plant material characteristics shall be coordinated with the design team to assure adequate access between the levee crown and the toe for two purposes: visual access is required for inspection of the toe area; and physical access is required for flood-fighting activities involving personnel and heavy equipment. In all cases, the planting berm must be of sufficient depth to accommodate any proposed vegetation while precluding root penetration into any root-free zone. Design must include adequate consideration of any internal drainage or seepage control system (see Figures 14 and 15).

c. Additional design requirements for planting berms include the following. For new projects, engineering and design shall be in accordance with ER 1110-2-1150, *Engineering and Design for Civil Works Projects*, and all related guidance. For existing projects, engineering and design shall be in accordance with CECW-PB memorandum dated 23 Oct 2006, *Policy and Procedural Guidance for the Approval of Modification and Alteration of Corps of Engineers Projects*.

4-3. Planters.

a. In overbuild areas, permanent plant containers, such as concrete planters, may be considered. Planters must not impact the designed dam or levee section, or appurtenant structures, such as berms, drains, ditches and wells. Planter design and layout must allow for adequate access up and down the embankment as required for inspection and flood-fighting activities and must be approved by the Dam or Levee Safety Officer.

b. Planters and containerized plants should be used selectively and should be considered only when normal planting is not practical. The initial cost and the ability of the sponsor to maintain this type of planting should be considered during design. Plants selected for use in planters should have mature heights of not more than approximately 20 feet.

4-4. Irrigation Systems. Irrigation systems within the vegetation-free zone pose two potential threats to system reliability: pressurized waterlines may fail, resulting in damage to the engineered embankment section; and irrigation water may impair visual inspection by obscuring wet areas that are actually due to seepage. Any irrigation system that targets the vegetation-free zone shall be engineered so as to address these issues and meet the approval of the District dam or levee safety officer. Designs may include features such as double-walled piping and leakage detection systems.

4-5. Flood-Fighting and Structure Maintenance. Flood-fighting and maintenance operations for levees, floodwalls, embankment dams, and appurtenant structures can be complex. These operations must not be impacted by the layout and physical characteristics of landscape plantings. Landscape plantings will be designed to permit inspection of structures from moving vehicles. Access requirements for emergency repair and replacement associated with flood-fighting efforts shall also be considered.

4-6. Maintenance of Plantings. Planting designs must be consistent with the capacity of the project sponsor to maintain them. Maintenance shall include the control and/or removal of invasive species. Low-maintenance plant materials are often the most appropriate choice.

4-7. Selection of Plant Material. Plants will be selected from approved plant lists prepared jointly by Division and District landscape architects in conjunction with the local sponsor or resource agencies. The list will include trees, shrubs, vines, forbs, sedges, and grasses that are native to the region and well adapted to the climactic, soil, and hydrologic conditions of the site. Plant lists should be appropriate to the specific structural conditions and requirements of each project. As the project site experiences fluctuations in various environmental conditions over time, such as water level, precipitation, and herbivory, some plants or species will not survive but others may thrive. A diverse array of plant species is essential to a riparian system's resiliency and its ability to provide and sustain a number of functions. A botanist familiar with local flora should be enlisted to select those species from the approved list most likely to meet project objectives.

4-8. Appropriate Ground Cover in the Vegetation-Free Zone.

a. The only acceptable vegetative ground cover in the vegetation-free zone shall be perennial grasses. Their primary function shall be to reliably protect against erosion. They shall be maintained as necessary to ensure the health and vigor of the primary species providing erosion protection. The species selected for each project shall be appropriate to the local climate, conditions, and surrounding or adjacent land uses. Preference should be given to the use of native species. Invasive or weed species shall not be acceptable. The species selected must be able to tolerate mowing to heights as low as 3 inches, as follows: at least once each year for inspection; and in anticipation of flood conditions and associated monitoring and flood-fighting activities.

b. If the local climate, hydraulic and hydrologic environment, soils, or other conditions will not support such grass species, then non-vegetative means of erosion control shall be employed, e.g. riprap, pavement, articulating concrete mats, or other engineered surface.

c. A maximum grass height is specified for embankment dams and their appurtenant structures (see Paragraph 3-4c, Vegetation-Free Zones).

4-9. Borrow Sites and Spoil Sites. Borrow sites and spoil sites shall be restored through proper regrading and revegetation.

CHAPTER 5

VEGETATION-RELATED MAINTENANCE AND REPAIR

5-1. Maintenance of Ground Cover. As ground cover in a flood damage reduction system, the primary purpose of grasses is the effective prevention of erosion; therefore, maintenance must assure a healthy, vigorous stand that is substantially free of weeds and bare spots. It will generally be necessary to periodically mow, graze, or burn grasses to permit proper inspection, manage pests, inhibit weed growth, or otherwise maintain the health and vigor of the plant stand. The appropriate time of year in which to conduct these maintenance activities will be a function of the species utilized as well as the motivating factor for the maintenance activity. For example, mowing to prohibit weed establishment may best be undertaken before the weed seeds become viable each year. The annual inspection may be scheduled to coincide with this period.

5-2. Operations and Maintenance Manual. For each project, it is important that the operations and maintenance manual include an annual maintenance program to control animal burrows and vegetative growth. It is also important that vegetation be managed in such a manner as to avoid the need for mechanized removal and associated embankment repair, and avoid any incidental growth and subsequent presence of endangered species that might prohibit access and activities necessary for operations or maintenance.

5-3. Removal of Non-Compliant Vegetation.

a. All vegetation not in compliance with this ETL shall be removed. A detailed removal plan shall be submitted to the local USACE District Levee Safety Officer for review and comment prior to removal of vegetation. The removal plan shall expand on the following basic requirements.

(1) By excavation, remove the trunk (or stem), stump, rootball and all roots greater than 1/2 inch in diameter – all such roots in, or within 15 feet of, the flood damage reduction structure shall be completely removed.

(2) Assure that the resulting void is free of organic debris.

(3) Fill and compact the void according to the original soil and compaction specifications; or, if no specifications exist, match adjacent soil and compaction.

b. Removal of non-compliant vegetation can create significant issues for the owner/operator, as maintenance may require environmental permits. The local sponsor must coordinate with the Corps and other appropriate agencies and obtain all the required environmental permits (including Corps of Engineers 404 permits) before conducting work within the levees. Mechanized land clearing below the plane of the “Ordinary High Water Mark” (defined at 33 CFR Part 328.3(e); in this document, see Figure 23 in Chapter 6 and the glossary in Chapter 7) will normally require Clean Water Act permits before work can commence. In regions with endangered or threatened species, and/or their critical habitat, vegetation removal of any kind may require clearance through the U.S. Fish and Wildlife Service or the National Marine Fisheries Service under the Endangered Species Act.

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5-4. Repair of Animal Burrows. For proper procedures for the repair of animal burrows, refer to the latest edition of FEMA publication 473, *Technical Manual for Dam Owners, Impacts of Animals on Earthen Dams*.

**CHAPTER 6
ILLUSTRATIONS**

6-1. General.

a. The figures presented here are cross-sections and are organized as follows. Figure 1 illustrates the minimum vegetation-free zone required for a basic levee section and serves as an introductory example for use in Figure 2. Figure 2 illustrates the proper application of the vegetation-free zone with regard to various vegetation types and stages of development. Figures 3 through 23 provide additional examples, illustrating the minimum vegetation-free zone required for each of various flood damage reduction system configurations. Root-free zones are indicated in Figures 13, 14, 15, 17, and 19. Vegetation-free zone requirements for embankment dams and their appurtenant structures are illustrated in Figures 20 and 21 and are presented in greater detail in Paragraph 3-4. Figure 22 illustrates the vegetation-management zone. Figure 23 illustrates a levee section with the ordinary high water mark above the riverside toe.

b. For clarity, Figures 1 through 23 are not drawn to scale; however, Figures 24 and 25 are drawn to scale, using trees in the medium to large size range. The purpose of these two proportionally correct figures is to clearly illustrate realistic spatial relationships between trees (and their root systems) and levees.

c. Note that the minimum vegetation-free zone is not influenced by the type of erosion protection used, so figures are not specific in that regard, e.g., riprap is not shown.

6-2. Figures 1 through 25

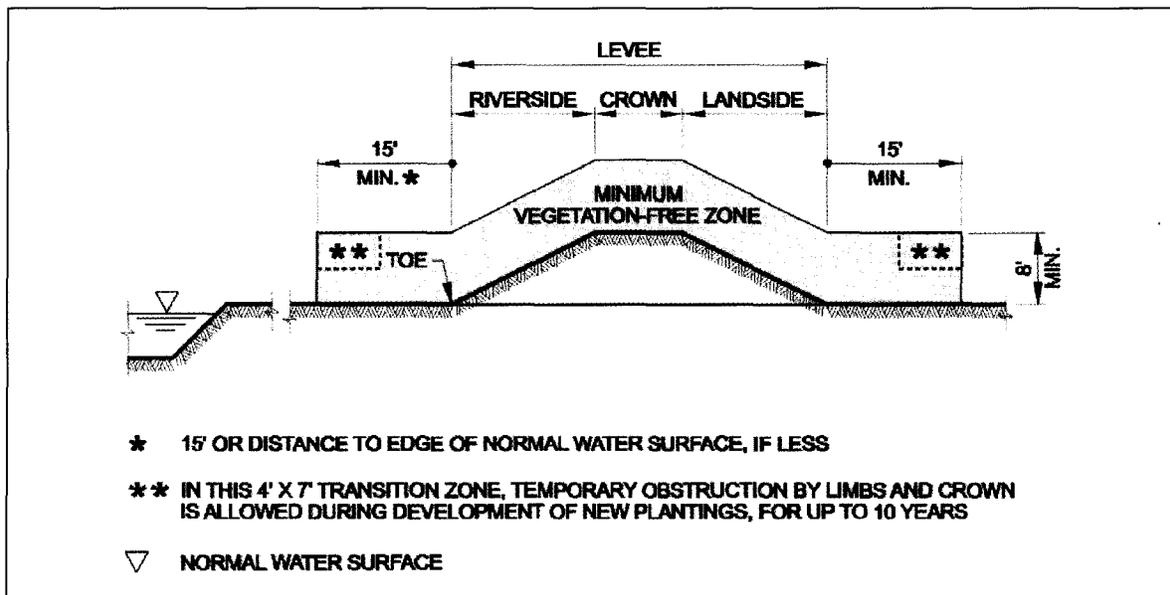


Figure 1: Levee Section – Basic.

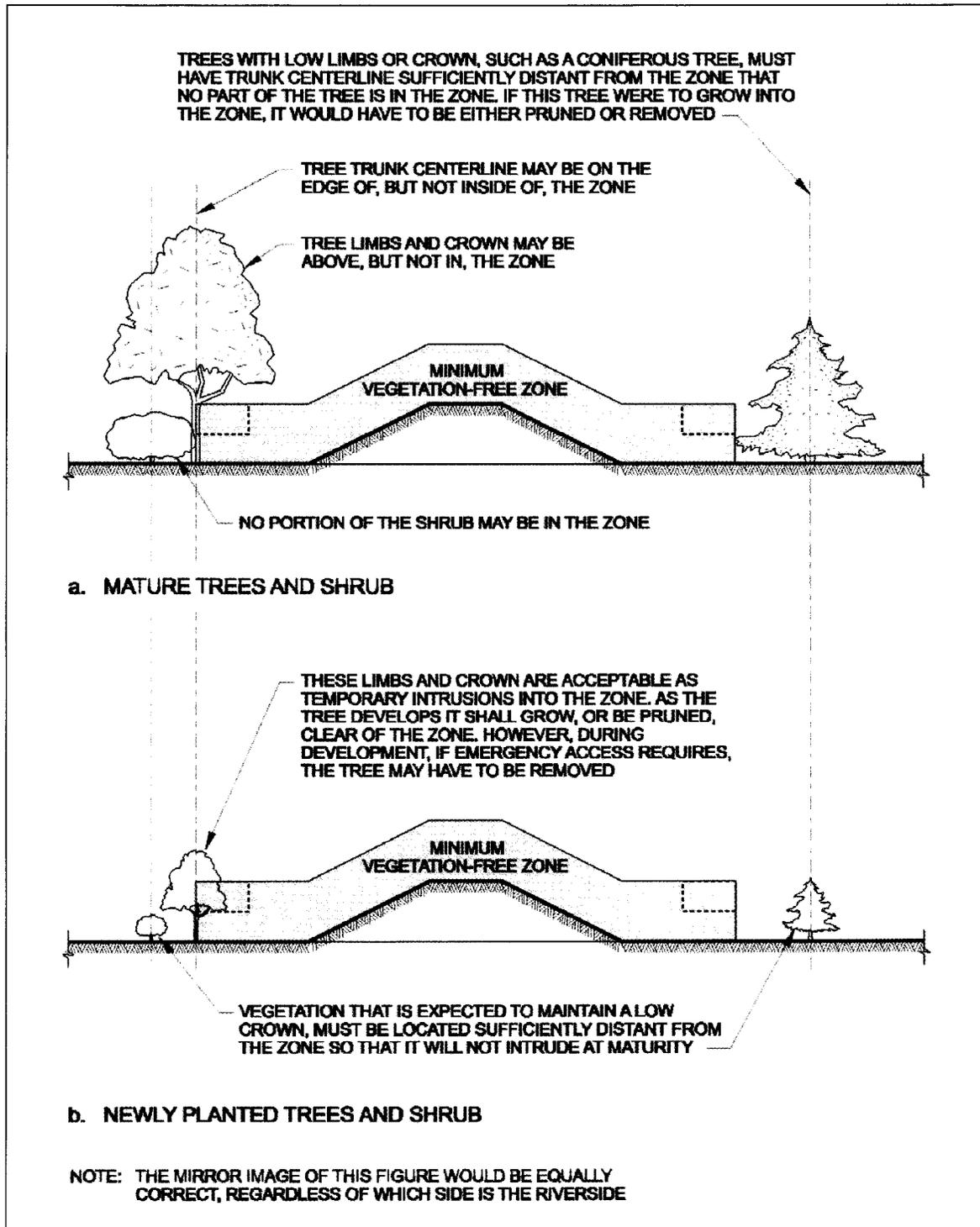


Figure 2: Proper Application of the Vegetation-Free Zone.

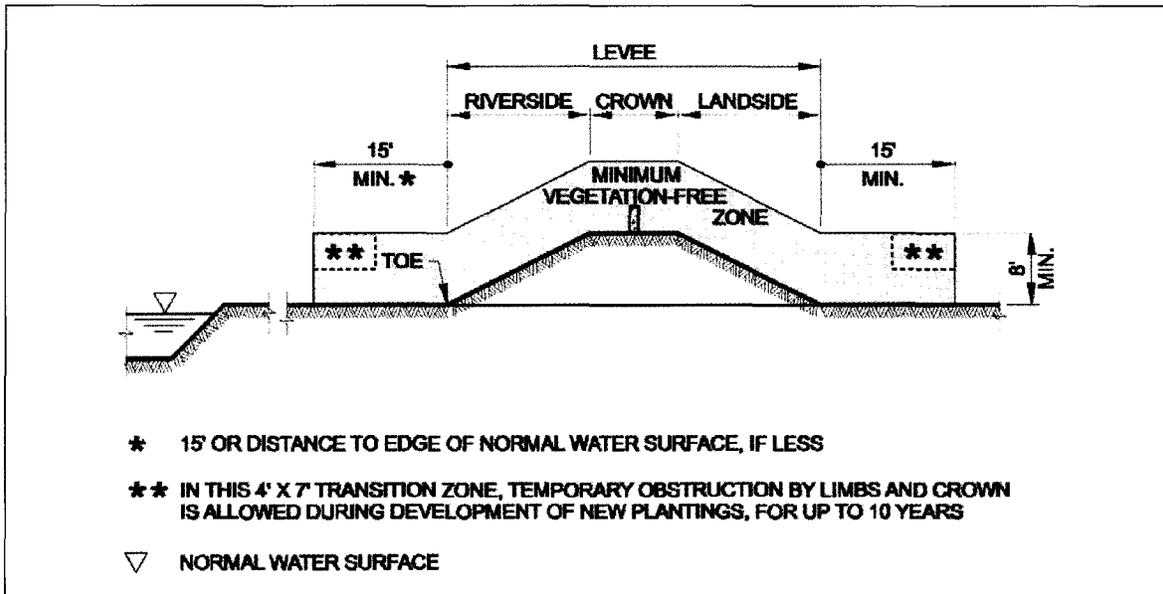


Figure 3: Levee Section – Basic, with Floodwall on Crown.

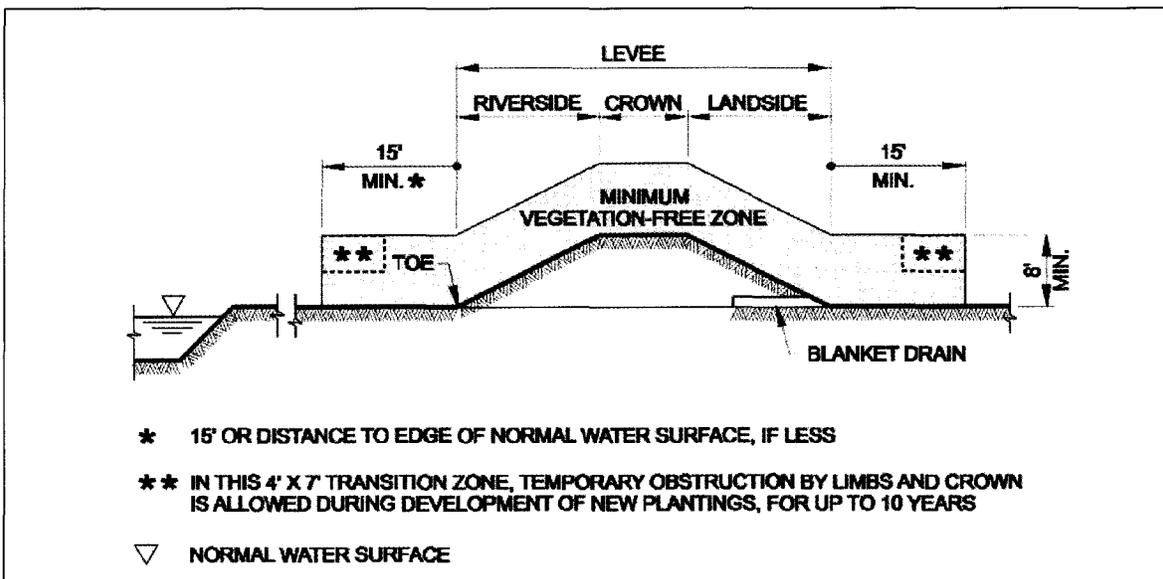


Figure 4: Levee Section with Blanket Drain.

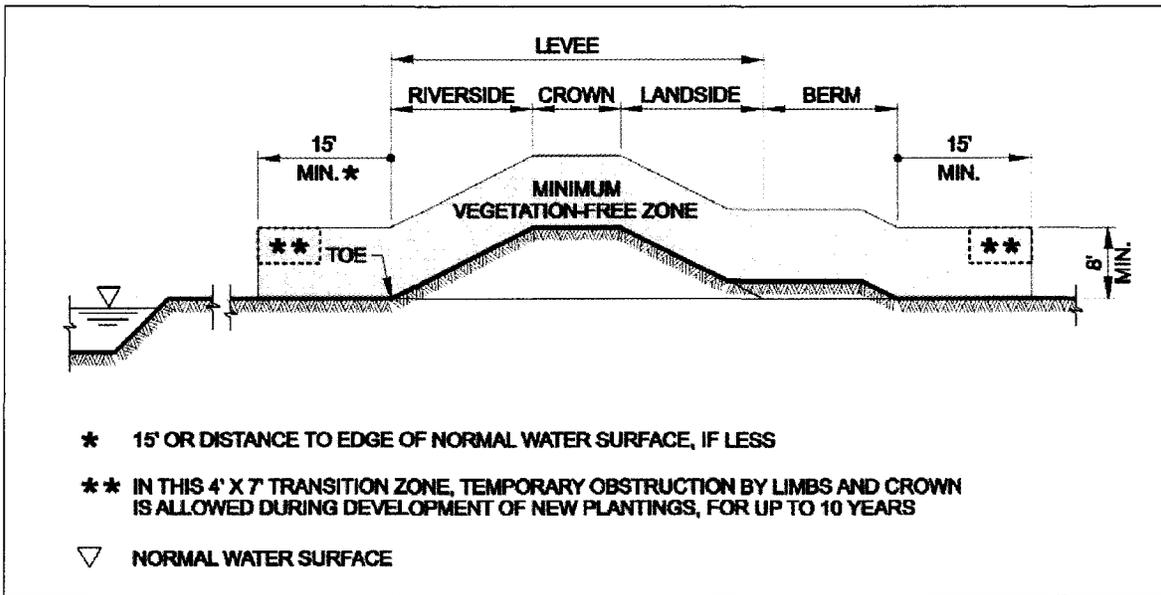


Figure 5: Levee Section with Seepage or Stability Berm.

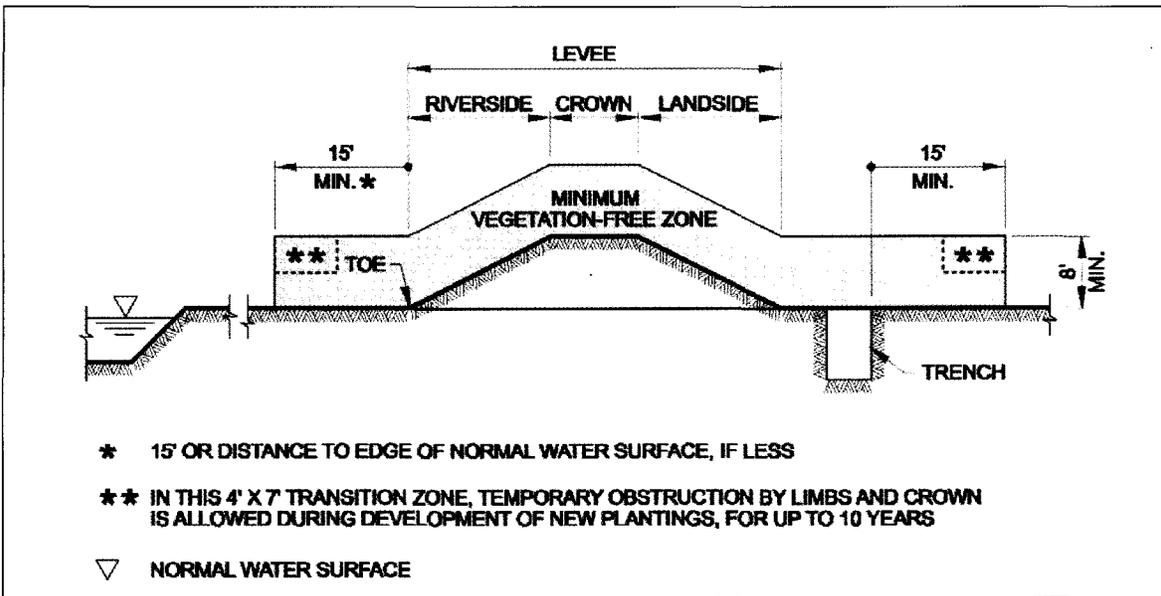


Figure 6: Levee Section with Pervious Toe Trench.

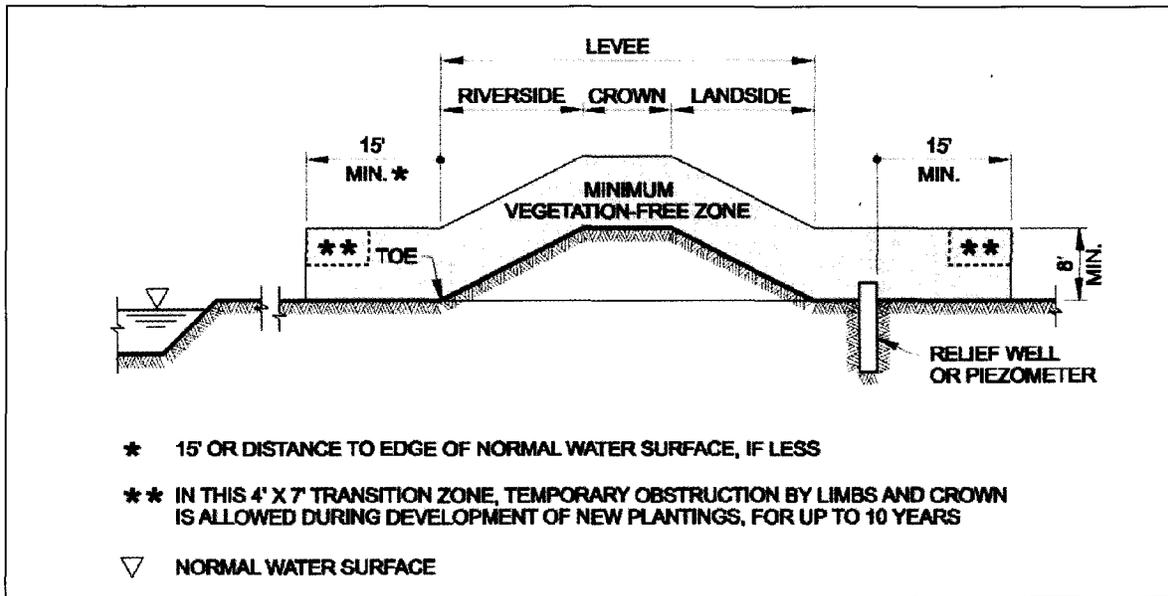


Figure 7: Levee Section with Relief Well or Piezometer.

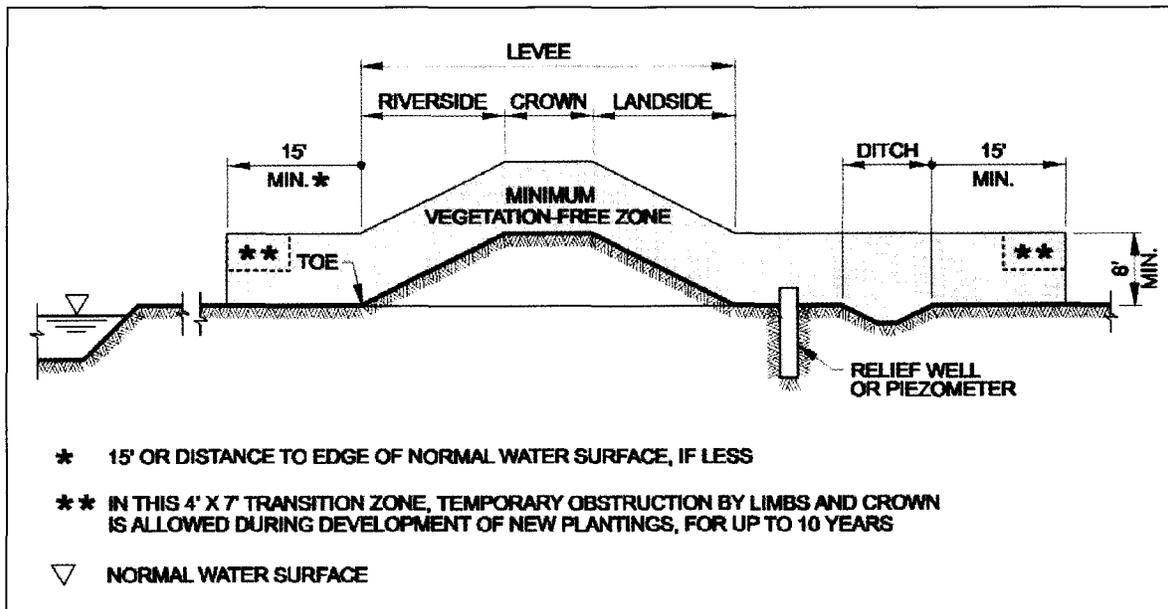


Figure 8: Levee Section with Relief Well or Piezometer and Seepage Collector Ditch.

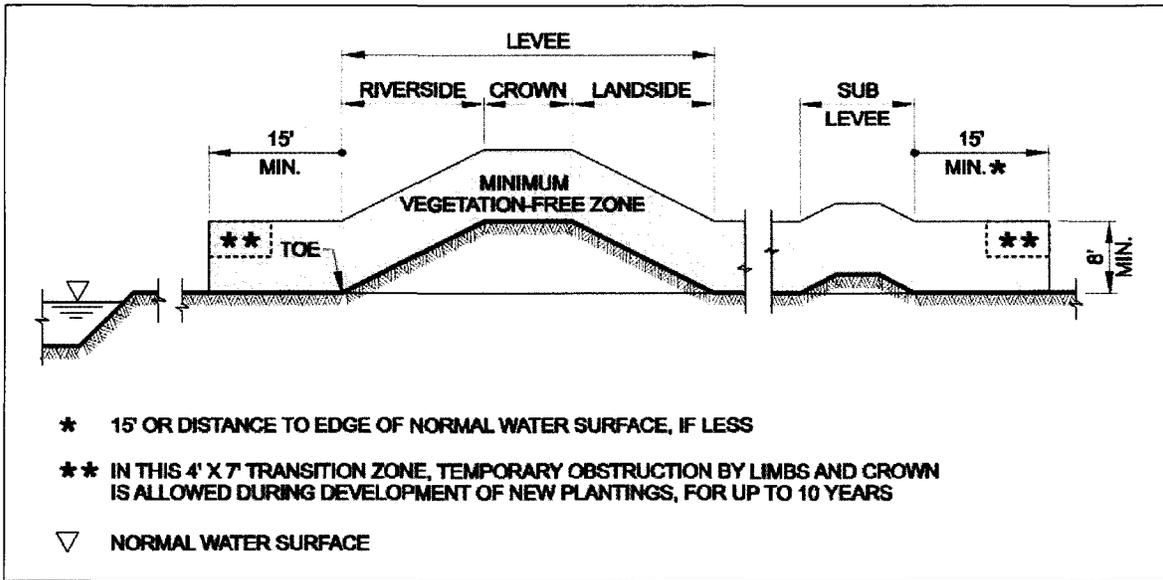


Figure 9: Levee Section with Sub-Levee.

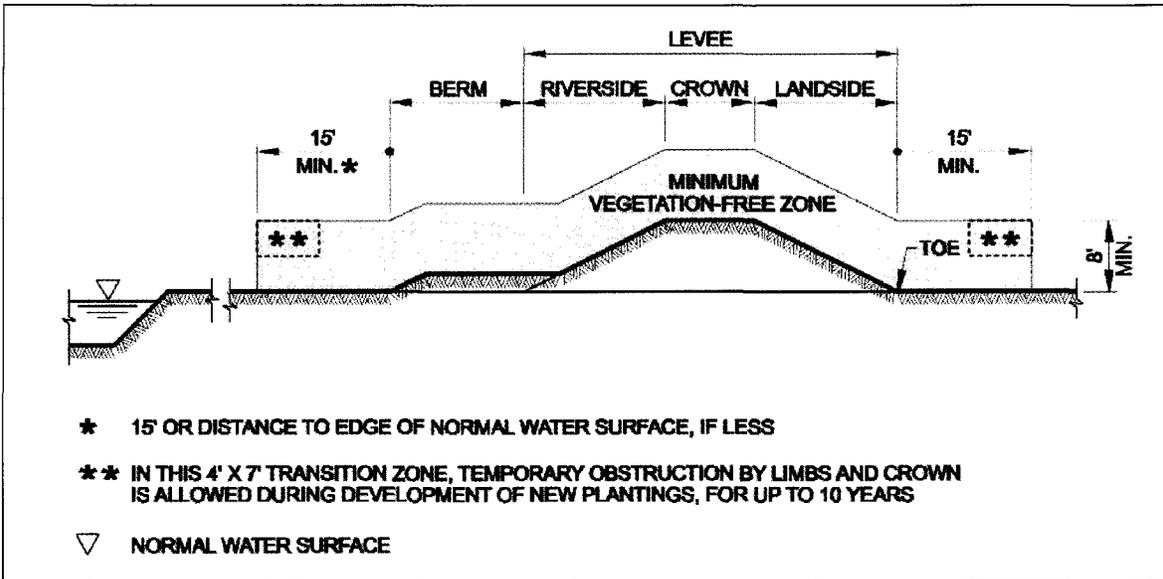


Figure 10: Levee Section with Stability Berm.

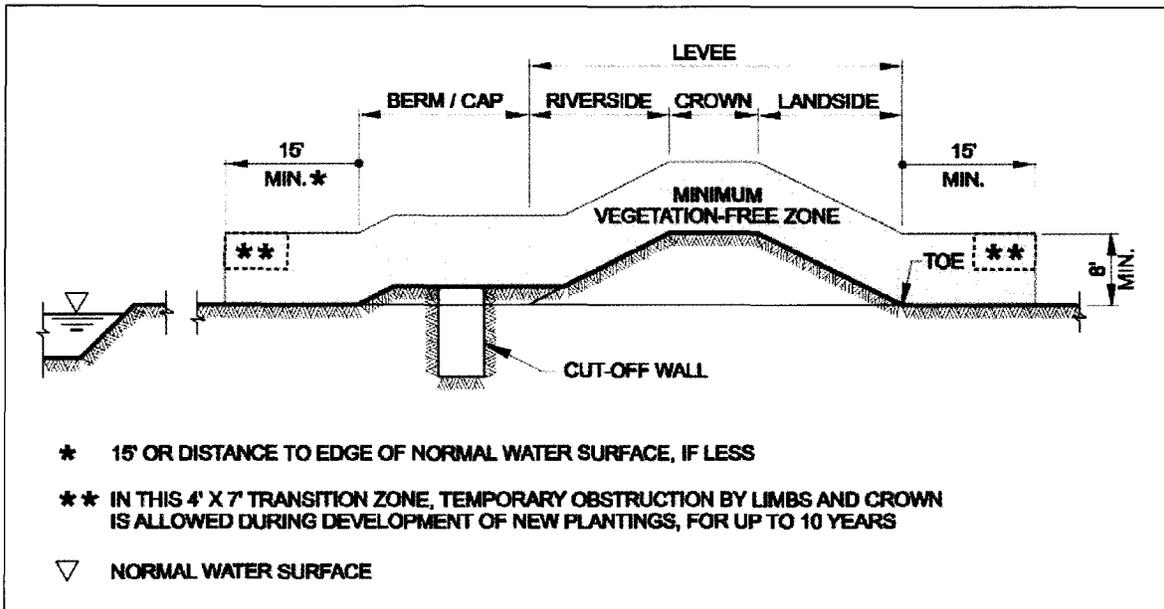


Figure 11: Levee Section with Cut-Off Wall and Impervious Berm.

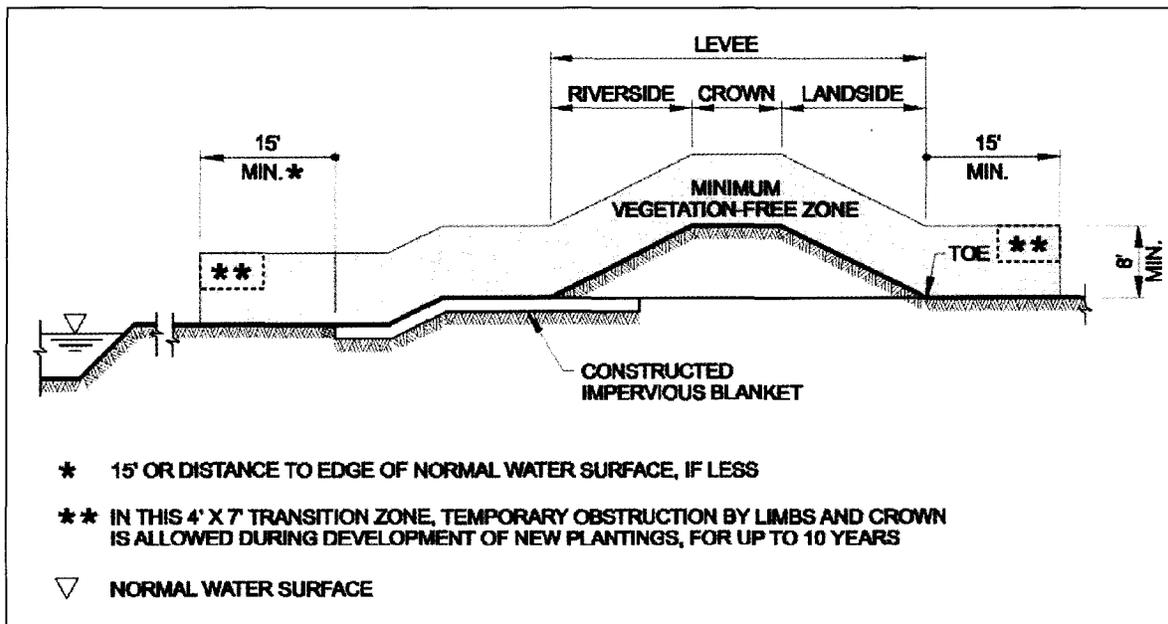


Figure 12: Levee Section with Constructed Impervious Blanket.

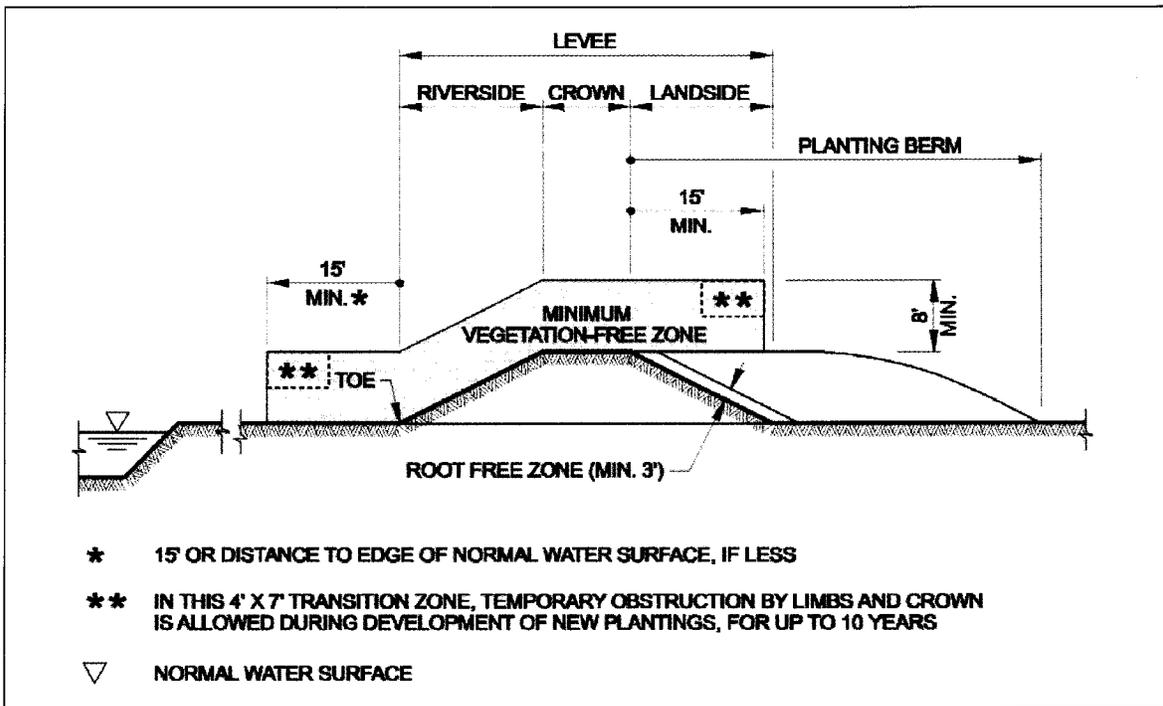


Figure 13: Levee Section with Planting Berm.

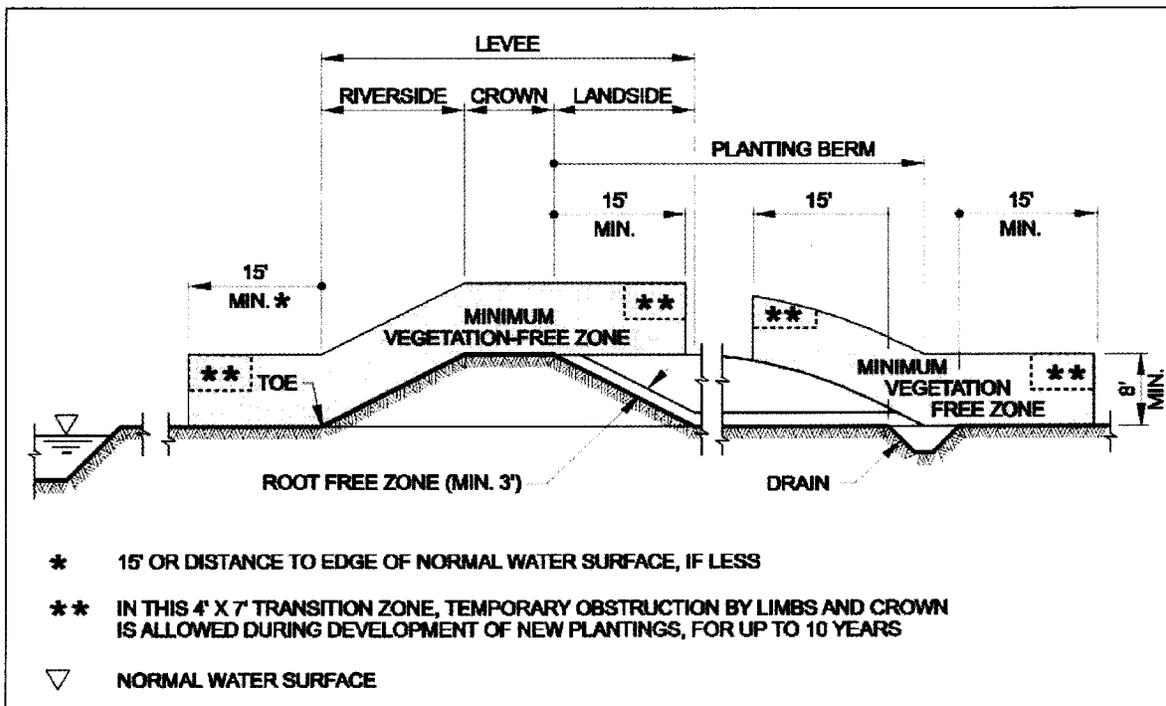


Figure 14: Levee Section with Planting Berm and Collector Drain.

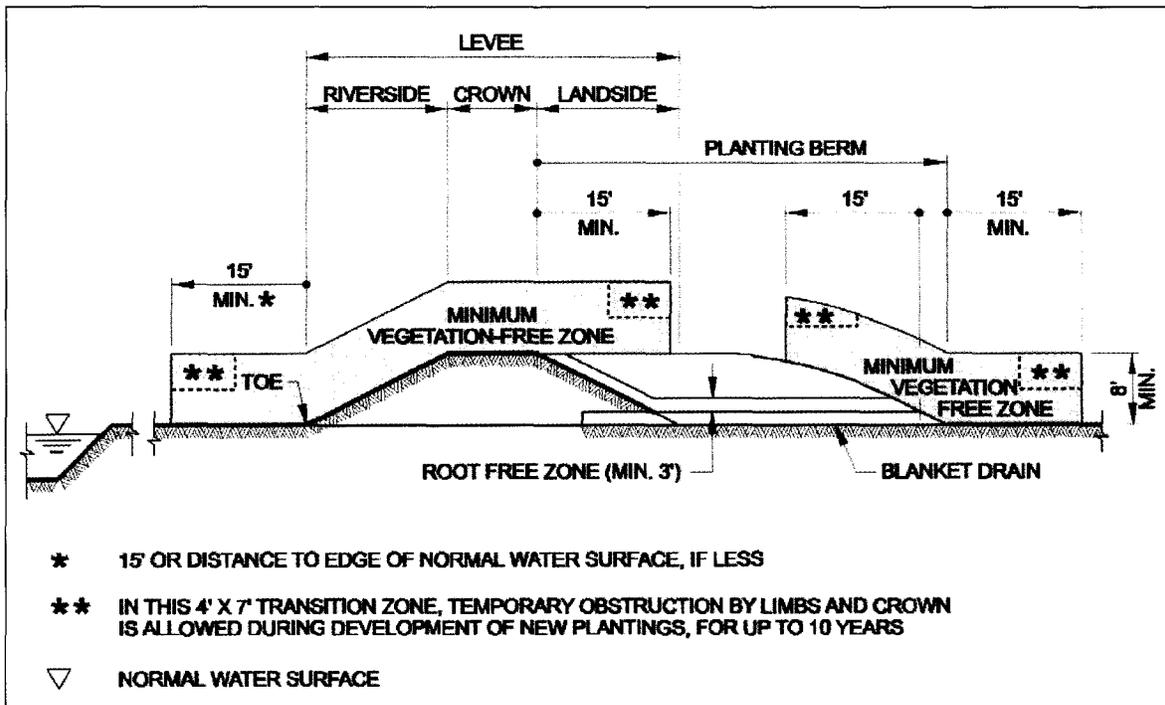


Figure 15: Levee Section with Planting Berm and Blanket Drain.

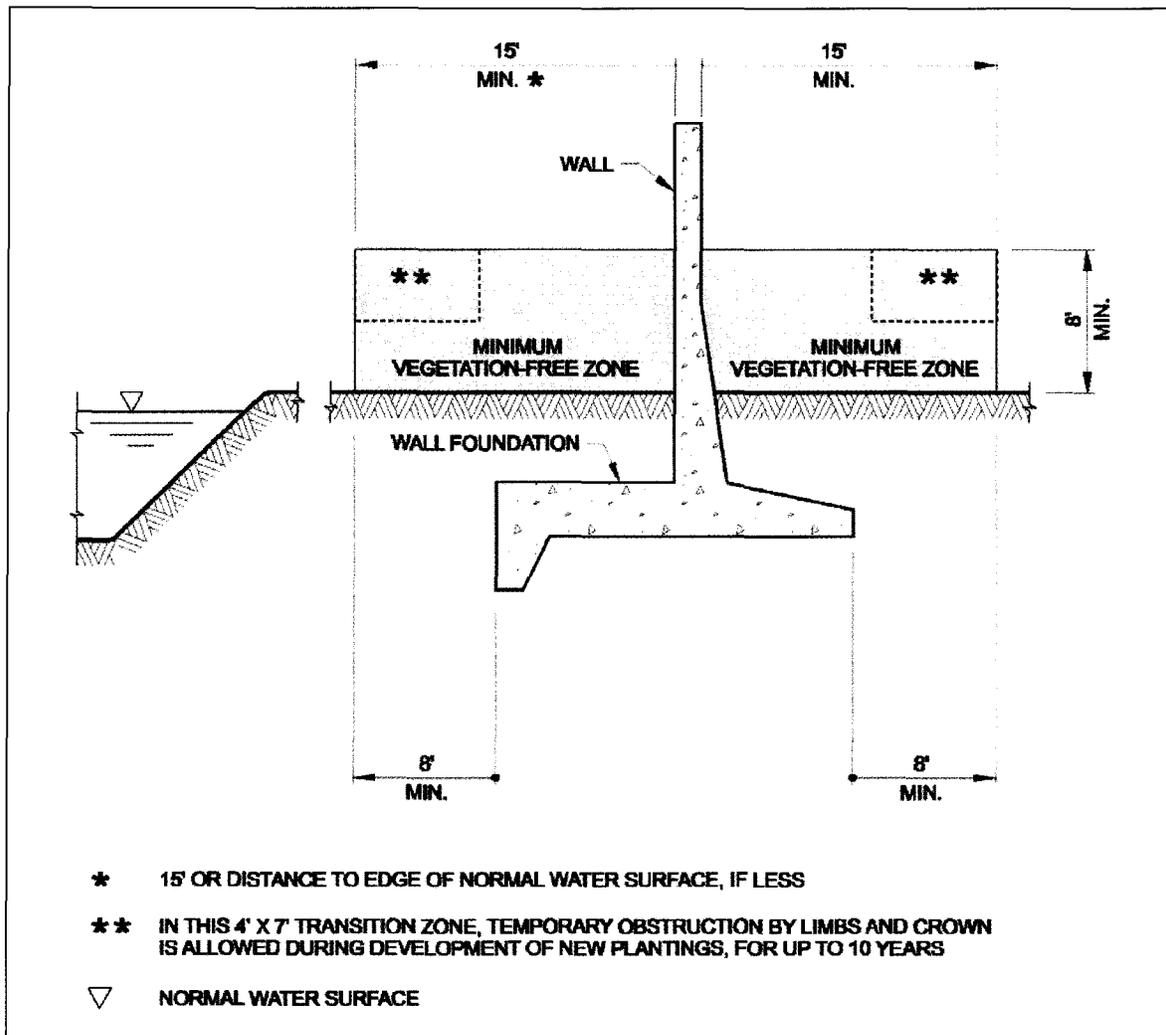


Figure 16: Inverted-T Type Floodwall.

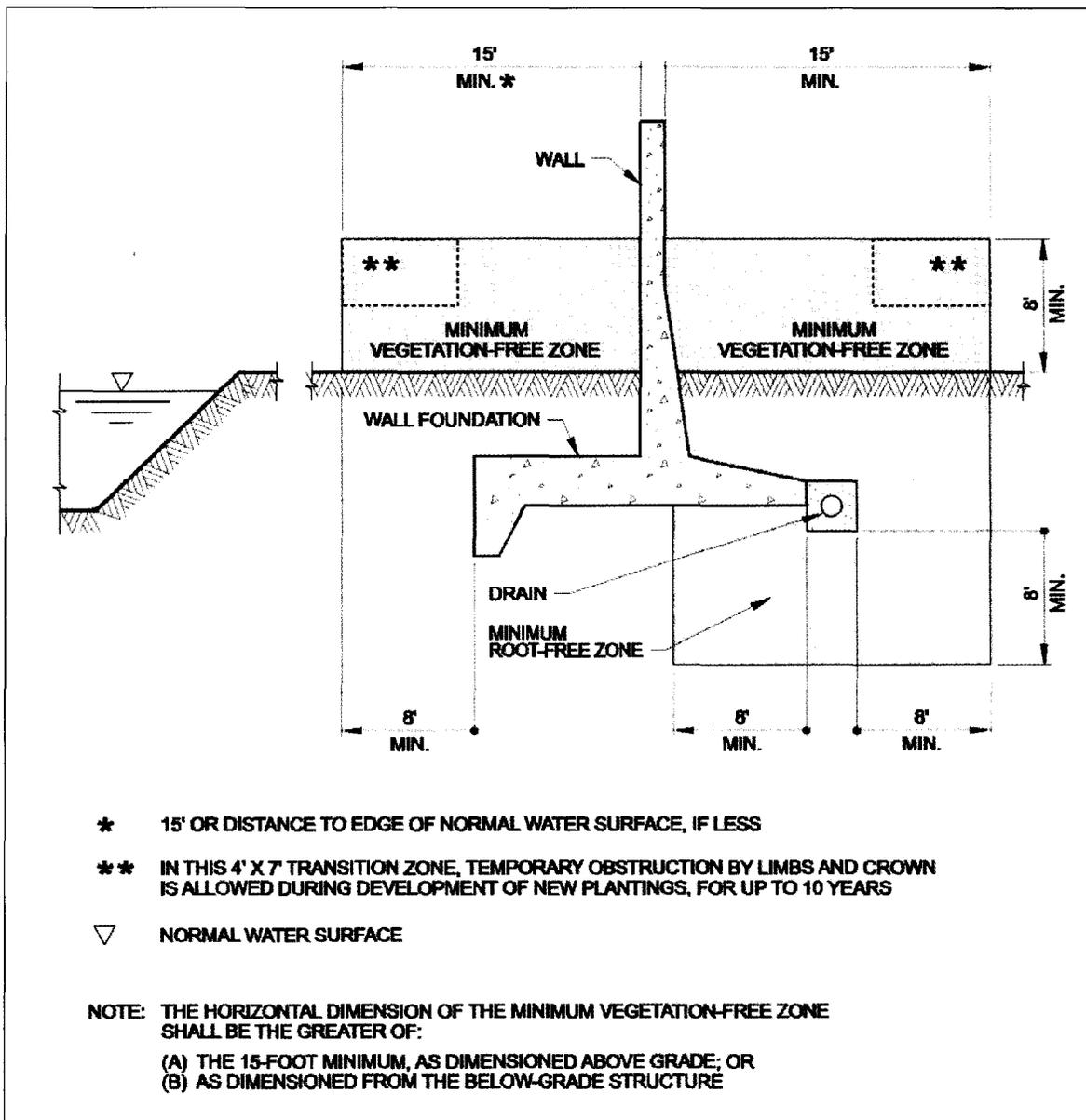


Figure 17: Inverted-T Type Floodwall with Drain.

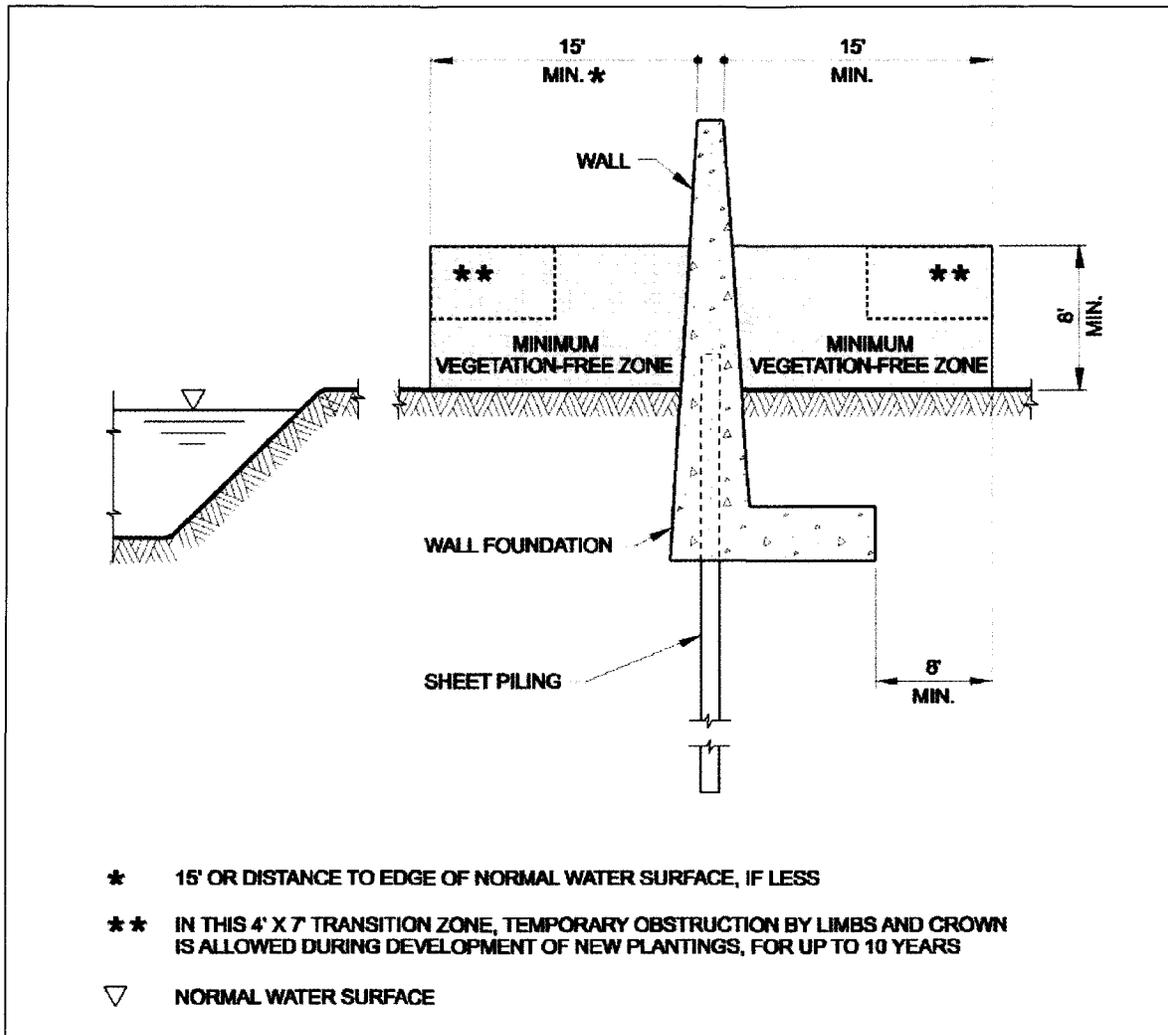


Figure 18: Cantilever-I Type Sheet-Piling Floodwall.

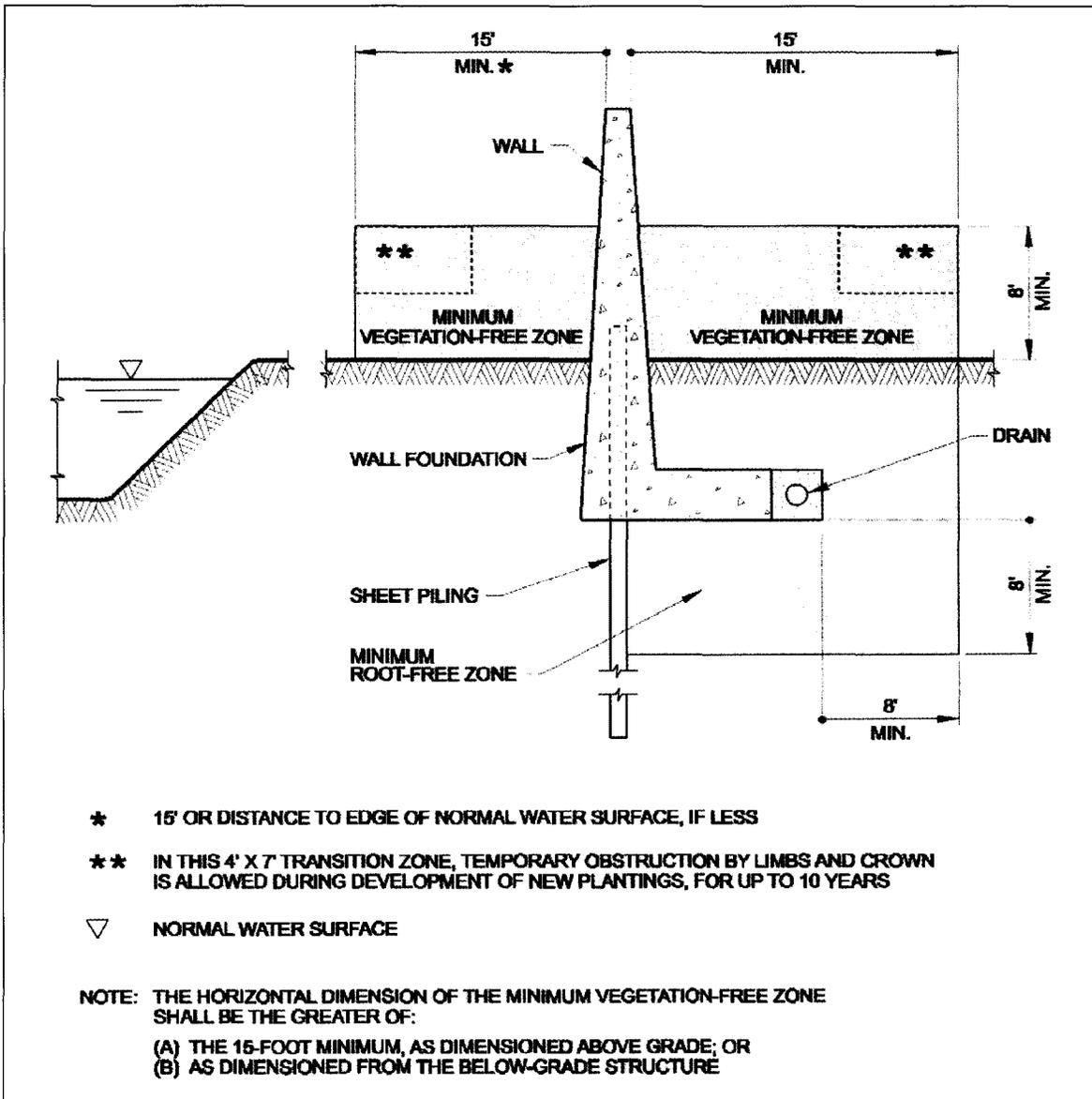


Figure 19: Cantilever-I Type Sheet-Piling Floodwall with Drain.

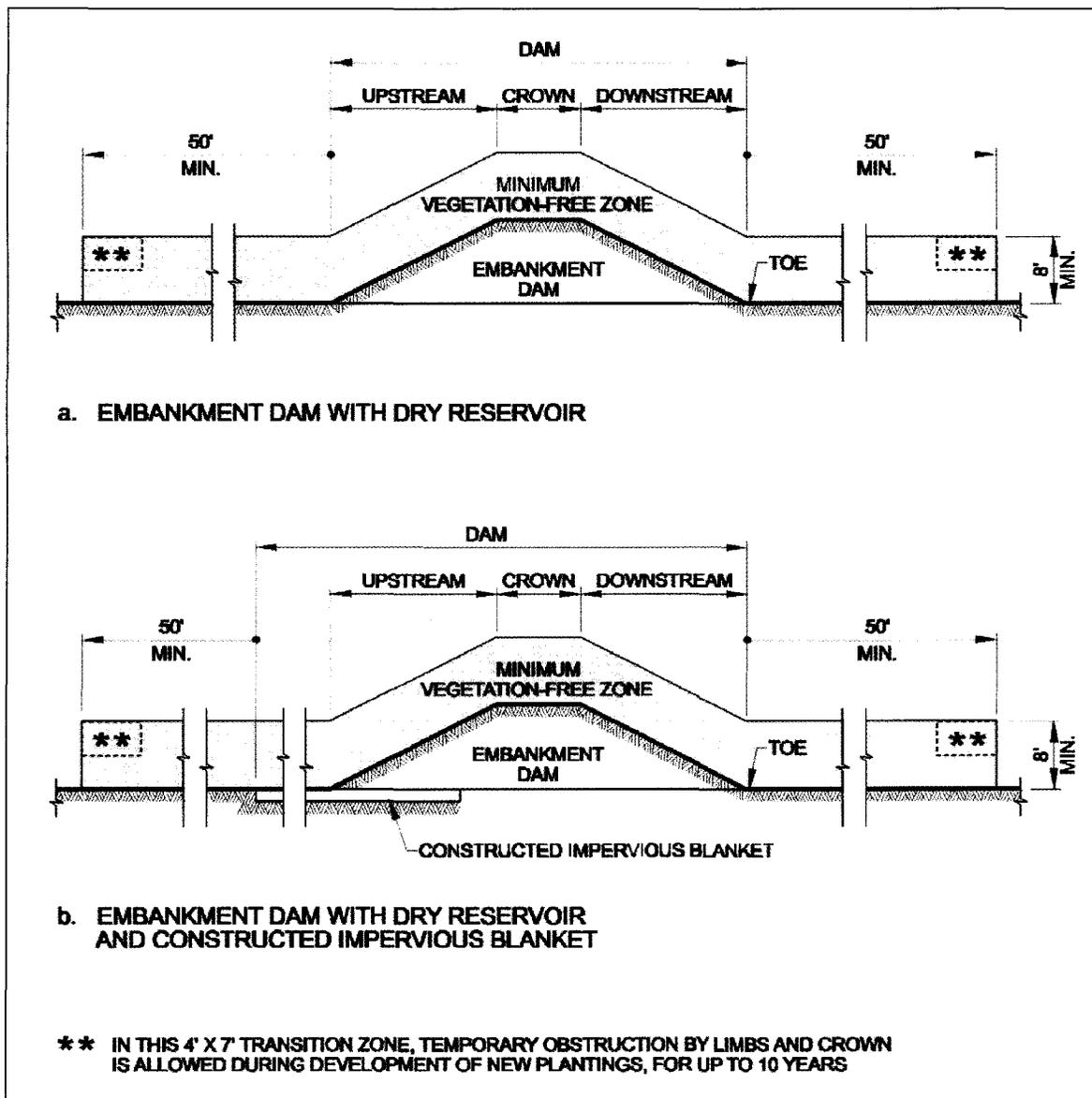


Figure 20: Embankment Dam (Earth Fill, Rock Fill, or Earth and Rock Fill).

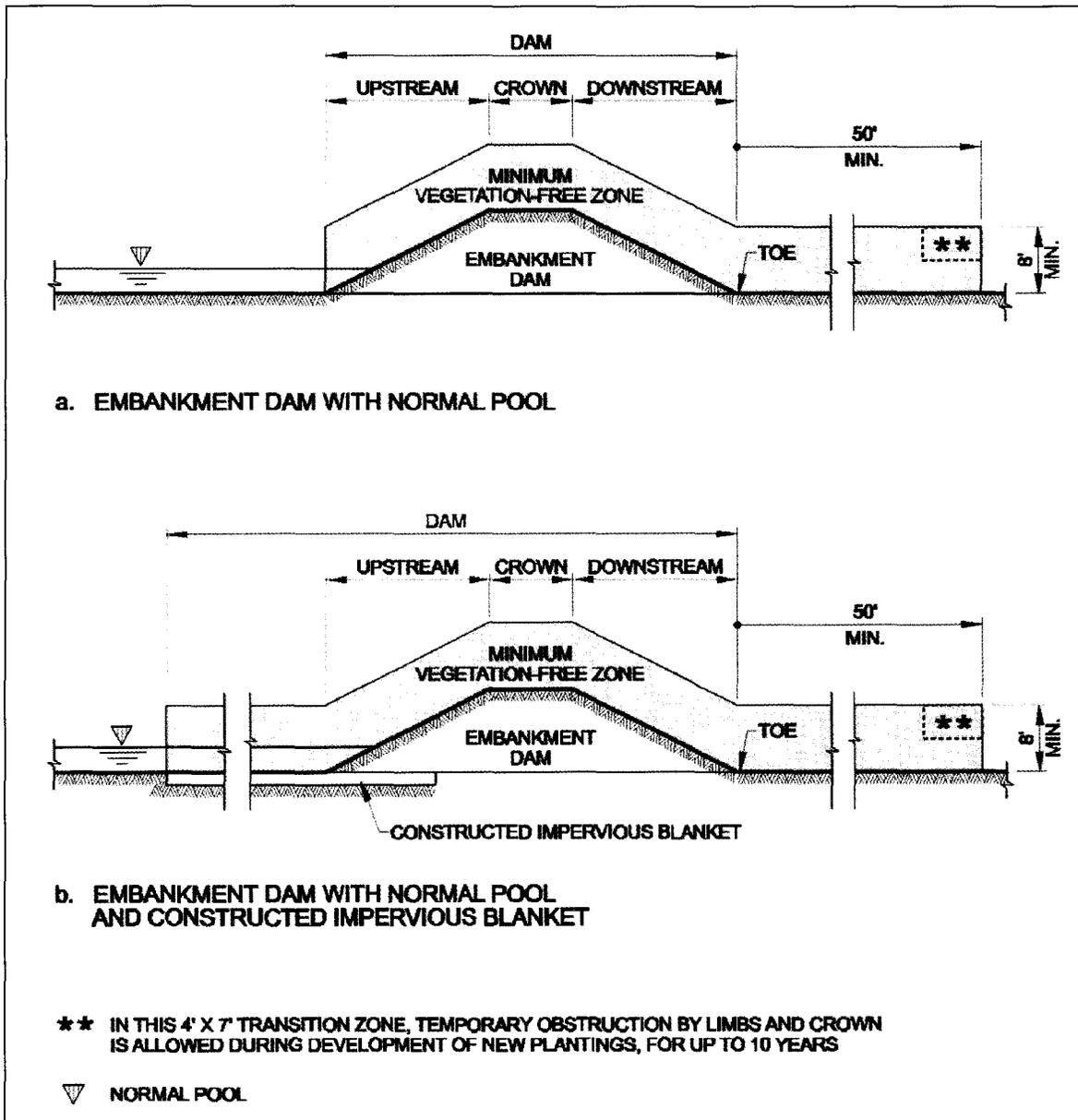


Figure 21: Embankment Dam (Earth Fill, Rock Fill, or Earth and Rock Fill).

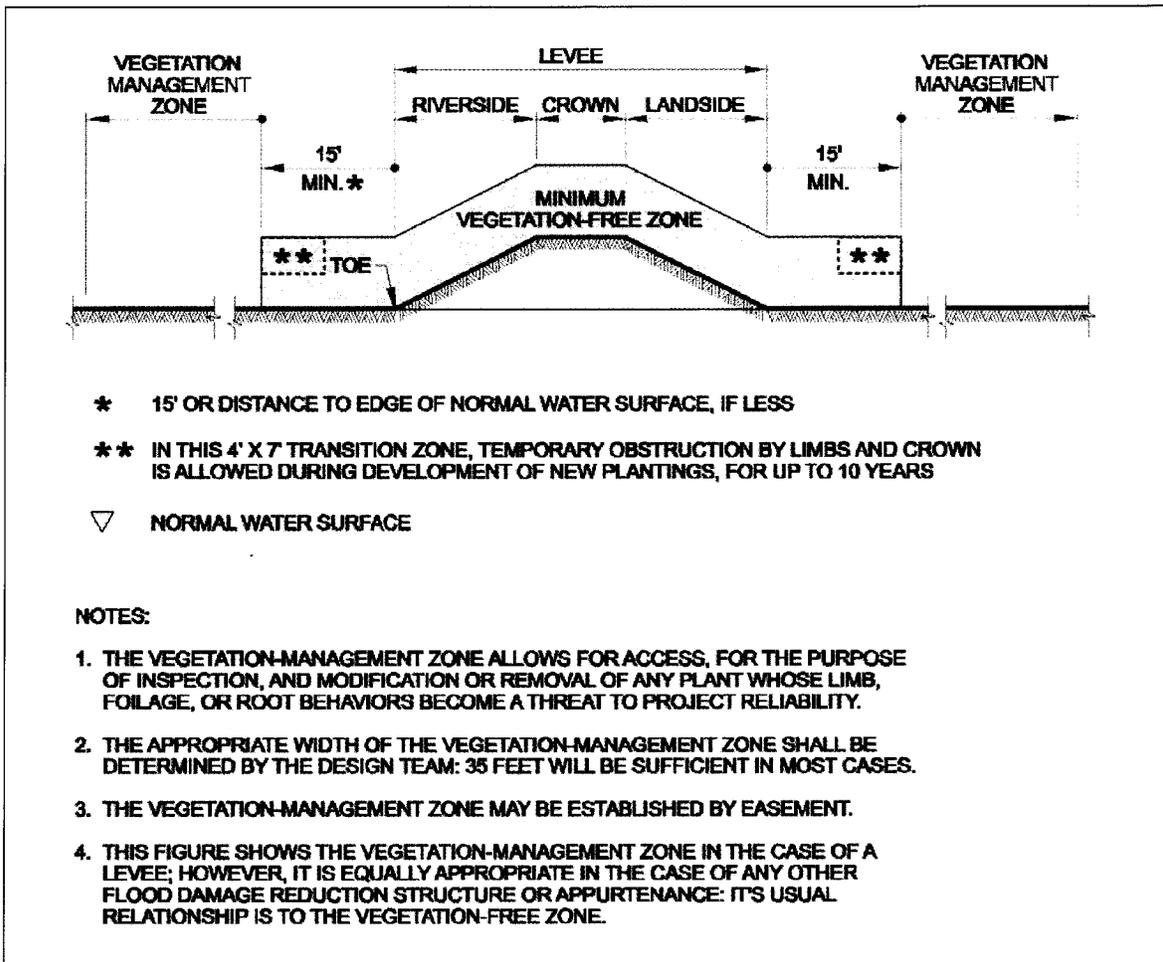


Figure 22: Vegetation-Management Zone.

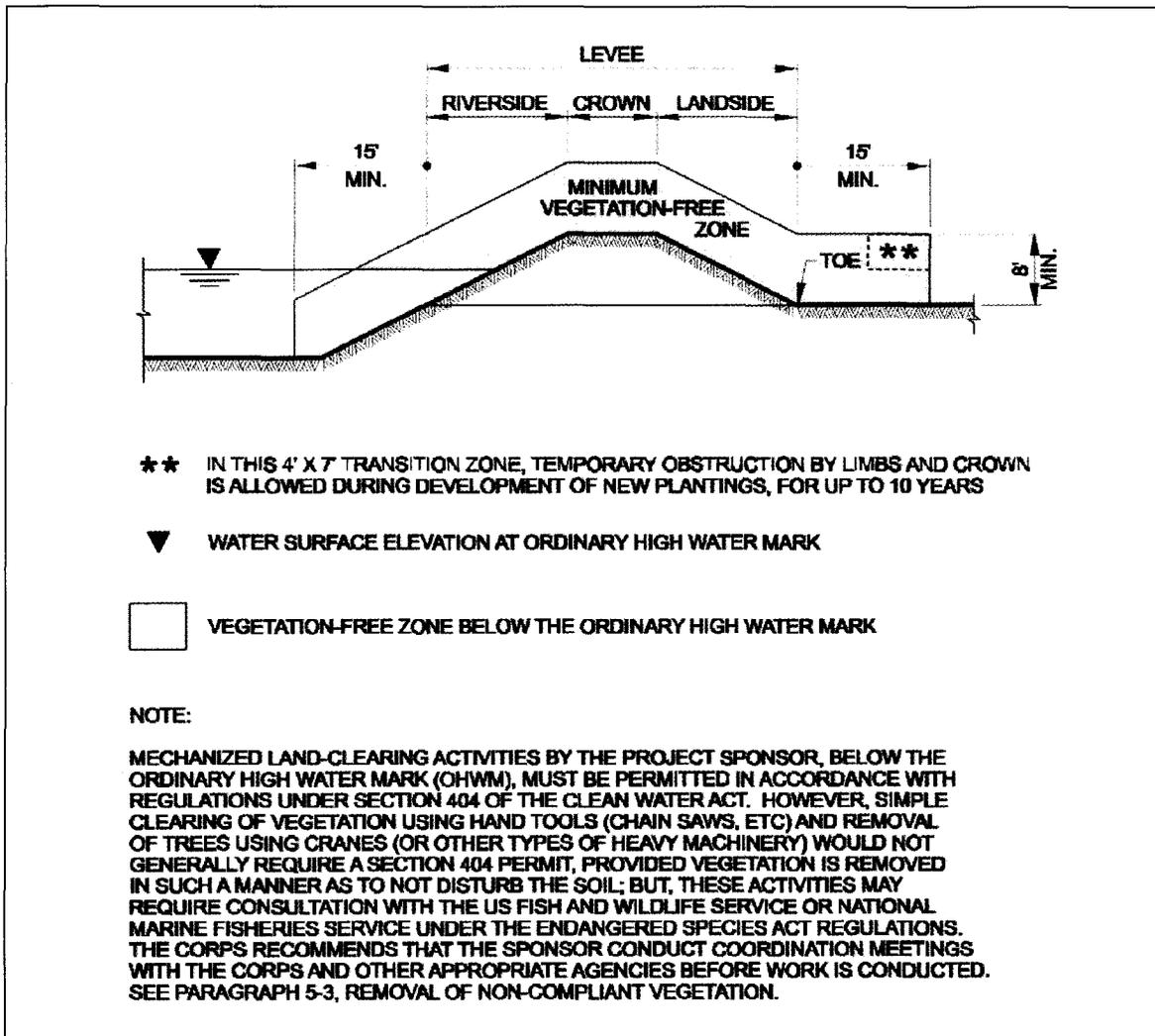


Figure 23: Levee Section with Ordinary High Water Mark Above the Riverside Toe.

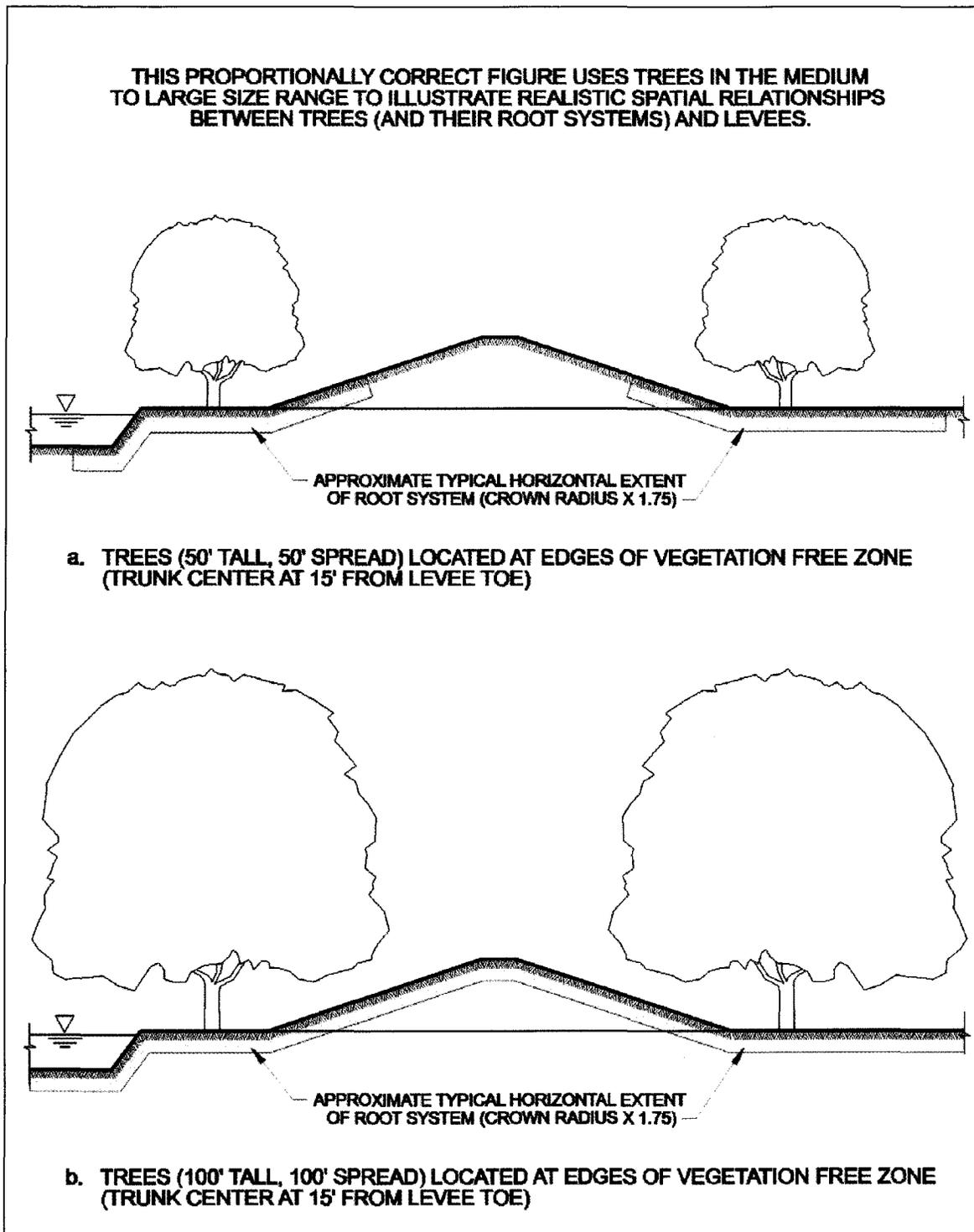


Figure 24: Levee (20 feet tall, 3:1 side slopes) with Trees, as Noted Above.

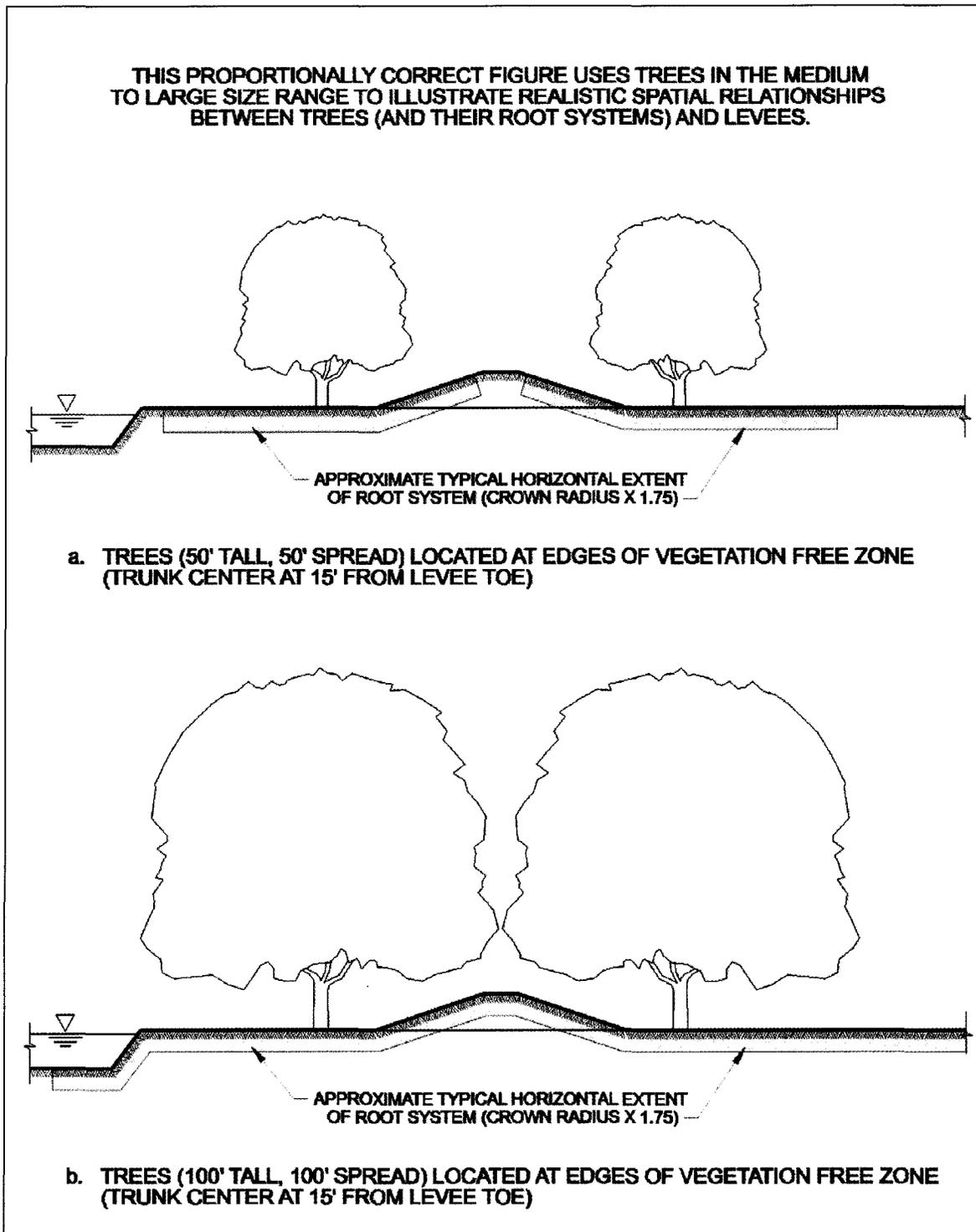


Figure 25: Levee (10 feet tall, 3:1 side slopes) with Trees, as Noted Above.

GLOSSARY

Critical Structure

A critical structure is any component of a flood damage reduction system that contributes to system reliability.

Flood Damage Reduction (FDR) System

A flood damage reduction system is made up of one or more flood damage reduction segments that collectively provide flood damage reduction to a defined area. Failure of one segment within a system constitutes failure of the entire system. Failure of one system does not affect another system.

Forb

A forb is an herbaceous (non-woody) annual, biennial, or perennial plant, other than grass, sedges, and rushes (e.g. alfalfa, clover, vetch).

Herbivory

Herbivory is the consumption of vegetation by animals.

Ordinary High Water Mark (OHWM)

The Regulatory definition of the OHWM is provided at 33 CFR Part 328.3(e) and states: “The term ‘**ordinary high water mark**’ means that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.” The OHWM determines the lateral extent of the jurisdiction of the Corps within Waters of the United States (see Figure 23).

Overbuild

Beyond the normal engineered cross-section of a levee, dam or appurtenant soil structure, overbuild is additional soil mass, fulfilling flood-damage-reduction design criteria and therefore subject to vegetation-free and root-free requirements.

Variance

A variance is a Corps-approved exemption from compliance with specific standards.

