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	Engineering and Design **CRITERIA FOR DESIGN AND CONSTRUCTION WITHIN THE LIMITS OF EXISTING U.S. ARMY CORPS OF ENGINEERS FORT WORTH DISTRICT CIVIL WORKS PROJECTS**	This Pamphlet supersedes Pamphlet 1150-2-1 dated 1 October 2013.
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U.S. Army Corps of Engineers, Fort Worth District
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Pamphlet
No. 1150-2-1 25 July 2023

CRITERIA FOR DESIGN AND CONSTRUCTION WITHIN THE LIMITS OF EXISTING U.S. ARMY CORPS OF ENGINEERS FORT WORTH DISTRICT CIVIL WORKS PROJECTS

1. Purpose

This Pamphlet provides guidance to individuals, developers, engineering firms, non-federal local project sponsors (hereinafter Non-federal Sponsors), and governmental agencies for the design and construction of activities related to the alterations of U.S. Army Corps of Engineers (USACE) Fort Worth District (CESWF) federally authorized civil works projects (excluding dams) constructed by CESWF and for which Non-federal Sponsors have the responsibilities for operation and maintenance.

The guidance contained in this Pamphlet applies to the activities per the date of publication. However, CESWF reserves the right to reconsider this guidance at any time due to unknown or unforeseen circumstances, technological advances, additional information, etc. Non-federal Sponsors may choose to implement additional guidance criteria if it does not conflict with the criteria described in this Pamphlet.

2. **Authorities**

33 USC 408. The authority to grant permission for temporary or permanent use, occupation, or alteration of any USACE civil works project is contained in Section 14 of the Rivers and Harbors Act of 1899, as amended, codified at 33 U.S.C. § 408, hereinafter Section 408. Section 408 authorizes the Secretary of the Army, on the recommendation of the Chief of Engineers, to grant permission for the alteration or occupation or use of a USACE project if the Secretary determines that the activity will not be injurious to the public interest and will not impair the usefulness of the project. The current policy and procedural guidance for processing Section 408 requests is included in Engineer Circular (EC) 1165-2-220.

33 CFR 208.10. 33 CFR part 208.10, Local Flood Protection Works, Maintenance and Operation of Structures and Facilities, are regulations that address Non-federal Sponsor operation and maintenance of civil works projects. EC 1165-2-220 Paragraph 9 contains additional guidance regarding Non-federal Sponsor maintenance and repair activities.

3. Applicability

This Pamphlet applies to all CESWF civil works projects for which an executed Project Cooperation or Partnership Agreement between USACE and the Non-federal Sponsor exists, or a letter of assurance agreeing to the operation and maintenance of the CESWF civil works project has been furnished to CESWF by the Non-federal Sponsor. U.S. Army Corps of Engineers Fort Worth District civil works

projects include flood risk management (typically consisting of channels, levees, and floodways), streambank protection, and ecosystem restoration.

This Pamphlet does not apply to CESWF dams or navigation projects. Guidance for proposed alterations of these types of civil works projects is provided in USACE technical publications other than this Pamphlet.

A list of CESWF civil works projects and Section 408 guidance can be found on the CESWF website: https://www.swf.usace.army.mil/Missions/Section-408/.

4. References

The U.S. Army Corps of Engineers website https://www.publications.usace.army.mil/ includes Engineering Manuals, Engineering Circulars, Engineering Regulations, Engineering Technical Letters, and Technical Reports pertaining to the design and construction of civil works projects. A representative list is included below.

- CPAR-GL-98-1 Installation of Pipelines Beneath Levees Using Horizontal Directional Drilling
- EM 1110-1-1804 Geotechnical Investigations
- EM 1110-1-1904 Settlement Analysis
- EM 1110-1-1906 Soil Sampling
- EM 1110-1-2908 Rock Foundations
- EM 1110-2-1901 Seepage Analysis and Control for Dams
- EM 1110-2-1902 Slope Stability
- EM 1110-2-1911 Construction Control for Earth and Rock-Fill Dams
- EM 1110-2-1913 Design and Construction of Levees
- EM 1110-2-2100 Stability Analysis of Concrete Structures
- EM 1110-2-2104 Strength Design for Reinforced-Concrete Hydraulic Structures
- EM 1110-2-2105 Design of Hydraulic Steel Structures
- EM 1110-2-2502 Retaining and Flood Walls
- EM 1110-2-2902 Conduits, Pipes, and Culverts associated with Dams and Levee Systems
- EP 1110-2-18 Guidelines for Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures
- ER 1110-1-261 Quality Assurance of Laboratory Testing Procedures
- ER 1110-1-1807 Drilling in Earth Embankment Dams and Levees
- ER 1110-1-8100 Laboratory Investigations and Testing
- ER 1110-2-8152 Temporary Cofferdams and Braced Excavations
- ER 1165-2-217 Review Policy for Civil Works
- ERDC/GSL TR-02-9 Guidelines for Installation of Utilities Beneath Corps of Engineers Levees Using Horizontal Directional Drilling
- ETL 1110-2-555 Design Guidance on Levees
- ETL 1110-2-556 Risk Based Analysis, Geotechnical Engineering
- ETL 1110-2-561 Risk and Reliability, Seepage and Slope Stability
- ETL 1110-2-569 Design Guidance for Levee Underseepage

5. General

a. Coordination between CESWF, the Non-federal Sponsor, and Requester is recommended as early as possible during the design process to identify potential issues and prevent schedule delays. A Requester is an entity (private, public, tribal, or federal) proposing the alteration to the CESWF civil works project. Meetings and site visits with CESWF, the Non-federal Sponsor, and the Requester are recommended.

b. Construction may not begin until the proposed alteration final contract plans and specifications have been reviewed and approved in writing by both the CESWF and the Non-federal Sponsor. If the proposed alteration is design-build, the CESWF review process will be discussed at the first coordination meeting.

c. Detailed designs, calculations, and construction procedures must be provided for review if boring, jacking, or tunneling operations are planned. Refer to subsequent paragraphs for additional details and required procedures.

d. Approved construction methods and best management practices to minimize erosion at the construction site must be implemented as part of the design. This includes making every effort to reduce the turbidity of the water at the site, such as by limiting the amount of time construction equipment is in the water. The Requester is responsible for compliance with applicable Stormwater Pollution Prevention Plan (SWPPP) and/or other permits administered by the Texas Commission on Environmental Quality (TCEQ). The SWPPP shall meet the requirements of the TCEQ, shall be approved by the Non-federal Sponsor, and shall be implemented before commencement of construction or construction support activities. The SWPPP and a copy of the Notice of Intent (NOI) must be retained on-site during construction. The Non-Federal Sponsor may impose additional water quality requirements.

e. When construction work is in progress located downstream of a CESWF dam, a request from the contractor for changes in regulated releases will be considered only for urgent and compelling reasons. Normally, regulated releases from upstream lakes for evacuation of floodwater, water supply, recreation, or other purposes considered to be in the best interest of the public, will have first consideration.

f. Normally, construction equipment, spoil material, supplies, forms, buildings for inspectors, labs, or equipment and supply storage buildings, or any item that may be transported by flood flows, shall not be placed or stored within the limits of the existing civil works project during construction activities without prior approval of the CESWF and the Non-federal Sponsor. Locations of construction trailers and stockpile areas shall be included on the alteration plans and shall be approved by the CESWF and the Non-federal Sponsor.

g. In addition to other requirements set forth in this Pamphlet, it is the responsibility of the Requester to determine if permits for the desired work may be required under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act. Coordination with the CESWF Regulatory Division in the early planning stages is recommended to prevent potential delays. Information about USACE permits can be found at the following website: https://www.swf.usace.army.mil/Missions/Regulatory/.

h. Levee maintenance roads, access roads, and recreation trails that are damaged due to construction activities shall be replaced or restored to a condition equal to or better than the pre-construction condition. Haul routes that cross a levee must be approved by CESWF and the Non-federal Sponsor. Levee protection methods, such as timber mats, may be required to protect the integrity of the levee during the construction process. All roads must be inspected and accepted by the Non-federal Sponsor prior to completion of the alteration.

i. All fill and backfill shall be compacted in 6-inch lifts as specified in the contract specifications approved by the CESWF. Compaction shall be to at least 95 percent of modified density, as specified in ASTM D-1557, with moisture within the limits of 3 percentage points above optimum to 2 percentage points below optimum moisture content. All backfill shall consist of impervious materials. Vegetation shall be reestablished to its original condition or better. All excess material shall be removed from the limits of the civil works project.

j. Provide scour protection consisting of articulating concrete block revetment system protection capable of being re-vegetated at the outfall of stilling basins designed according to the exiting jet velocity. If approved by the Non-federal Sponsor, stone riprap or concrete paving may be substituted.

k. The crown or crest of the levee referred to in this Pamphlet is the original design levee crest elevation. This may or may not be the same as the current levee crest elevation. All alterations shall be based on the higher of the two elevations.

l. The CESWF will provide applicable hydraulic models to be used for design.

m. No increase in the civil works project design flood water surface profile will be allowed. The hydraulic impacts of temporary construction activities associated with a proposed alteration shall be evaluated on a case-by-case basis.

n. The valley storage impacts on the existing civil works project shall be evaluated as necessary.

o. The proposed alteration may be subject to local and regional floodplain and regulatory requirements.

p. Disturbance of existing recreation facilities must be mitigated.

q. Interior drainage areas are an integral part of a civil works levee project. Proposed alterations to interior drainage areas must be reviewed and approved in accordance with this Pamphlet.

r. Closure/re-routing of recreation trails during construction shall be coordinated with the Non-federal Sponsor.

s. The Contractor must coordinate with the Non-federal Sponsor before construction begins. The Contractor shall acquire all permissions, rights-of-entry, real estate instruments, and other requirements of the Non-federal Sponsor.

t. A pre-construction meeting is required between the Contractor and the Non-federal Sponsor before construction begins.

u. The Contractor is responsible for monitoring creek/river forecast conditions.

6. Crossing Over Existing Levees at Grade

Crossing over levees at grade is not a preferred method but will be considered as an option if site conditions dictate this is the only cost-effective alternative.

a. The Non-federal Sponsors, at their discretion, may not allow proposed crossings at grade over existing levees.

b. No excavation or notching will be performed into or on the levee or within the levee template.

c. The design of the crossing shall include stripping of the topsoil from the levee and the utility line placed up and over the levee template slopes at grade. This will require rather abrupt line grade changes at the levee crest. The new line shall be covered by placing new fill uniformly on the slopes and the top of the levee and sloped away from the line and parallel to the longitudinal axis of the levee. A minimum of 2 feet of cover over the new line shall be provided. The slope of the fill covering the new line shall be 1 vertical on 20 horizontal or flatter longitudinally along the levee crest and slopes. The topsoil shall then be replaced, all disturbed areas shall be seeded or sodded to establish turf, and any damage to levee access roads shall be repaired. During construction, the ability of the Non-federal Sponsor to flood fight within the impacted area shall not be impaired.

d. All valves located within 15 feet of either side of the toe of the levee shall be provided in a concrete box enclosure with a manhole-type cover. Valve boxes located within the civil works project shall be underground and flush with the surface. If the valve box is placed in the levee crest, the bottom of the excavation shall not be lower than 1 foot above the design water surface elevation. Fill shall be uniformly placed to slope away from the top of the valve box. If possible, all valves shall be placed on the landside of levees a minimum of 15 feet from the levee toe.

e. All manholes located within the civil works project having rim elevations below the design water surface elevation shall have bolted, watertight covers in accordance with Title 30, Texas Administrative Code.

7. Pipe Crossing Under Levees with Open Excavation

Pipe crossings under levees with open excavation are the least preferred alternative because of the added risk during construction and will be evaluated accordingly if it is the selected alternative.

a. Provide a temporary ring levee (cofferdam) on the riverside of the existing levee at the location of the subject crossing at the same crest elevation as the existing levee. This ring levee shall have a minimum crest width of 10 feet and side slopes of 1 vertical on 3 horizontal or flatter. Construct the temporary cofferdam of impervious materials according to the provisions specified in Paragraph 5.i.

b. When the temporary ring levee is complete, excavate through the main levee using 1 vertical on 3 horizontal cut slopes. The toe of the main levee and cofferdam or ring levee shall be a minimum of 20 feet (measured horizontally) from the top edge of the excavation.

c. Generally, sources for borrow materials shall not be located within the limits of the civil works project right-of-way. In addition, depending on the type of soil and if pervious materials or unstable materials exist in the foundation of the existing levee, it may be desirable to limit the depth of excavation or specify a minimum distance from the landside toe of the levee. All excavated slopes shall be properly designed, and the drawings sealed by a registered professional engineer.

d. After the pipe has been placed, the open excavation shall be backfilled in accordance with Paragraph 5.i. When backfill operations are completed, the entire foundation area to be occupied by the replaced levee fill shall be scarified, plowed, and/or harrowed to a depth of 6 inches and then compacted at a minimum 95 percent modified density.

e. Accomplish levee replacement by placing fill in 6-inch lifts and compacting to a minimum 95 percent modified density. After compaction, the moisture content shall be within the limits of 3 percentage points above optimum to 2 percentage points below optimum.

f. Determine the in-place moisture content and density of the levee fill on a frequency of about one sample for every 500 cubic yards of backfill placed in the levee.

g. When the breached levee has been reconstructed to its original alignment and grade, the temporary ring levee shall be removed, and all disturbed surfaces shall be finish-graded and turfed by seeding or solid sodding.

h. All manholes located within the civil works project having rim elevations below the design water surface elevation shall have bolted, watertight covers in accordance with Title 30, Texas Administrative Code.

i. For pipelines, install a control structure to prevent water from the levee riverside flowing through the pipeline to the levee landside. If the control structure is located on the riverside of a levee, it must be accessible during the flood stage of the river or stream and in all weather conditions. Controls may be automated, however, there must be manual override capability at all structures.

j. Gravity storm drains discharging into an existing floodway or channel shall be provided with automatic flap gate(s) at the discharge end of the line and shall have energy dissipators, as required. The Non-federal Sponsor, as per the written agreement, shall be responsible for the inspection and maintenance of all drainage structures to ensure proper operation of the flap gates or other features.

k. Monolithic conduits or conduits with watertight joints shall be used under the levee and levee template.

8. Pipe Crossing Under Levees with Boring or Jacking of Sleeves

The sequence of work shall be as follows:

a. Excavate the boring and jacking pit (which must be on the landside outside the projected toe of the levee template slope).

b. Bore and jack the sleeve to a point beyond the projected riverside toe of the levee template slope.

c. The annular space between the bore and sleeve shall be pressure grouted with bentonite slurry.

d. Place the product line in the sleeve.

e. Pressure grout the product line in the sleeve with bentonite slurry.

f. Excavate the pit on the riverside and construct a manhole with a gate valve placed on the inside face of the manhole away from the channel. Tie the line from the sleeve under the levee and into the manhole with a gate valve.

g. Tie the line from the sleeve under the levee and into a manhole on the landside.

h. During work on items 8.a through 8.g, a plug will be required. The plug shall be placed and braced at the open end of the sleeve and pipe located in the jacking pit at the close of work each day. This plug must remain in place until the gate valve is installed and connections are made to ensure protection from flooding from the river.

9. Pipe Crossing with Horizontal Directional Drilling Under Levees and Channels

a. Detailed contractual drawings, plans, procedures, and engineering calculations shall be provided to CESWF for review (see Reference CPAR-GL-98-1 for guidelines on directional drilling). These must include all the requirements of Paragraph 5 and the following additional items:

(1) Inside diameter of the final borehole and the outside diameter of the product casing.

(2) Detailed description of construction and horizontal boring methods to be utilized.

(3) Provide the method of pressure grouting the annular space between the outside of the product casing and the inside of the bore to prevent seepage under the levee template during maximum river stages.

(4) A profile of the proposed line showing alignment (including the location of the river and levees).

(5) Location of entry and exit points, location, elevations, and proposed clearances for all utility crossings and structures.

(6) Right-of-way lines, property boundary, and other utility right-of-way or easement lines.

(7) Depth under the base of the levee, depth of the line under the river channel, and location of both ends of the string. If the proposed depth of the pipe string directly below the base of the levee is less than 30 feet, then detailed engineering calculations sealed by a registered professional engineer shall be provided for review. These calculations must show a minimum 1.5 factor of safety against hydro-fracturing to be acceptable.

b. Develop and provide a quality control plan for the alteration that includes the maximum allowable drilling pressure, gage calibration method, and specific responsibility for assuring that the pressure is not exceeded. During the drilling process, the pressure in the borehole must be monitored

to ensure that the operational drilling pressures remain within safe limits to prevent soil fracturing. The name of the party responsible for monitoring the work must be specified.

c. The minimum clearance distance from the top of the proposed pipe encasement to the bottom of the creek/river channel shall be 7 feet. If the existing bottom of the channel is lower than the original design grade, the existing bottom of the channel shall be used. If the existing bottom of the channel is higher than the original design grade, the original design grade shall be used. All crossings shall comply with the applicable requirements of the Texas Administrative Code.

10. Buried Lines Parallel to Levees and Channels

a. Buried lines parallel to a levee (on either the riverside or the landside) will not be allowed where the final location of the buried line will be within the extended template of the levee. For example, a line buried 5 feet deep must be at least 15 feet away from the toe of a levee with a 1 vertical on 3 horizontal slope.

b. Sumps, ditches, swales, or other civil works project features crossed by the buried line shall be restored to their pre-construction condition.

c. Buried lines parallel with the channel bank must be at least 25 feet from the projected river channel slope template.

d. When a proposed buried line crosses an existing pump station outfall or other feature that necessitates an aerial crossing, the line shall be placed on piers with the piers aligned to provide minimal obstruction to flow within the outfall channel and designed to catch minimal debris. The preferred alternative is the placement of the line under the discharge channel encased within concrete. The encasement shall extend a minimum of 5 feet beyond the top of the channel side slopes.

11. Crossings of Levees and Channels

a. Bridges.

(1) The preferred alternative is for the bottom of low steel (or low chord) of the bridge to be 15 feet above the design levee crest elevation or the existing levee crest, whichever is higher. Alternatives to the 15 feet clearance will be considered on a case-by-case basis if 15 feet is not feasible. Notching into the levee will not be allowed.

(2) Proposed new bridges should be designed to minimize the number of bents located within the template of the levee. If bridge piers are required in the levee template, extensive investigation and analyses (seepage and stability) based on site-specific conditions will be required to show potential impacts that the piers may have on the levee. The driving of piles within the template of the levee will not be allowed.

(3) Bridges shall be designed to avoid/minimize the blocking of maintenance roads. If maintenance roads are blocked due to the design and construction of a proposed bridge, new maintenance roads must be provided.

(4) All stormwater runoff from bridge decks must be piped to grade to prevent erosion within the existing civil works project.

(5) Revetment slope protection must be provided from the top of the levee to the levee toe within the shadow line of the bridge.

(6) The bridge must be designed to minimize the number of piers within the existing civil works project. If the new bridge is within 500 feet of an existing bridge, the proposed new piers should be in alignment with the existing bridge.

(7) Provide a minimum freeboard between the low point of the bridge crossing and the design water surface elevation of 3 feet or to the top of the levee at the bridge location, whichever is higher.

(8) Any obstruction caused by the proposed bridge and its piers shall not significantly reduce the hydraulic conveyance of the existing civil works project.

(9) Submit final plans and hydraulic computations to indicate that the proposed alteration will not reduce the hydraulic conveyance of the existing civil works project. The analysis shall include a comparison of With-Project Conditions to Baseline Conditions.

(10) Alterations crossing navigable waterways shall require a U.S. Coast Guard permit. Clearances and requirements shall be as directed by the U.S. Coast Guard.

b. Crossings Under Rivers and Channels by Open Excavation. This is not the preferred alternative but will be considered as an option if site conditions dictate that this is the only cost-effective alternative.

(1) The minimum clearance distance from the top of the proposed pipe encasement to the bottom of the creek/river channel shall be 7 feet. If the existing bottom of the channel is lower than the original design grade, the existing bottom of the channel shall be used. If the existing bottom of the channel is higher than the original design grade, the original design grade shall be used. All crossings shall comply with the applicable requirements of the Texas Administrative Code.

(2) Sufficiently anchor or encase the line to prevent floatation.

(3) Backfill the excavation with material similar to that excavated. If soil is excavated, backfill with compacted impervious fill material. If rock is excavated, backfill with concrete.

(4) Generally, no cofferdam fill crossings shall be allowed in water greater than 6 feet in depth. Cofferdam fill crossings in water greater than 6 feet may be allowed if geotechnical and structural designs prove that sheet piling would not be a viable method.

c. Aerial Crossings of Rivers and Channels

(1) Provide a minimum freeboard of 3 feet between the low point of the crossing and the design water surface elevation.

(2) The obstruction caused by the supporting structure and its piers shall not significantly reduce the carrying capacity of the river or channel. No longitudinal cross bracing will be used.
(3) Submit final plans and hydraulic computations to indicate that the proposed alteration would not reduce the hydraulic conveyance of the river, stream, or existing civil works channel project.

(4) Alterations crossing navigable waterways shall require a U.S. Coast Guard permit and/or a USACE Section 10 permit. Clearances and requirements shall be as directed by the U.S. Coast Guard and/or USACE.

12. Headwalls, Chutes, Gate Valves, Flap (Automatic) Gates, etc.

a. Install headwalls, gate valve structures, flap (automatic) gates, and other types of outfall structures in such a manner as to prevent obstruction of flow or the creation of scouring conditions within the project. All headwalls must transition with the appropriate slopes and all flow discharge points must be at the flow line of a channel or ditch or at the normal water surface. Chutes will not be allowed unless they are the only viable alternative.

b. All structures shall be installed in such a manner to prevent or minimize operation and maintenance problems.

13. Pump Discharge Pipelines Over Levees

a. The invert of the discharge shall be at the toe of the protective works (levee) and shall be free-vented at the highest point. For very large lines, deviation from these criteria may be considered, however, under no condition shall excavation be permitted into the levee. See Paragraph 6 for requirements for crossing over a levee on grade.

b. Flap (automatic) gates are not required at the outfall of the discharge lines.

14. Electrical and Telephone Criteria for Overhead Wire Crossings

a. The Non-federal Sponsor may require directional boring under the levee as opposed to an overhead crossing.

b. No structure (poles or otherwise) shall be located closer than 15 feet from the toe of a levee.

c. No structure (poles or otherwise) shall be located closer than 15 feet from the top of a channel slope.

d. Provide a minimum vertical clearance of 28 feet between the crown of the levee and the low point of the sag of the wire where it crosses the levee, computed under the most adverse conditions of temperature, wind, and other loading.

e. Provide a minimum vertical clearance of 28 feet between the natural ground and the low wire at the low point of the sag in the area of the civil works project channel, or 3 feet above the design water surface level, whichever is higher (refer to the National Electrical Code for the minimum clearance of high voltage lines.)

f. Locate guy wires and anchors in such a manner that they do not interfere with the operation and maintenance of the existing civil works project channel, levees, or related structures. No anchors may be placed on the levee.

15. Low Dams or Diversion of Flows

a. Submit plans, hydraulic and structural computations, and specifications for low dams or other obstructions. This information will be reviewed to determine the hydraulic and structural impacts of the proposed construction on the civil works project. Prior to an extensive engineering study, CESWF and the Non-federal Sponsor will review the concept plan, proposed location, and purpose.

b. Diversion of flows into or out of a civil works project area shall be reviewed to evaluate adverse hydraulic and structural impacts.

16. Process for Abandoning Existing Pipelines

a. Requests to abandon existing buried pipelines within a civil works project shall be submitted in writing to CESWF and the Non-federal Sponsor. No buried line within a civil works project may be abandoned without the review and approval of CESWF and the Non-federal Sponsor.

b. As a minimum, the portion of the abandoned pipeline under a levee shall be completely filled with concrete or grout to prevent seepage through the abandoned line during flood conditions.

c. Abandoned buried pipelines that are located on civil works project property, but are not located under a levee, shall be plugged at each end with concrete or grout.

d. Structures associated with abandoned buried pipelines, such as manholes, shall be removed and the resulting hole filled and compacted in accordance with the provisions in Paragraph 5.i.

e. Aboveground abandoned pipelines shall be removed from the civil works project right-of-way, including any associated structures.

17. Construction of Recreation Facilities

Recreation facilities proposed by the Non-federal Sponsor or other entity will be evaluated to determine the impacts (hydraulics, operation and maintenance, etc.) to the civil works project.

18. Trees and Other Vegetation

a. The presence of undesirable vegetation can compromise the structural integrity of levees, floodwalls, and other critical structures, which may lead to system failure if not corrected. Trees and other vegetation, such as shrubs and vines, may create both structural and seepage instabilities, prevent adequate inspection, surveillance, monitoring, and create obstacles to operation, maintenance, repairs, and flood fighting activities.

b. Planting of trees on the levees will not be allowed nor approved. Planting of additional trees within existing civil works projects is not encouraged and will be evaluated only on a case-by-case basis. Only trees with deep-type root systems and high canopies may be planted in selected areas of existing

civil works projects. The plantings shall be a minimum of 15 feet from the toe of the levee or the top of the channel bank. Trees may be placed no closer than at an average spacing of 100 feet, center-to-center. Trees shall be pruned to permit mowing with tractor-type mowers. No shrub or vine-type plants will be permitted.

c. Vegetation-Free Zone**.** The Vegetation-Free Zone (VFZ) is a three-dimensional corridor surrounding all levees, floodwalls, and critical appurtenant structures where no vegetation, except short grass cover, is permitted. The VFZ is required to ensure acceptable project performance under all design conditions and must be of sufficient dimension to provide access for surveillance, inspection, monitoring, maintenance, repairs (routine and emergency, including slide repairs), and flood fighting. The VFZ must be accessible by personnel and equipment at all times. This includes four-wheel-drive vehicles, as well as larger equipment, such as tractors, bulldozers, and dump trucks. Figure 1 and Figure 2 illustrate the limits of typical Vegetation-Free-Zones associated with levees and floodwalls. The minimum width of the VFZ includes the entire cross-section of levees and floodwalls, plus 15 feet clear distance on each side. The width of the VFZ shall be measured from the centerline of the tree trunk or plant stem to the limit of the levee cross-section or floodwall.

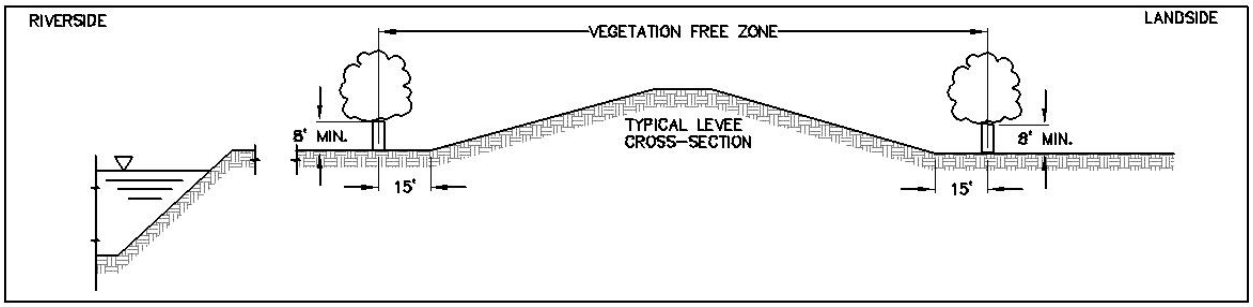

Figure 1. Levee Vegetation-Free Zone

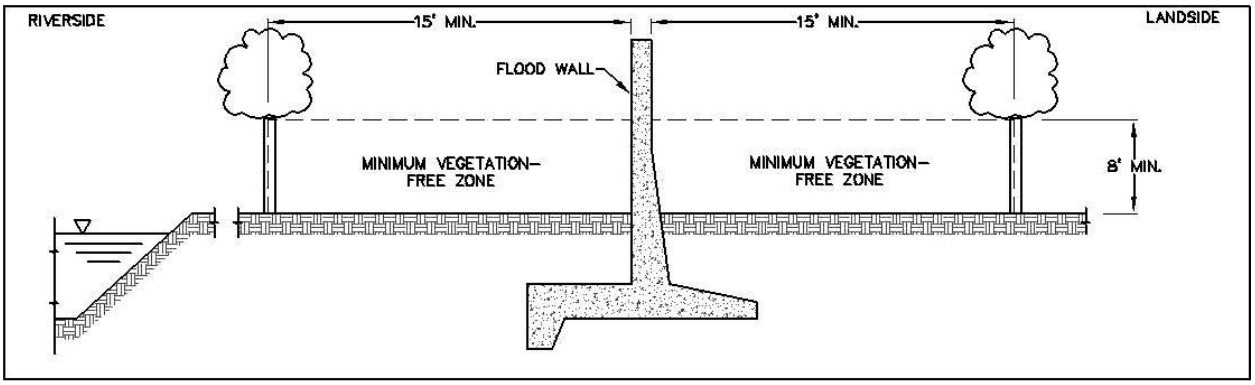

Figure 2. Floodwall Vegetation-Free Zone

19. Proposed Projects Outside of and Adjacent to a CESWF Civil Works Project

a. EC 1165-2-220 states Section 408 jurisdiction applies to alterations proposed within the real property identified and acquired for a civil works project. However, proposed projects located outside and adjacent to a CESWF civil works project may impact the civil works project. Awareness of these proposed projects by the Non-federal Sponsor and coordination between CESWF, the Non-federal Sponsor, and the Requester is recommended to evaluate the impacts of the proposed project with the goal of preventing or resolving negative impacts. Specific issues to consider include potential seepage or stability problems related to proposed retaining walls or deep foundations, adverse impacts due to proposed utilities, changed drainage conditions, verification of the existing civil works project boundaries relative to the proposed project boundaries, and monitoring of the project during construction by the Non-federal Sponsor to prevent damage to and encroachment into the civil works project, such as storage of equipment and materials.

b. Proposed projects adjacent to a levee require special attention. Design and construction activities may adversely impact the structural integrity and stability of the levee. The CESWF will evaluate the proposed project design and coordinate with the Non-federal Sponsor and the Requester.

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