

**FEASIBILITY STUDY WORK PLAN
FOR
ENGINEERED EARTHEN-BOTTOM FLOOD CONTROL CHANNELS
LOCATED WITHIN THE
MALIBU CREEK AND DOMINGUEZ CHANNEL WATERSHEDS**

**MAINTAINED AND OPERATED BY THE
LOS ANGELES COUNTY FLOOD CONTROL DISTRICT**

**IN COMPLIANCE WITH THE
WASTE DISCHARGE REQUIREMENTS
FILE NUMBER 99-011-2010WDR**

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Attachment 1 Waste Discharge Requirements for Los Angeles County Flood Control District, Proposed Maintenance Clearing of Engineered Earth-Bottom Flood Control Channels, Los Angeles County (Order No. R4-2010-0021)

Attachment 2 Best Management Practices (BMP) Manual for Soft-Bottom Channel Clearing

1. Introduction

The Los Angeles County Flood Control District (LACFCD) owns and maintains numerous engineered soft-bottom flood control channels (SBC) within the County of Los Angeles (County). These channels convey storm flows from the canyons and nuisance flows from adjacent and surrounding areas. The LACFCD conducts annual maintenance on these SBC facilities to protect life and property from potential flooding, fire hazards, control vector nuisance issues, and for the facilities to efficiently and effectively function as intended.

In connection with the maintenance of these SBC facilities, LACFCD obtains permits from the Los Angeles Regional Water Quality Control Board (Regional Board) as well as other agencies. Generally, maintenance activities must be performed in accordance with a Clean Water Act (CWA) Section 404 permit issued by the U.S. Army Corps of Engineers (COE), with the Regional Board issuing a CWA Section 401 Water Quality Certification which contains conditions related to state water quality issues.

On February 4, 2010, the Regional Board adopted the Waste Discharge Requirements (WDR) for the maintenance of the aforementioned SBC channels (project) as part of the permit renewal process. The adopted WDR required a Feasibility Study (FS) to be conducted within six years for all the earth-bottomed channels, authorized in the WDR, in each watershed within the Los Angeles County. This Study Workplan addresses the FS for the Malibu Creek and Dominguez Channel (Combined) Watersheds.

2. Feasibility Study Requirements

Condition 45 of the WDR sets forth the basic goal of the FS, which is to “perform a study of the hydraulic capacity and existing conditions of all reaches covered by this WDR to determine where a potential may exist for native vegetation to remain within the soft-bottom portion of the channel or if additional hydraulic capacity is needed.” This condition also requires that LACFCD shall solicit input from stakeholders during Work Plan development and prior to the finalizing of the Technical Assessment Report and recommendations.

WDR Condition 47 further requires that the FS include at least the following components: Study Workplan (reflected in this document); Technical Assessment Report; and Recommendations. The requirements for the Study Workplan (SW) are set forth in WDR Condition 48, which states:

“Within 5 months of WDR issuance, a Workplan for the first watershed shall be submitted to the Regional Board Executive Officer for approval. The plan will include: a detailed plan for a hydraulic analysis of each earth-bottom segment in relation to the conveyance capacity of the upstream and downstream channels, in addition to the Water Quality Monitoring. The hydraulic analysis shall include, but not limited to, the height and density of vegetation in the earthen channel bottom and its effect on the conveyance capacity of flood flow in the channel and

shall include discussion of changes in expected stream flow in response to requirements of the Los Angeles County Municipal Separate Storm Sewer (MS4) NPDES Permit, Standard Urban Stormwater Mitigation Plans (SUSMPs), Total Maximum Daily loads (TMDLs) and other pertinent local plans including, but not limited to the Integrated/Regional Water Management Plan (IRWMP) (including implementation of, and plans for, increased stormwater infiltration), the City of Los Angeles' Integrated Resources Plan, the relevant watershed master plan and the LACFCD's Drought Management Plan. Several reasonable Manning's n should be used in the hydraulic analysis to evaluate the representative height of the channel for flood control and natural habitat purposes and should be in accordance with "Guide for Selecting Manning's Roughness coefficients for Natural Channels and Flood Plains," United States Geological Survey Water-Supply Paper 2339 or other appropriate guidance."

The assessment of biological functions and values of these reaches should be made such that comparisons of habitat type, maturity and extent of native or invasive plants can be made between reaches.

WDR Condition 50 sets forth the requirements for the Technical Assessment Report (TAR), which, in addition to requiring a hydraulic analysis of each reach in the subject watershed, also requires

"An assessment of the biological functions and values for each reach and an assessment of water quality as required. For each reach, the report shall address capacity requirements for flood control; design criteria and anticipated limitations; and an analysis either of potential areas where vegetation may remain and areas with the potential for restoration of native vegetation, or where justification exists to clear additional vegetated areas. For those areas where vegetation may remain, the technical assessment report should specify the amount(s) and type(s) of native vegetation that could remain in the channel."

Requirements for the Recommendations element of the FS are set forth in WDR Condition 51, which requires

"...that the document shall be submitted within seven months of Workplan approval to the Regional Board Executive Officer and shall include options where reaches where native vegetation may be allowed to remain or where native vegetation could be re-established. Recommendations shall also include suggested schedules of vegetation removal frequency in order to ensure the maximum habitat preservation, consistent with necessary flood control, is achieved. For recommendations approved by the Executive Officer, LACFCD shall make the necessary changes to the next years' Work Plan (Annual Work Plan), including proposals for additional BMPs as may be appropriate, and shall submit such changes to the Executive Officer 21 days prior to any clearing activities."

Additionally, pursuant to WDR Condition 49, water quality monitoring is required to be conducted during clearing activities for reaches within the watershed designated for a FS in a particular year and that monitoring is to be reported with the Technical Assessment Report, along with an assessment of BMP effectiveness.

3. Objective

This report constitutes the SW for engineered SBC within the Malibu Creek and Dominguez Channel Watersheds. This SW outlines the methodology, steps, and procedures of how the hydraulic study, biological studies, water quality monitoring, and stakeholders' notification elements of the FS will be performed and coordinated.

4. Workplan Elements

The following sections outline the elements that will be included in the FS.

4.1 *Hydraulic Analysis*

4.1.1 Location

This SW includes eleven defined SBC reaches in the Malibu Creek and Dominguez Channel Watersheds. These eleven SBC reaches vary in length from 56 feet (ft.) to as long as 3,584 ft. (see Table 1 for a complete listing and details of all eleven SBC reaches).

4.1.2 Approach

- a. Perform hydraulic analysis using the COE's Hydrologic Engineering Center River Analysis System computer program for the eleven SBC reaches to determine whether the flood control has capacity for each channel reach.
- b. For SBC reaches identified as having excess flood control capacity, further hydraulic analysis will be performed, in consultation with a biological consultant, to evaluate what level of vegetation could be implemented consistent with the LACFCD's flood control objectives for those reaches.
- c. For SBC reaches identified as having inadequate flood control capacity to meet the LACFCD's flood control objectives, further hydraulic analysis will be performed, in consultation with a biological consultant, to evaluate the amount and type of vegetation to be removed in order to meet the LACFCD's flood control objectives for those reaches.

4.1.3 Office and Field Investigations

- a. As-built and other plans, including those for channels, structures, bridges, and utilities, along with topographic mapping, and field surveys within the study

- area, shall be collected and reviewed to determine channel configuration and conditions.
- b. For locations where as-built and other plan data are not available, LACFCD shall research, collect, organize, and review all readily available spatial data.
 - c. Field investigations shall be conducted for all eleven SBC reaches of the Malibu Creek and Dominguez Channel watersheds to verify channel geometry, stability, and roughness values. The field investigations shall occur between mid-July and mid-September when channel reaches are expected to contain the maximum amount of vegetation re-growth, prior to vegetation removal during fall maintenance activities. The existing vegetation shall be observed taking note of type, density, and size. All the SBC reaches shall be photographed for documentation purposes.
 - d. LACFCD shall research, collect, organize, and review all readily available hydrologic studies as well as other documentation pertaining to the eleven SBC reaches of the Malibu Creek and Dominguez Channel Watersheds.

4.1.4 Hydraulic Analysis Modeling

- a. LACFCD shall prepare one-dimensional steady-flow hydraulic models for all the project reaches using HEC-RAS.
- b. The cross section locations and intervals will be coordinated to ensure consistency and to make certain the channel and project areas are completely and adequately represented in the models.
- c. Hydraulic roughness coefficients for all project reaches shall be determined using field notes, aerial photographs, and several hydraulic references. The hydraulic roughness coefficients shall be representative of observed field conditions and correlated with biological consultant's vegetation transect surveys.
- d. The hydraulic references that will be used to determine the hydraulic roughness coefficients shall include "*Open-Channel Hydraulics*" by Ven T. Chow and "*Guide for Selecting Manning's Roughness Coefficients for Natural Channels and Flood Plains*," United States Geological Survey Water-supply Paper 2339 (1984).
- e. The general modeling guidelines for bridges shall be followed. For vertical piers, 2 feet of debris accumulation on each side of each pier shall be assumed and loss coefficients and other data shall be adjusted accordingly. For piers with sloping extensions, 2 feet of debris accumulation for a distance up to 6 feet below the water surface shall be assumed.

- f. LACFCD shall perform the steady flow computations using HEC-RAS for the design flow rates for each project reach.
- g. The limits for data collection upstream and downstream of the study reach shall be at a distance such that any user-defined boundary condition won't affect the results within the study reach.
- h. LACFCD shall run the hydraulic analyses under a mixed flow regime. Manning's equation shall be used to compute normal depth as the starting water surface boundary condition. A sensitivity analysis may be performed by selecting other starting water surface boundary conditions to ensure that the limits for data collection upstream and downstream of the study reach are sufficient.
- i. LACFCD shall include discussion of changes in expected stream flow in response to requirements of the MS4, NPDES Permit, SUSMP, TMDL, and other pertinent local plans, as required by WDR Condition 48.

4.1.5 Hydraulic Analysis Report

LACFCD shall prepare a Hydraulic Analysis Report (HAR) that documents and summarizes the hydraulic analysis performed for each SBC reach. The HAR shall include a written narrative that describes the hydraulic characteristics of the project study areas. The report shall also contain sufficient detail (e.g., tables, equations, graphic displays, and example computations) to allow an independent assessment of the soundness of the report's analysis and conclusions.

4.2 Biological Technical Assessment

The biological studies described in this SW will be conducted at each of the eleven SBC reaches by a biological consultant to the LACFCD.

4.2.1 Literature Review

The biological consultant will conduct a literature review to review and update existing information gathered through the SBC maintenance program about species that have been afforded special status by state, federal, and local resource agencies and which have a potential to occur within the Malibu Creek and Dominguez Channel Watersheds.

Sources to be reviewed include:

- a. Special status species lists from the California Department of Fish and Wildlife (CDFW), U.S. Fish and Wildlife Service (USFWS), and California Native Plant Society (CNPS);
- b. Database searches of the California Natural Diversity Database (CNDDDB) and the Electronic Inventory of the CNPS;

- c. Most recent Federal Register listing package and critical habitat determination for each federally listed Endangered or Threatened species potentially occurring within the project areas;
- d. CDFW's Annual Report on the status of California's listed Threatened and Endangered plants and wildlife; and
- e. Other relevant biological studies conducted in the Malibu Creek and Dominguez Channel Watersheds.

4.2.2 Field Surveys

The biological consultant will conduct field surveys with a qualified botanist and wildlife biologist to identify the plant and wildlife species present at each of the eleven channel reaches. The vegetation types and wildlife habitats will be described, mapped, and quantified.

The surveys are expected to be conducted during the summer season, prior to the initiation of the LACFCD's fall channel maintenance activities, when the majority of plant species present at the channel reaches will be identifiable. Note that the surveys for special status plant species (Section 4.2.4) will be conducted during the spring season. Because most migratory birds move through the region in spring, only the breeding birds should be present during this summer survey. A vegetation map will be produced and included with the final biological TAR. Photographs of existing conditions will also be obtained.

4.2.3 Vegetation Transect Data Collection

Two sets of vegetation transect data will be collected for each of the eleven SBC reaches. The primary purpose of these surveys is to determine the relative amounts of non-native vegetation vs. native vegetation in the SBC reaches before and after annual maintenance.

The first set of transects will be performed during the summer season prior to initiation of the annual fall maintenance activities.

The second transect set will be conducted as soon as possible after completion of fall maintenance activities. Transect number and location will be correlated with the hydraulic roughness coefficients developed by the LACFCD's hydraulic analysis.

The first set of transects is expected to be completed in August, following LACFCD's summer field surveys.

To the extent practical, vegetation transects will be conducted at those areas within each channel reach that are identified with unique hydraulic roughness coefficients. Each transect will be conducted to measure vegetation cover and species diversity using the point-intercept method. Unless there is a high diversity of plant species, the point-intercept method is generally equivalent to the more time-consuming line-intercept

method. Since the flood control channels in general reflect relatively low plant species diversity, the point-intercept method will be used for these channel reaches.

Global Positioning System data points will be collected for each of the transect locations. Transects will be conducted perpendicular to the stream (“bank to bank”) and will be of varying width. Transect locations will include “maintained areas” of the channel reach in order to provide comparison between pre–maintenance conditions and post–maintenance conditions.

4.2.4 Focused Surveys for Special Status Plant Species

Focused Surveys for Special Status Plant Species will be conducted for each of the eleven SBC reaches during the blooming periods for each of the plants, which vary depending on rainfall and temperature. Therefore, reference populations will be monitored to determine the appropriate survey time (generally between March and July).

Since blooming periods for special status plant species typically overlap, surveys in early spring and in late spring are expected to cover the special status species. A total of four surveys are planned for the eleven SBC reaches to occur in April through July.

The focused surveys will be conducted at each of the eleven SBC reaches according to current protocols developed by CDFW. Field notes will be taken during the surveys. If any special status plant species are found, the location of each population will be mapped and voucher specimens will be collected and deposited in an appropriate herbarium to ensure the accuracy of the identification.

Any special status species observed will be reported to the CNDDDB.

4.2.5 Focused Surveys for Threatened and Endangered Wildlife Species

Focused surveys for Threatened and Endangered wildlife species are conducted on a regular basis for the SBC maintenance program. These surveys are conducted annually for Threatened and Endangered fish, and bi-annually for Threatened and Endangered Amphibians and Birds. Surveys for the federally Endangered and California Species of Concern arroyo toad (*Anaxyrus californicus*), and the state and federally endangered least Bell’s vireo (*Vireo bellii pusillus*) and southwestern willow flycatcher (*Empidonax traillii extimus*) were initiated in 2002 and 2003 at channel reaches selected by the USFWS for their potential to support this amphibian and two bird species. Besides 2002 and 2003, these surveys were conducted in 2005, 2007, 2009, 2011, and 2013.

Of the eleven SBC reaches included in the FS for the Malibu Creek and Dominguez Channel Watersheds, there is no potential habitat for the arroyo toad. Potential habitat, however, is present at channel reaches #27 (Wilmington Drain) and #28 (Triunfo Creek) for the least Bell’s vireo and southwestern willow flycatcher. The results of current and previous surveys at these SBC reaches will be included in the biological technical assessment.

4.2.6 Migratory Bird Surveys

Four migratory bird surveys will be performed at channel reach #28 (Triunfo Creek) in the Malibu Creek Watershed during the fall migration period in southern California (August to November). These survey results will be combined with the results of previous spring focused surveys (see section 4.2.5 above) to evaluate the overall use of migratory birds in this SBC reach. The results of these surveys and previous surveys for migratory birds will be included in the biological technical report.

4.2.7 California Rapid Assessment Method Surveys

The ecological condition of each of the eleven SBC reaches will be evaluated using the California Rapid Assessment Method (CRAM). The CRAM results will allow for comparison among the eleven channel reaches in the Malibu Creek and Dominguez Channel Watersheds as well as other channel reaches maintained by the LACFCD. This analysis will also facilitate future monitoring activities to evaluate changes in the condition of these channel reaches over time.

Upon completion of the field work for this assessment, the biological consultant will input the collected data into the state-wide CRAM database as required by the CRAM technique. All data collection and data management will be performed in strict accordance with the protocols described in the CRAM User's Manual. The final score generated by the assessment will be incorporated into the biological technical assessment.

4.2.8 Biological Technical Assessment Report

After collection of all post-maintenance vegetation transects data, a biological technical assessment report will be prepared that documents plant and wildlife species observed at each of the eleven SBC reaches.

The Biological Technical Report will include:

- a. Methodology used to conduct the biological surveys and vegetation transects;
- b. Description of the existing vegetation types and associated wildlife resources, including maps of existing vegetation types for each of the eleven SBC reaches;
- c. Results of focused surveys for special status plant and wildlife species in the SBC reaches;
- d. Results of migratory bird surveys;
- e. CRAM results for the ecological condition of all eleven SBC reaches;

- f. Comparison of biological functions and values among each of the eleven SBC reaches;
- g. Comparison of vegetation transects with hydraulic roughness coefficients;
- h. Value rankings based on biological function and value for each of the eleven SBC reaches.

4.2.9 Recommendations

The value rankings developed for each of the eleven SBC reaches in the biological technical assessment will be correlated with the hydraulic analysis to develop recommendations regarding where and what vegetation should be removed and/or can be allowed to remain. The value rankings will also include suggested schedules of vegetation removal frequency in order to ensure maximum habitat preservation is achieved, consistent with the LACFCD's flood control objectives.

If the hydraulic analysis indicates that any of the eleven SBC reaches can support additional native vegetation, value rankings in the biological technical assessment will be used to identify appropriate areas for re-establishment of such vegetation.

4.3 *Water Quality Monitoring and Best Management Plan*

The WDR requires Water Quality (WQ) Monitoring and Best Management Practices (BMP) activities to be analyzed.

WDR Condition 49 states:

“The objectives of the water quality monitoring are to assess BMP effectiveness and to ensure that water quality is not impacted as a result of the proposed maintenance activities, or surface water diversion. BMPs are to be implemented in association with maintenance activities to avoid impacts to water quality which would result in exceedances of water quality standards.

As part of the Feasibility Study, water quality assessments within each reach will be required on a one-time basis before, during, and after maintenance clearing activities. Each project reach will require three (3) sampling stations: upstream of the project; within the project; and downstream of the project reach.

The testing parameters required will be the same as for Surface Water Diversion.

- pH
- temperature
- dissolved oxygen
- turbidity
- total suspended solids (TSS)

Downstream TSS shall be maintained at ambient levels. Where natural turbidity is between 0 and 50 Nephelometric Turbidity Units (NTU), downstream increases shall not exceed 20%. Where natural turbidity is greater than 50 NTU, downstream increases shall not exceed 10%.

Analyses must be performed using approved US Environmental Protection Agency methods, where applicable.

These constituents shall be measured at least once prior to the maintenance activity and then monitored for on a daily basis during the first week of maintenance activities, and then on a weekly basis, thereafter, until the work is complete. When reaches are within the watershed designated for a FS in a particular year, WQ monitoring should be conducted for those reaches as part of the FS and reported with the TAR.

Any exceedances of water quality standards may result in corrective and/or enforcement actions, including increased monitoring and sample collection.”

The following is the process by which LACFCD will implement the WQ Monitoring.

4.3.1 Baseline/Pre-Project Monitoring

1. Pre-Project Monitoring to establish natural channel conditions
 - a. Shall be conducted within a week prior to start of maintenance work
 - b. Field Reconnaissance Cleanout operations/approach/methods
 - c. Identify scope of project; Location and type of BMPs
 - d. Identify estimated duration
2. Define upstream (U), within project (W) and downstream (D) sampling points
3. Record the following WQ data at U/W/D sampling points
 - a. Field measurements
 - pH
 - Temperature (T)
 - Turbidity
 - b. Lab samples
 - Dissolved O₂; Standard Method (SM) 4500-OG
 - Total Suspended Solids; SM 2540/EPA 160.2
 - Deliver samples to lab
 - c. Lab results
 - Normal turn-around time = 7 days

4.3.2 During-Project Monitoring

1. During the first week of project, conduct water sampling once a day
2. Appropriate BMPs shall be installed downstream prior to water sampling and start of work

3. For subsequent weeks, conduct water sampling once a week
4. Check in with Crew Leader, Foreman, etc.
 - a. Discuss changes in project scope/duration
 - b. Discuss WQ measurements
 - c. Maintenance of BMPs
5. WQ monitoring/sampling at U/W/D sampling points
 - a. Field measurements
 - b. Lab samples
 - c. Outside influences on WQ
6. E-mail/Phone call notification to Project Manager if turbidity measurements exceed WDR limits
7. Field crews to implement appropriate modifications to BMPs, which may include stopping work, increasing BMPs, and/or perform additional monitoring and sampling, as necessary

4.3.3 Post-Project Monitoring

1. Shall be conducted within seven days of completion of maintenance activities, in natural channel conditions
2. Take post-project WQ monitoring/sampling at U/W/D sampling points
 - a. Field measurements
 - b. Lab samples
 - c. Outside influences on WQ
3. Finalize field data sheets
4. Prepare figures of U/W/D sampling points
5. Receive lab reports
6. Submit final data within 30 days from the final sampling date for submittal to the Regional Board

4.3.4 Best Management Plan

1. Determine which BMPs to implement to avoid impacts to WQ or that would result in exceedances of WQ standards.
2. No indirect impacts to WQ or beneficial uses.
3. No downstream impacts to WQ during maintenance or operation
4. No WQ impacts during periods between maintenance activities or upon completion of maintenance activities.

4.3.5 Water Quality Data Analysis Submittal

A summary of WQ testing results, in tabular format, will be prepared for each reach that had WQ monitoring performed. Tables will provide data collected from before, during, and after the cleanout for the three (3) sampling stations. Comments regarding observed site conditions, BMPs installed on site, recommended modifications to BMPs, significant communications with field staff, and explanations for changes to previous conditions and measurements will be included.

4.4 Stakeholder Solicitation

In compliance with the WDR, the LACFCD will solicit stakeholder input and to make information on maintenance activities for SBC reaches readily available to the public. The list of stakeholders will include affected and interested parties, municipalities, environmental groups, and other organizations.

4.4.1 Objective

The LACFCD will solicit stakeholder input during the development of the FS SW and prior to the finalization of the TAR and Recommendations. In addition, prior to any maintenance activities, watershed maps that specify areas of maintenance and an approximate maintenance schedule shall be published on the LACFCD website. Stakeholders shall be notified of these activities. After submission to the Regional Board's Executive Officer, LACFCD shall post the Annual Project and Mitigation Monitoring Reports on the LACFCD website.

4.4.2 Stakeholder Identification

LACFCD shall compile a list of watershed stakeholders consisting of interested parties, municipalities, environmental groups, and other organizations that are either affected by the LACFCD's maintenance activities in the watershed or that have expressed interest.

4.4.3 Preparation for Soliciting Stakeholder Input

LACFCD shall send a letter to the mayors of affected cities within which the soft-bottom channel maintenance activities are occurring and an e-mail for all other identified stakeholders notifying them of the availability of the Work Plan for their review and comment. This notification will include the deadline for the submittal of comments and will also note that the TAR Report and Recommendations that will be available for review and comment in the future.

4.4.4 Soliciting Stakeholder Input

Upon receiving stakeholder comments, LACFCD shall compile, organize and incorporate, as appropriate, the comments into the SW.

4.4.5 Technical Assessment Report and Recommendations

Upon finalizing the draft TAR and Recommendations, LACFCD shall notify the stakeholders of the availability of the draft report and the opportunity for their review and comment. LACFCD shall organize and incorporate the comments, as appropriate, into the final Technical Assessment Report and Recommendations.

4.4.6 Information Access on LACFCD Internet Website

Prior to any maintenance activities within the eleven channel reaches, watershed maps shall be published on the LACFCD website and information shall be provided regarding the scheduled maintenance activities. The information posted for scheduled maintenance activities shall include the proposed schedule; description of the channel reach existing conditions; area of proposed impact; and description of any existing aquatic resources. The Annual Project and Mitigation Monitoring Reports shall also be posted on the LACFCD website.

4.4.7 LACFCD Internet Website for Soft-Bottom Channel Maintenance

The LACFCD website will include the watershed maps, scheduled maintenance activities, Annual Project Report, and Mitigation Monitoring Report. LACFCD shall also notify the stakeholders of the address for this website. LACFCD will update the watershed maps and the Annual Project and Mitigation Monitoring Reports approximately once a year and the scheduled maintenance activities approximately once a week (depending upon activities), during appropriate times of the year.