

4. Operations and Maintenance

4.1. Introduction

Operations and Maintenance (O&M) is the physical operation of the flood control system, as well as the ongoing maintenance of the associated infrastructure. This includes but is not limited to: erosion and wave wash repair and prevention, crack control resulting from settlement, slope stability repair due through seepage and under-seepage, animal burrow control, and repair, maintenance, removal and repair of penetrations through the levee, managing encroachments and vegetation, depression/rutting, subsidence/settlement, and providing security of the levee system against vandalism and terrorism. (More recently the term Operations, Maintenance, Repair, Replacement, and Rehabilitation (OMRR&R)) is being used to refer to the obligations of levee maintaining agencies. For the purposes of this document the term O&M will be used.) O&M must be performed on a regular basis in accordance with the manuals and procedures provided and updated to meet requirements as prescribed by inspection criteria of the various agencies and programs and that have jurisdiction.

During development of the MUSR RFMP one of the most deliberated issues was the growing challenges local levee maintaining agencies (LMAs) must deal with to effectively operate and maintain the current flood control system to provide the flood control benefit it was originally designed to provide. The current flood system of levees, weirs, and bypasses was largely developed as a 'single purpose' system with the goal to reduce flooding and flood damages. The system development did not necessarily account for or accommodate the natural environment. Since development of the system new laws such as the Endangered Species Act, and changes in societal aspirations for the preservation of the natural environment, have created challenges and conflicts in managing, and operating the flood control system. This has particularly become an issue for rural levee maintaining agencies as they are not sufficiently funded to manage these emerging challenges.

4.2. Background

The California Central Valley Flood Control Association (Association) was established in 1926 to promote the common interests of its members in maintaining effective flood control and protection in the California Central Valley. The Association has been and continues to be actively involved in advancing and advocating for effective flood management in both rural and urban areas. To support the regional flood management planning effort underway throughout the Central Valley, the Association established the Rural LMA Work Group (Workgroup) in late 2012 with the purpose of identifying and describing problems faced by rural areas and proposing solutions/actions for inclusion in the Regional Flood Management Plans (RFMP). This effort was based on the Workgroup's belief that sustainable, system-wide flood management must consider the role of rural communities and agricultural areas, which provide the opportunity to realize multiple objectives identified in the 2012 Central Valley Flood Protection Plan. While

the initial focus was on rural LMA issues, it became clear that urban LMAs are facing many of the same challenges, and the issues discussed here are not exclusively rural issues.

The Workgroup identified a number of O&M related issues including:

Channel, Bank, and Bypass Maintenance – Insufficient maintenance of channels and banks of the Sacramento flood control system is adversely impacting its carrying capacity and performance and is compromising the ability of LMAs to maintain PL84-99 eligibility for their levee systems, as channel migration can lead to levee erosion. Barriers to performing adequate maintenance include: insufficient funding and resources; timing and costs associated with environmental and regulatory restrictions; competing maintenance priorities; and completing interests and mandates of federal and state regulatory and resource agencies, and flood system maintenance agencies.

Permitting and Maintenance Activities – Many maintenance activities are exempt from NEPA and CEQA but require compliance with other laws such as State and federal endangered species laws and California’s Fish and Game Code for lake and streambed alteration law. Compliance with such laws is usually achieved through a project by project permitting process that is often burdensome, lengthy, and expensive.

Maintenance of Mitigation and Habitat Enhancement Projects – The increasing number of mitigation planting and habitat enhancement projects within the channels, bypasses, and other floodways of the Sacramento and San Joaquin River flood systems together with existing ‘legacy’ mitigation and habitat enhancement projects is compounding the already challenging regulatory environment faced by levee maintainers. Failure to properly plan, fund (including long-term funding), maintain and manage mitigation and habitat enhancement projects can result in adverse impacts to hydraulic capacity, conveyance, and ability to inspect, monitor, maintain, and flood fight. Further, plantings are migrating beyond their original project limits and the lack of “safe harbor” agreements is creating financial and operational constraints for the LMAs. (For example vegetation growth within the Sutter National Wildlife Refuge has been identified as an impediment to flood flow conveyance within the Sutter Bypass. DWR has been assisting USFWS address this vegetation growth issue and significant progress has been made. However there is no permanent funding mechanism in place that ensures current maintenance levels will be maintained long term.)

Rodent and Burrowing Animal Control – The presence of rodents on levees is a historic and ongoing problem that poses a threat to levee integrity due to increased seepage penetration into the levee and interior and exterior erosion causing voids and levee stability issues via the burrows the rodents create.

Pipe Maintenance and Inspection – LMAs lack the enforcement authorities for inspection and maintenance of private and certain public pipe penetrations in their levees. The Central Valley Flood Protection Board (CVFPB), as the authorizing agency, has issued the encroachment permits for these facilities and holds the enforcement authority through the encroachment permits. In light of reluctance of pipe owners to properly inspect and maintain their pipes, there is a need to develop clear enforcement action and also develop other cost effective methodologies for performing the inspections that do not solely rely on video and sonar.

Encroachments – Undocumented encroachments and non-compliant encroachments present safety and legal challenges for LMAs.

Eligibility in the PL84-99 RIP – Inactive status in the Rehabilitation and Inspection Program (RIP) results in a loss of eligibility for Federal PL 84-99 rehabilitation assistance (i.e., funding) following an emergency event and Sponsors and LMAs would therefore be faced with rehabilitating damaged levees using all non-federal funds. It is not feasible for Rural LMAs to design, implement, and fund rehabilitation of levees following an emergency event without federal assistance. Since LMAs are unable to fund or otherwise implement repairs, it is unclear who would make the repairs and if this responsibility would fall on the State as the non-federal sponsor. Currently, the majority of the MUSR levee system is inactive in the RIP and is ineligible for Federal PL 84-99 rehabilitation assistance

Flood Structure Protection Area – Flood protection structures can be adversely impacted by land use decisions which do not fully consider how the activity is integrated into a region's flood protection requirements and systems. Creation of a consistent process is needed to allow LMAs the ability to review land-use activities in the vicinity of flood protection structures so that the activities do not conflict with the design, construction, maintenance, operation of the LMA's facilities, and do not compromise or impair the system's integrity.

Funding - Some LMAs are responsible for maintenance of system-wide improvements but receive no funding assistance from the system-wide beneficiaries. The burden of maintaining and operating the system falls on a relatively small number of local landowners. Funding programs need to be developed and implemented that include all beneficiaries.

Following below is a more detailed discussion of the identified O&M issues and potential solutions which should be considered.

4.3. Issues & Solutions

4.3.1. Channel, Bank, and Bypass Maintenance

Insufficient maintenance of channels, banks, and bypasses of the flood control system is adversely impacting its carrying capacity and performance and is compromising the ability of LMAs to maintain PL84-99 eligibility for their levee systems. Barriers to performing adequate maintenance include: insufficient funding and resources; timing and costs associated with environmental and regulatory restrictions; competing maintenance priorities; and competing interests and mandates of federal and state regulatory and resource agencies, and flood system maintenance agencies.

Water Code section 8361 indicates that the California Department of Water Resources must maintain specific enumerated project features, including the “channels and overflow channels” of the Sacramento River and tributaries, while the local maintaining agencies are responsible for other features, including levees. However, the DWR's Channel Evaluation and Rehabilitation program for the Sacramento system has been hindered at times by budget and environmental constraints. This has resulted in banks that have eroded into levees, channels that have become

overgrown with vegetation, and overflow channels that have seen increased sediment deposition, resulting in decreased carrying capacities of the system and as a result are negatively affecting levee inspection ratings.

As part of assuming maintenance responsibility for the Sacramento River Flood Control System, the State agreed to comply with the regulations of the United States Army Corps of Engineers (USACE) as defined in the Standard Operation and Maintenance Manuals for the Projects (USACE, 1955). In the manual, Section VI, Channels, describes “The channels of the project constitute that part of the waterway which lies between the levees of the Sacramento River...and all tributary and distributary streams.” The manuals go on to describe the maintenance requirements of the channels and floodways in Section 6-02, paragraph a.1, which includes “(i) The channel or floodway is clear of debris, weeds, and wild growth;” as well as “(iv) Banks are not being damaged by rain or wave wash, and that no sloughing of banks has occurred.” Finally, paragraph b of the same section requires that “(1) Weeds and other vegetal growth in the channel shall be cut in advance of the flood season and, together with all debris, removed from the channel; and... (4) Dumped rock or other suitable types of protection should be placed at locations found by experience to be critical trouble points, with a view to stabilizing the channel alignment and preserving the general uniformity of the bank lines.”

The above requirements of the O&M manuals for the Sacramento River system have not consistently been met. This may be the result of State funding constraints, difficulty in meeting regulatory requirements for sensitive resources, or simply a lack of prioritization. As a result, LMAs are encountering issues with overgrown channel vegetation encroaching onto levees resulting in decreased channel capacity and non-compliance with levee vegetation standards; bank erosion that has encroached into the levee section and resulting in compromised levee stability; and an increase in unacceptable levee inspections resulting from these State responsibilities that may impact the ability of the State to receive federal assistance following a flood event.

Potential solutions which should be considered include:

- That the State recognize and accept the definition of channels as clearly described in Section VI of the Standard Operation and Maintenance manual as “The channels of the project constitute that part of the waterway which lies between the levees of the Sacramento River ... and all tributary and distributary streams.”
- That the State should work with the USACE to update the standard Operation and Maintenance manuals for both the Sacramento River System to establish appropriate channel maintenance measures that both preserve the design capacity with consideration for the ecosystem function of the river channels and floodways. Current O&M standards are outdated and no longer feasible.
- That the State and LMAs should work with Regulatory Agencies on long-term maintenance plans to avoid the need for mitigation. These plans could limit the areas for sediment removal, vegetation thinning or removal, or slope protection in areas where the channel is encroaching within 35 feet of the levee. Maintenance measures and standards would include best management practices and be covered in mutually developed maintenance agreements to avoid lengthy and costly environmental consultation.

- That the State develop a dedicated and reliable Statewide funding mechanism to provide a minimum annual revenue stream to support channel and bank maintenance.

4.3.2. *Permitting and Maintenance Activities*

Many maintenance activities are exempt from NEPA and CEQA but require compliance with other laws such as State and Federal endangered species laws and California's Fish and Game Code lake and streambed alteration law. Compliance with such laws is usually achieved through a project by project permitting process that is often burdensome, lengthy, and expensive.

Compliance with the State and Federal endangered species acts (ESA) presents a difficult challenge primarily because mitigation requirements for activities impacting listed species are changing (e.g. giant garter snake and rodent hole grouting), and the process to obtain permits is burdensome and lengthy often times delaying maintenance or forcing LMAs to conduct their maintenance without consultation or risk eligibility in federal rehabilitation programs. This dilemma is particularly concerning for rural LMAs because they lack the financial resources to rehabilitate the levees following any event without federal assistance. Further, LMAs lack the resources to implement costly mitigation measures.

In addition to ESA issues, other regulatory permits such as Clean Water Act Section 401 and 404 also are required from time to time. Also notification to California Department of Fish and Wildlife (CDFW) for a streambed alteration permit is required for any activity that will substantially divert or obstruct the natural flow of the river; substantially change or use any material from the bed, channel, or bank of a stream; or deposit or dispose of debris, waste or other material where it may pass into a river. CDFW contends that Section 1600 applies to areas from the top of levee waterside hinge point crown to the water and wetted channel. While there is disagreement between the LMAs and CDFW on what actions constitute substantial, both parties have been relatively successful in moving forward with streambed alteration agreements enabling maintenance activities to proceed.

Levee maintenance requirements were prescribed by USACE decades prior to ESA laws upon turnover of the Sacramento River flood control system. LMAs have adjusted their maintenance methodologies to accommodate these laws and the listings of species but common maintenance practices that in the past were not considered to affect listed species now are making it difficult to meet obligations for levee maintenance without first engaging in time consuming and expensive consultation and permitting processes. Potential solutions which should be considered include:

- A regional programmatic agreement or framework for permits with the resource agencies could provide an effective avenue for permitting that enables the LMAs to conduct their maintenance activities while considering the interests of listed species and resources. Agreements could be tailored for the species, timelines, etc. For example giant garter snake and rodent hole grouting.
- Setting aside designated mitigation areas or providing pre-mitigation (advance mitigation).

- Reaching agreement on standard avoidance and minimization measures (timing and/or phasing of maintenance activities) at a regional level to avoid “adverse impact” finding by resources agencies.

4.3.3. *Maintenance of Mitigation and Habitat Enhancement Projects*

The increasing number of mitigation planting and habitat enhancement projects within the channels, bypasses, and other floodways of the Sacramento River flood system together with existing ‘legacy’ mitigation projects is compounding the already challenging regulatory environment faced by levee maintainers. Failure on the part of some ‘habitat implementers’ to properly plan, fund (including long-term funding), maintain and manage mitigation and habitat enhancement projects can result in adverse impacts to hydraulic capacity, conveyance, and ability to inspect, monitor, maintain and flood fight. (For example vegetation growth within the Sutter National Wildlife Refuge as mentioned earlier). These impacts combine to reduce the flood system’s resilience and robustness. Further, plantings are migrating beyond their original project limits and the lack of “safe harbor” agreements is creating financial and operational constraints for the LMAs.

Rural LMAs recognize that when trying to accomplish specific goals, such as species recovery for example, there is value in implementing mitigation and enhancement projects within the flood control system. However, LMAs are being adversely affected both financially and operationally as they cannot perform proper levee maintenance due to increased costs, permitting, or inability to access, inspect and perform repairs within those sites. This in turn can impact the status of the levee system in the PL 84-99 Rehabilitation and Inspection Program. Potential solutions which should be considered include:

- Identity which types or habitat/mitigation creation are the most problematic for flood control system operations;
- Limit enhancement/mitigation within floodways to species which must have riparian locations.
- Examine in a comprehensive regional manner, the goals, objectives and necessity for mitigation planting and habitat enhancement within the flood control system;
- Identify and securing sustainable funding for long term maintenance;
- Define maintenance roles and responsibilities;
- Obtain long-term (programmatic) regulatory permissions to perform levee maintenance without the need for additional mitigation;
- Include LMA in the planning, design and implementation process;
- CVFPB more actively monitor and enforce permits issued for habitat/mitigation; and
- Provide safeguards to neighboring landowners and levee maintaining agencies when the habitat and/or species migrate beyond their original project limits.

4.3.4. *Eligibility in the PL84-99 Rehabilitation and Inspection Program*

Inactive status in the Rehabilitation and Inspection Program (RIP) results in a loss of eligibility for Federal PL 84-99 rehabilitation assistance (i.e., funding) following an emergency event and Sponsors and LMAs would therefore be faced with rehabilitating damaged levees using all non-federal funds. It is not feasible for Rural LMAs to design, implement, and fund rehabilitation of levees following an emergency event without federal assistance. Since LMAs are unable to fund or otherwise implement repairs, it is unclear who would make the repairs and if this responsibility would fall on the State as the non-federal sponsor.

Levee systems are inspected through the USACE RIP. Systems that receive unacceptable ratings through either routine or periodic continuing eligibility inspections are placed on inactive status in the RIP, which affects the amount and type of federal funding assistance for which a non-federal sponsor may be eligible following a flood event.

A system status of inactive in the RIP results in a loss of PL 84-99 rehabilitation assistance following a flood event. It does not necessarily result in a loss of FEMA NFIP certification or accreditation nor does it result in a loss of federal assistance for emergency flood fighting. A system status of active in the RIP does not guarantee rehabilitation assistance will be provided, only that it is eligible. Rural LMAs may have difficulty meeting the benefit cost ratio requirements in order to receive the rehabilitation assistance.

Flood control works that are eligible for USACE's RIP program, either Active or Inactive, are ineligible for assistance from FEMA for emergency repairs and permanent restoration. (FEMA may provide assistance for the placement and removal of flood fighting measures (e.g., sandbags, buttresses) on flood control works that are eligible for USACE's RIP program if such activity is necessary to eliminate an immediate threat to life, public health and safety, or improved property).

Loss of eligibility in the PL 84-99 RIP would mean that the LMAs and the State of California would have to fully fund rehabilitation following a high water event. Neither the State nor the Rural LMAs have sufficient budgets to fund the increased rehabilitation costs.

The State now requires a local partnership agreement for many new projects including those funded under Propositions 1E and 84. Clauses in this agreement, also referred to as a "local O&M agreement", include a requirement for the LMA "to continue to participate in and comply with the policies and procedures of the USACE Rehabilitation and Inspection Program" as well as Section 208.10. It is unclear how this requirement and the inability to meet this requirement affect rural LMAs.

System-Wide Improvement Frameworks (SWIFs) provide one avenue to maintain eligibility in the RIP and thus receive rehabilitation assistance while addressing long-term maintenance or repair deficiencies. Also SWIFs provide a federal nexus for a Section 7 consultation. Several LMAs in the Regions wish to pursue SWIFs but questions remain as to how their development and implementation will be funded. In addition, it is essential that the USACE, CVFPB, and the LMAs jointly and cooperatively confer about common understandings and reasonable corrective actions to address levee deficiencies identified in the PIRs. LMAs have urged DWR to allow for

development of SWIFs as part of the next phase of the regional flood management planning process as loss of PL84-99 eligibility may have cost implication for the State. Also development of SWIFs can help; optimize system performance, resiliency and robustness; improve regional coordination; encourage sharing of regional resources; remove institutional barriers; and create institutional frameworks to promote project implementation, all of which are key aspects of the 2012 CVFPP and the SSIA.

4.3.5. *Rodent and Burrowing Animal Control*

The presence of rodents on levees is a historic and ongoing problem that poses a threat to levee integrity due to increased seepage penetration into the levee and interior and exterior erosion causing voids and levee stability issues via the burrows the rodents create.

It is imperative that every LMA has an aggressive rodent abatement and damage repair and prevention program. Diligent efforts to eradicate burrowing animals are a necessity, and eliminating them from an infested levee is extremely difficult. Control of these animals and the damage they create must be pursued frequently and persistently to ensure safety of the levee during both normal conditions and high water events.

Adequate rodent control is a two-part maintenance process of eradicating the rodents and properly filling their burrows. Where possible steps should also be taken to reduce/eliminate conditions that attract rodents. The more rodents in an area and the longer they have been there, the greater the threat due to greater loss of levee material and further increase in populations. Voids within the levees cannot be easily detected, and therefore, pose a significant risk to levee integrity and stability. Interpretation of environmental laws and regulations by various resource agencies, differing methods, the presence of listed species, and other environmental factors, can limit the periods during which poison bait can be utilized and other methods can be employed to control rodents. The implementation of these regulations may be in conflict with the approved and allowed proper use of the compounds being applied and often conflict with the optimal timing for successful control. Complete eradication of rodents is difficult. However, a well-managed eradication program vigorously applied throughout the year can keep populations and concentrations of rodents under reasonable control.

Coupled with aggressive rodent abatement, thorough repair of levees damaged by burrowing rodents is essential to minimize risks posed to levee integrity. Damage repair can be achieved by excavation and re-compaction of burrows, filling holes with grout slurry, and other comparable methods. Regardless of the method of rodent burrow damage repair, voids must be filled to minimize risk to levees. Past practices of simply dragging over the rodent holes to cover them is inadequate, and does not fill the voids left by rodent infestation. Potential endangered species act (both CESA and ESA) impacts during rodent burrow repair activities in some locations have been expressed as a concern by resource agencies. Potential solutions which should be considered include:

- Facilitation through environmental compliance regulatory processes and relief from some limitations of how and when eradication actions can be performed.

- Funding to assist in the purchase and use of specialized equipment and services such as grouting machines, hiring licensed trappers and performing biological assessments to determine potential impacts to other desirable species as well as provide options for more effective control programs.
- Establish guidelines for habitat projects that could become a source of rodents. An example of this might be the development of habitat that could create a breeding area for beaver and muskrats that will migrate and take up residence in a levee.
- Establish procedures and guidelines for removal of rodent habitat and food sources.
- Establish funding and programs to work with local property owners, the farming community, and agricultural commissioners to coordinate rodent abatement activities on properties near the flood protection system, to minimize threats to levee integrity and crop destruction.

4.3.6. *Pipe Maintenance and Inspection*

LMAs lack the enforcement authorities for inspection and maintenance of private and certain public pipe penetrations in their levees. The Central Valley Flood Protection Board (CVFPB), as the authorizing agency, has issued the encroachment permits for these facilities and holds the enforcement authority through the encroachment permits. In light of reluctance for pipe owners to properly inspect and maintain their pipes, there is a need to develop clear enforcement action and also develop other cost effective methodologies for performing the inspections that do not solely rely on video and sonar.

Gravity or pressurized pipes that penetrate the levee are required to be inspected and maintained pursuant to the Code of Federal Regulations (CFR) Section 208.10 and the Standard Operations and Maintenance Manual. Those documents only provide general requirements. Current USACE guidance documents require inspection utilizing video or sonar inspection every five (5) years. Maintenance is performed as appropriate to repair or replace pipe penetrations in order to bring them into compliance with the USACE and CVFPB standards. Permitted repairs and installations must also be compliant with current California Code of Regulations, Title 23. Waters, Division 1. Central Valley Flood Protection Board.

The intent of the USACE's video inspection program is to monitor the interior of pipes through the levee every five (5) years so that pipes can be rehabilitated or replaced before damage occurs that could threaten the integrity of the levee. The inspection also provides a record of the previous condition of each pipe for comparison over time, allows an inspector to examine parts of the pipe that cannot be inspected visually from the pipe exterior or levee surface, and allows the pipe owner, DWR and /or the LMA to determine whether the condition of a pipe requires action to protect the levee. Additionally, by identifying pipes that need attention prior to failure, the repairs can be scheduled to occur outside of the typical flood season, and at a time when the pipe owner could find them more cost-effective than an emergency repair.

Video inspections are costly, and some pipe owners are resisting or refusing to perform them. This is problematic for LMAs as failure to perform and report the inspection results could result in unacceptable ratings by USACE and/or CVFPB. Other effective methods of inspection, such

as pressure testing, may provide an acceptable level of analysis and be more cost effective and practical, and might allow for a higher level of compliance. Also, most pipes are steel, and video inspection may be limited in identifying problems as most of the corrosion occurs from the exterior of the pipe. Access to the video equipment is limited and use generally requires cutting access entrances for insertion of the devices. These access entrances can cause additional sites for corrosion to start and can be difficult and expensive to install properly. These pipes present a very minor threat for flooding, when they cross above the floodplain or have positive closure structures on the waterside of the levee since these measures generally prevent or limit conveyance of flood waters.

While there is little or no disagreement for the inspection requirements on pipes that are located below the design water surface elevation, there are instances, where pipes are installed on the levee slope surfaces and only penetrate the levee just below the crown above the design water surface elevation. Additionally, once the pipe inspections have been performed, and maintenance/rehabilitation actions are identified, there exist various issues regarding the necessity and expense associated with obtaining permits and the permit requirements for maintenance/rehabilitation. Routine maintenance actions should not require costly permit application processes or expensive upgrades to the existing facility. There are also instances where a “one size fits all” regulation may not provide the most cost effective or best practice for a given situation. An example of this is positive closure devices on pipes that are located above the design water surface elevation.

In addition to the issues listed above, a majority of pipes are permitted encroachments in the flood control systems. The encroachment permits are issued through the CVFPB and only require an endorsement by the LMA. Although the existing permits themselves do not typically include requirements for video inspections, they do include a standard condition that would require the encroachment owner to remove, alter, or relocate the encroachment at their sole expense for any reasons upon written notice from the CVFPB. Because the CVFPB is the permitting agency, they hold the enforcement authority. However, they have rarely used their authority and have only recently been given legal authority to develop an enforcement process to bring encroachments into compliance with current standards.

The primary issue for LMA’s is that they do not own or operate many of the pipes that penetrate their levees, and therefore lack the ability to access those pipes for inspection and maintenance. Furthermore, the LMAs cannot afford to be held financially responsible for those inspections or the maintenance of the pipelines. Enforcement of the inspection and maintenance requirements is difficult and costly for the LMAs and is the responsibility of the CVFPB.

Potential solutions which should be considered include:

- CVFPB adopt a standard noticing procedure to remind pipe owners that they must maintain their pipes in accordance with the permit terms and current standards, including video inspections of pipes crossing under or through levees;
- Require pipe owners provide annual records of maintenance, inspection, repair, and replacement demonstrating compliance with permit terms and current standards to the LMA;

- Where pipes were installed as part of the system and the LMA is responsible for maintenance of that facility, the State should consider a funding program to assist LMAs with bringing the system facilities into compliance;
- Streamlined permitting for simple repairs and rehabilitation of pipelines;
- Outreach and education of utility owners to help them understand why compliance with the standards is important so they become willing and proactive participants; and
- Add flexibility to the regulations to avoid “one size fits all” policies for construction, repair and inspection so that more cost effective solutions can be implemented that retain the overall protection desired.

4.3.7. Encroachments

Undocumented encroachments, permitted or not, and documented, non-compliant encroachments present safety and legal challenges for LMAs. If an LMA or the State cannot produce documentation of an encroachment, that encroachment is flagged during inspections as an unpermitted encroachment and therefore unacceptable. If an encroachment is not in compliance with its permit, it is also flagged as unacceptable. Depending on the type of encroachment, either can cause an entire levee system to lose eligibility under PL 84-99. Of particular concern are encroachments representing a risk to levee integrity.

Encroachment scenarios currently presenting challenges include:

- Non-permitted encroachments;
- Legacy encroachments lacking documentation (i.e., not specifically or thoroughly documented in as-builts)
- Encroachments permitted by CVFPB, no concurrence from USACE;
- Encroachments permitted by CVFPB with concurrence from USACE, but now not in compliance with permit terms;
- Encroachments permitted by CVFPB with concurrence from USACE, in compliance with permit terms but compliance is not documented;
- Encroachments permitted by CVFPB with concurrence from USACE, in compliance with permit terms but now present a risk to levee integrity or hinder/prevent proper O&M and/or flood fighting; and
- Encroachments not permitted, but constructed by the USACE as documented in the as-builts and/or O&M manual.

In addition to typical encroachments owned by an individual or company, there are some encroachments that exist as a result of the levee system itself. These encroachments, primarily interior drainage ditches adjacent to the landside levee toe, retaining walls, rip-rap, and pipes, present a unique set of problems as they often pre-date permits, and documentation can be inconclusive. Some of these encroachments may be found in as-builts, but others are not seen in as-builts or the as-builts cannot be found. These encroachments are typically maintained by the

LMA, but many have either exceeded their lifespan and/or need improvements to meet current standards. Recommendations for addressing these issues are:

- Establish a process, agreed to by the CVFPB and USACE, for retroactive permitting of encroachments determined not to impair or threaten system integrity;
- USACE and CVFPB research historical and current files to build a database of encroachments and provide LMAs with access the database.
- Provide funding to remove unnecessary facilities;
- CVFPB adopt a standard noticing procedure to remind encroachment owners that they must maintain their encroachments in accordance with the permit terms and current standards.
- Require encroachment owners provide annual records of maintenance, inspection, repair, and replacement demonstrating compliance with permit terms and current standards to the LMA.
- Develop a funding program to address required upgrades, improvements, and/or documentation of the facilities included in the original project and are still necessary for the functioning of the system (i.e., landside drainage ditches, erosion protection, or other facilities).

4.3.8. *Flood Structure Protection Areas*

Flood protection structures can be adversely impacted by land use decisions (“land-use activities”) which do not fully consider how the activity is integrated into a region’s flood protection requirements and systems. For example construction of a barn, house or swimming pool directly adjacent to a levee could hinder levee maintenance, flood fighting, etc. These adverse impacts can be minor, requiring recurring, unbudgeted maintenance effort; creating a need for major levee repair projects; or even catastrophic, causing failure of the levee during a high-water event, leading to a major flood event. In addition, un-integrated land-use activities can be cited by flood protection authorities as reason for decertification of a flood protection structure and/or removal of flood protection systems from aid programs such as PL84-99.

"Land-use activity" could mean any ministerial, discretionary, or other regulatory permit approvals that are likely to lead to a change to improved or unimproved land, including but not limited to buildings or other structures, mining, dredging, filling, grading, paving, excavation or drilling operations or storage of equipment or materials. These approvals include, but are not necessarily limited to:

- General Plan amendments;
- Zoning Map changes;
- Conditional Use Permits;
- Design Review Permits;
- Parcel Mergers and Lot Line Adjustments;
- Sign Permits;
- Encroachment Permits;
- Public & Private Utilities;
- Specific Plans & amendments;
- Zoning Text amendments;
- Planned Development Permits;
- Subdivision Maps and Parcel Maps;
- Building Permits;
- Grading Permits;
- On-site Development Permits;
- Underground Pipelines.

To ensure LMAs have an opportunity to review and comment on land-use activities which could impact their systems, improved communication and interaction between LMAs and land-use authorities is needed. Creation of “Flood Structure Protection Areas” directly adjacent to levees and other flood control structures would provide LMAs an opportunity for input on land-use decisions occurring in the vicinity of their facilities. These areas would be identified in county and city floodplain management ordinances and/or general plans as zones in which input is required from LMAs before land-use decisions are finalized.

The RFMP process could be used to identify areas within the region of applicability of Flood Structure Protection Areas. The RFMP process could also help develop model floodplain ordinances and general plan amendments for adoption by local land-use authorities detailing how Flood Structure Protection Areas should be developed, implemented, and administered.

4.3.9. *Levee Vegetation Management*

The 2012 CVFPP describes the State’s approach to levee vegetation management in light of USACE’s Engineering Technical Letter 1110-2-571, which emphasizes the need to establish a vegetation-free zone on and adjacent to project levees. The 2012 CVFPP Levee Vegetation Management Strategy is intended to reflect a flexible and adaptive management strategy that meets public safety goals, and protects and enhances sensitive habitats. It should be noted that not all resource agencies concur with the 2012 CVFPP approach. Based on the current understanding of levee failure mechanisms, properly trimmed and spaced levee vegetation poses a low threat to levee integrity as compared to many indisputable risk factors, such as under-seepage, through-seepage, slope instability, erosion, and rodents. Under the State’s Levee Vegetation Management strategy,

- New levees will be constructed and managed in consistency with the guidelines in U.S. Army Corps of Engineers Engineering Technical Letter 1110-2-571 with a vegetation-free zone.
- Levees with “legacy” trees will be managed to allow the existing large trees and woody vegetation to live out their normal life cycles unless they pose an unacceptable threat, while maintaining visibility for inspection and access for maintenance and flood-fight. This strategy allows for the retention of lower waterside vegetation below the “Vegetation Management Zone.”

The Vegetation Management Zone is the area on and near a levee in which vegetation is managed for visibility and accessibility using a life-cycle management strategy. For typical sized levees the Vegetation Management Zone would include the entire landside levee slope plus 15 feet beyond the landside toe (or less if the existing easement is less than 15 feet), the levee crown, and the top 20 feet (slope length) of the waterside levee slope.

The Life Cycle Management approach achieves “visibility and accessibility” criteria while progressing gradually (over many decades) toward the USACE vegetation policy goal of eventually eliminating woody vegetation from the Vegetation Management Zone on the landside slope, crown, and upper waterside slope of levees. Existing trees and brush larger than 4” should be allowed to remain on the levee slope to live out their normal life cycles. Trees (alive or dead) will be removed if they posed an unacceptable threat to levee integrity. Removal would be accomplished in consultation with appropriate resource agencies.

This approach would protect waterside vegetation, which acts to stabilize the bank and provide erosion protection, while also providing habitat for sensitive species. In order to sustain this critical habitat, the CVFPP levee management strategy retains waterside vegetation (below the Vegetation Management Zone).

Under the State’s strategy, vegetation that was introduced, allowed, required as mitigation, or endorsed by a previous USACE action to comply with environmental requirements, or was present when the levee system was transferred from the USACE to a non-federal sponsor, would not be removed or be subject to the Life Cycle Management approach.

LMA’s within the Region generally agree that the 2012 CVFPP Levee Vegetation Management Strategy is a workable strategy for them. .

4.3.10. *Funding*

The Sacramento River flood control system provides system-wide benefits but its operation and maintenance is subdivided and delegated to individual entities, and is not funded, executed or coordinated in a system-wide manner. Some LMAs are responsible for maintenance of system-wide improvements but receive no funding assistance from the system-wide beneficiaries. The burden of maintaining and operating the system falls on a relatively small number of local landowners. As one of the near-term actions identified in the State System-wide Investment Approach (SSIA), DWR has developed the Flood System Repair Program (FSRP) to help LMAs repair documented critical problems with flood control facilities of the SPFC in non-urban areas. To address longer-term systemic maintenance issues, DWR should expand the FSRP to develop and implement a maintenance subventions cost share program that provides technical and financial assistance to LMAs for long-term system maintenance and rehabilitation.

4.3.11. *Subsidence/Settlement*

PIRs typically note crown settlement, or subsidence, as an issue that must be corrected. This evaluation is typically based on the elevation of the crown relative to crown elevations in close proximity. However, differing crown elevation does not necessarily indicate a structural

problem. The as constructed drawings typically do not provide detailed survey data to measure crown settlement. In many cases, the crown is significantly higher than the design elevation, thus confirming the lack of detail in the as constructed drawings that simply indicate design elevation. Therefore, if the existing levee exceeds design elevation, it should not be considered a settlement, or subsidence problem, even if settlement or subsidence has occurred. In addition, if detailed surveys are performed over time and ongoing settlement of the crown is documented, it should be noted that it is a design deficiency and not the responsibility of the LMA.

4.3.12. *Depression/Rutting*

The expression of depressions and rutting on a gravel levee crown roadway are seasonal in nature and are typically repaired during annual maintenance activities. The failure to maintain depressions and rutting would result in unacceptable ratings during the DWR's spring and fall surveys. If these inspections do not indicate an issue, then the PIR should consider them seasonal and not a deficiency that could pose a threat during the next high water event.

Therefore, the PIR should consider whether the rutting is seasonal and will be repaired prior to flood season. In addition, the expression of depressions and rutting in a paved roadway (including shoulder), such as a county road or state highway, are not levee problems if they are not impacting the performance of the roadway. These roads are supported by a thick gravel base, which has the permeability to drain any ponding of water on the levee crown during a rainstorm, thus keeping the water from damaging the sub-grade levee structure. For those roadways that are prone to rutting (i.e.; thin road base) and are the responsibility of an agency other than the LMA, the LMA will coordinate with that agency in identifying problem areas affecting levee stability and maintenance.