

U.S. Army Corps of Engineers Flood Risk Management Programs

Appendix D

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U.S. Army Corps of Engineers Flood Risk Management Programs

1 Introduction

The U.S. Army Corps of Engineers (USACE) Civil Works Program helps to manage the Nation's water and related land resources for commercial navigation, flood risk management, environmental restoration, and allied purposes. Civil Works programs are generally administered by a nationwide distribution of 38 USACE field offices (districts) with oversight provided by eight regional offices (divisions). USACE Headquarters, located in Washington, DC, provides policy and administrative direction and oversight.

Civil Works includes six primary mission areas that, for operational and performance management purposes, are defined by the USACE as business programs. Two programs relate to flood risk management: 1) Flood and Coastal Storm Damage Reduction, and 2) Emergency Management.

The Flood and Coastal Storm Damage Reduction Program (F&CSDR) focuses on proactive (pre-flood) flood risk management, mostly involving the planning and construction of flood damage reduction infrastructure (projects) and USACE management of part of that built infrastructure. F&CSDR activities are funded by regular annual appropriations provided by Congress to the USACE at levels that are fairly stable year-to-year.

The Emergency Management Program (EM) focuses on preparedness and reactive (post-flood) actions to help communities respond to and recover from flood and coastal storm disasters and other national emergencies. The EM program is funded primarily by emergency supplemental appropriations provided intermittently by Congress to the USACE in the aftermath of major floods and other disasters at levels that can differ significantly year-to-year.

These flood risk management programs are reviewed in turn below.¹ Major program components, activities, and budget trends are described. The review highlights that some significant program components have only recently been introduced and are still in development, while other long-standing program elements are now being modified in significant ways and codified in revised USACE guidance.²

¹ The review was developed using numerous information sources, including agency policy and program reviews and analyses; program authorities; engineering regulations, manuals, technical letters, circulars, and pamphlets; agency appropriations data; agency correspondence and agreements with other government agencies; as well as interviews conducted by the author with various USACE staff. To maintain brevity in the narrative, only a few source citations are made and no reference list is provided. The penultimate draft was reviewed by various USACE staff with expertise in the programs reviewed, and their comments and suggestions were incorporated herein. The content of the narrative is solely the responsibility of the author.

² The review was largely completed in early 2011 when many of the programs were in a state of change, and only limited updates to the program descriptions were made since that time. Consequently, some of the program descriptions might be somewhat dated, and the latest fiscal year for which program funding data is provided is 2010.

2 Flood & Coastal Storm Damage Reduction

Historically, the primary focus of USACE F&CSDR project planning, construction, and management has been flood hazard reduction—that is, reducing the likelihood of flood waters inundating a location—toward the goals of promoting human safety and reducing property damage from floods and coastal storms. Federally-authorized F&CSDR projects built by the USACE generally achieve flood hazard reduction using dams with reservoirs, dry dams, dikes, levees and floodwalls, and the channelization of rivers and tributaries.

The USACE began to construct flood control infrastructure in 1917, although until the 1930s that activity was limited to the Lower Mississippi Valley and the Sacramento River in California. Congress, in the Flood Control Act of 1936, established a federal policy that flood control on navigable waters and their tributaries was necessary for public welfare and a proper activity of the federal government. Since that time the USACE has constructed more than 500 dams that include flood damage reduction as one authorized purpose; hundreds of separate projects aimed at reducing flood hazards from rivers and tributaries for individual communities that encompass roughly 12,000 miles of levees; and more than 90 coastal storm damage reduction projects.

Most of the dam projects on major river systems were constructed prior to the 1970s. Since then the USACE program has focused primarily on planning and implementing new and modified F&CSDR projects for individual towns and cities as well as the rehabilitation of existing projects that are operated and maintained by the USACE.

The USACE is responsible for the operation and maintenance (O&M) as well as repair, rehabilitation, and replacement of most dam and reservoir projects, as well as the levee systems and other flood damage reduction infrastructure that are part of what is collectively known as the Mississippi River & Tributaries (MR&T) project. Hereafter, such projects are referred to as “USACE O&M” projects.

Most of the other F&CSDR projects were built by the USACE for individual communities and then turned over to their non-federal project sponsors who became responsible for project O&M and other management (repair, rehabilitation, and replacement). Hereafter, such projects are referred to as “local O&M” projects.

Table 1 shows FY 2010 regular Civil Works appropriations allocated to the F&CSDR Program, by funding account, and the general uses of those funds. The \$1.865 billion provided to the USACE F&CSDR Program in FY 2010 accounted for roughly 38% of total appropriations for Civil Works in that year.

Table 2 shows the amount of regular appropriations provided to the USACE F&CSDR Program activities for fiscal years 2004 through 2010, by funding account.³ The data indicate that program funding increased fairly significantly over that period, from just over \$1.1 billion in FY 2005 to almost \$1.9 billion in FY 2010, driven mainly by increased funding for the Construction General (CG) account.

³ In addition to the regular (annual) appropriations, in 2009 Civil Works received an additional \$1.376 billion in “stimulus” funds allocated to F&CSDR under the American Recovery & Reinvestments Act of 2009, which is not included in Table 2.

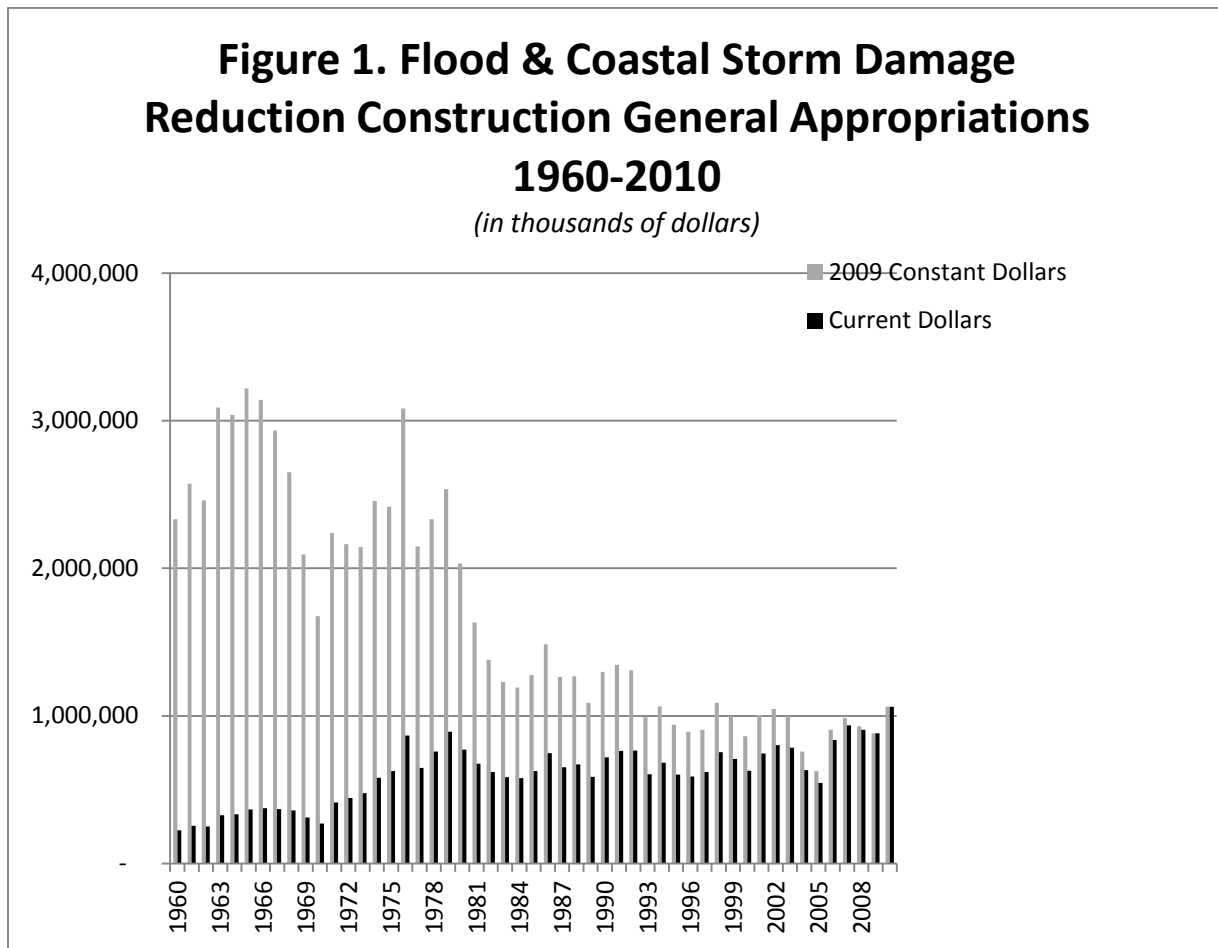
Table 1. FY 2010 Regular Appropriations for Flood & Coastal Storm Damage Reduction (F&CSDR)

Appropriations Account	2010 Funding (thousands \$)	Funded Activities
Construction General (CG)	1,063,000	CG funds are allocated for the implementation of new and modified F&CSDR projects authorized by law, including USACE O&M dams and local O&M projects that become the management responsibility of their non-federal sponsors when implementation is complete. Roughly one-half of CG funds provided in FY 2010 were allocated for the major modification of eight USACE dams, and the other half was spread over 179 local O&M projects.
Operation & Maintenance (O&M)	485,000	O&M funds are allocated for the operation, maintenance, security and care of USACE O&M dams and other USACE O&M F&CSDR projects. Funds are also used for safety program activities at completed USACE O&M and local O&M projects, which generally include inventory, annual and periodic inspections, risk assessments and communications, and some risk management activities.
General Investigations (GI)	72,000	GI funds are used for studies authorized by law for prospective F&CSDR projects, including collection of basic information, surveys, detailed studies, and plans and specifications prior to construction. Minor funding is allocated to national programs that provide technical and planning assistance to states and localities.
Mississippi River & Tributaries (MR&T)	245,000	MR&T funds are used for the investigation, rehabilitation, operation and maintenance, and other management activities involving F&CSDR projects managed by the USACE in the Mississippi River alluvial valley below Cape Girardeau, Missouri.
Total	\$1,865,000	

Table 2. Regular Appropriations for F&CSDR by Account, FY2004 – FY2010 (thousands of \$)

Account	FY2010	FY2009*	FY2008	FY2007	FY2006	FY2005	FY2004
CG	1,063,000	883,000	906,000	935,389	836,989	546,000	633,108
O&M	485,000	324,000	438,000	319,457	288,850	287,000	303,491
GI	72,000	77,000	84,000	29,481	60,726	52,000	44,571
MR&T	245,000	294,000	307,000	326,618	325,044	214,000	233,000
Total	1,865,000	1,578,000	1,735,000	1,610,945	1,511,609	1,099,000	1,214,270

A broader historical perspective on CG funding in years is provided by Figure 1, which presents annual F&CSDR construction appropriations over the period 1960-2010 in both nominal (current dollars) and real (constant 2009 dollars) terms. In nominal terms, there was a generally increasing trend in annual F&CSDR construction funding over the 50-year period, from a low of under \$250 million in 1960 to a high of more than \$1 billion in 2010. However, when the nominal appropriation levels are converted to constant dollars, it can be seen that, in real terms, the highest annual construction funding for F&CSDR over this period occurred in the mid-1960s at a level that was roughly three times the level in 2010.



Further, when the data on annual F&CSDR construction appropriations over recent years is decomposed by project type (as will be outlined later), it shows that the significant increase in construction dollars over recent years is entirely due to sharply increased funding for the major modification of USACE O&M dams.

The F&CSDR Program includes the following major components:

1. Planning and implementation of local O&M projects, which involves the investigation and implementation of F&CSDR projects that are turned over to their non-federal sponsors for O&M and other management when implementation is complete.
2. Dam Safety Program, which involves routine safety program activities as well as non-routine risk assessments and management actions for over 500 USACE-built and managed flood damage reduction dams.
3. Levee Safety Program, which includes routine processes such as the annual inspection of over 14,000 miles of levee systems as well as non-routine risk assessments and management actions for levees to the extent consistent with USACE authorities and budget priorities.
4. Technical and planning assistance programs, which provide planning and technical assistance and related support to states and communities for flood risk management.
5. Interagency coordination with the Department of Homeland Security, Federal Emergency Management Agency (FEMA), which largely relates to FEMA's administration of the National Flood Insurance Program

These programs are reviewed below. The reviews highlight that the Levee Safety Program is relatively new and still in development, while other long-standing F&CSDR programs have undergone significant changes in activities, procedures, or budgetary importance in recent years.

2.1 Planning and Implementation of Local O&M Projects

The USACE plans and then implements F&CSDR projects for individual towns and cities. These projects are cost-shared with their non-federal project sponsors and then turned over to those sponsors for O&M and other management when implementation is complete. These local O&M projects include flood damage reduction projects that address flooding associated with rivers and tributaries, and hurricane and storm damage reduction projects that address flooding from wind- and tide-generated waves and currents along the nation's coasts. Projects may involve new projects or modifications to existing projects, both of which require project-specific congressional authorization and then project-specific congressional appropriations for implementation by the USACE.

The local O&M projects implemented by the USACE generally have focused on flood hazard reduction using levees and floodwalls and the channelization of rivers and tributaries. Nevertheless, projects often involve at least some components, such as flood warning and preparedness systems and flood proofing of selected structures that focus on reducing vulnerability (i.e., the adverse consequences for people and assets when they experience flooding). F&CSDR projects have much less frequently included primary components intended to reduce exposure (i.e., the potential for people and assets to come into direct contact with flood waters when flooding is experienced). Project measures such as the permanent relocation (removal) of structures from flood-prone areas, for example, have to date generally played only a minor role in local O&M projects (see Box 1).

Box 1: Use of Relocation (Removal) of Floodplain Structures in Local O&M Projects

The removal and relocation of structures from flood-prone areas was first mentioned as an allowable Civil Works management measure in the Flood Control Act of 1938 for situations in which the construction costs for structural management measures (e.g. levee alignments) could be substantially reduced by evacuation of part of the area to be protected; those cost savings were allowed to be used toward relocation costs. In response to concerns in more recent decades about the environmental impacts of flood damage reduction (FDR) measures such as dams, levees, and channelization, various Water Resource Development Acts (WRDA) have required USACE FDR planning studies to consider so-called “nonstructural” (NS) measures in plan formulation, which are defined by the USACE as measures that reduce flood damages without significantly altering the nature or extent of flooding.

While many implemented USACE-built local O&M projects have involved at least some NS elements, primarily NS plans involving the permanent removal and relocation of structures in flood-prone areas have been very infrequently recommended and implemented. According to a 1985 USACE policy study, relocation of structures had, up to that time, been used mostly in conjunction with other management measures in areas within the 25-year floodplain that historically had been characterized by severe and repeated flood damage.

One reason that plans involving significant relocation of structures have been infrequently recommended and implemented is that they often have been difficult to economically justify. Many observers have claimed that the USACE traditionally has had a cultural bias against projects involving relocation, and that bias was reinforced by USACE planning guidance. Prior to 2001, USACE guidance said that property damages avoided (PDA) was a claimable benefit for structural water control measures, but not in the case of relocated properties. This guidance stance was rooted in the presumption that the market prices of structures to be relocated are fully discounted for flood hazards, so that the buyout costs for these structures already incorporate the value of expected PDA from relocation. This logic implied that adding PDA for relocated structures to buyout costs would represent double counting of benefits and, consequently, claimable benefits for relocation were limited to the estimated benefits for the new uses for the vacated lands. Those new use benefits could include, for example, recreation and environmental benefits as well as property damages avoided for adjacent properties. Many observers did not understand or accept that logic, however, and in the WRDA of 1999, Congress directed the USACE to calculate benefits for NS alternatives using methods similar to those for structural alternatives, while avoiding the double counting of benefits. The USACE instituted a change in benefit estimation procedures in 2001, but it is unclear whether and to what effect it has been applied in USACE FDR planning studies.

Another significant obstacle to the relocation of structures on a large scale for flood damage reduction is that municipalities and their residents often view moving significant parts of towns as undesirable or impractical. When considering plans involving the relocation of structures, the USACE focuses on voluntary buyouts of individual properties. The voluntary nature of the buyouts can make it difficult to relocate all structures within a contiguous area, since some property owners in the area may not be willing to sell. This in turn has contributed to the difficulty of economically justifying property buyouts on the basis of the benefits provided by the new uses of the vacated lands.

In very recent years, USACE planning for local O&M projects has put more emphasis on investigating opportunities for reducing the potential consequences that could result from flooding by reducing the exposure and vulnerability of people and assets to the hazard, rather than simply focusing on opportunities for reducing the hazard (i.e., likelihood of flooding). The USACE generally refers to

management actions that can reduce exposure and vulnerability to flooding as “nonstructural” measures, which the USACE distinguishes from “structural” measures as follows:

“Nonstructural measures reduce flood damages without significantly altering the nature or extent of flooding. Damage reduction from nonstructural measures is accomplished by changing the use made of the floodplains, or by accommodating existing uses to the flood hazard. Examples are flood proofing, relocation of structures, flood warning and preparedness systems (including associated emergency measures), and regulation of floodplain uses.”

“Structural measures are physical modifications designed to reduce the frequency of damaging levels of flood inundation. Structural measures include: dams with reservoirs, dry dams, channelization measures, levees, walls, diversion channels, pumps, ice-control structures, and bridge modifications.”

In the project planning process, USACE regulations say that plans can be formulated to include nonstructural measures independently or in combination with structural measures. The regulations also require planning studies to describe a primarily nonstructural alternative to a recommended plan when that plan does not involve significant nonstructural management measures. To date, project plans that involve primarily nonstructural measures have been infrequently recommended and implemented, although in the last few years the USACE has stressed that planning studies should fully explore and consider nonstructural measures for reducing the exposure and/or vulnerability of people and assets to flooding.

Along the same lines, for the last ten years USACE authorities have allowed for the planning and implementation of combined ecosystem restoration and flood damage reduction (FDR) projects. Such planning contexts can formulate and consider plans that employ “green infrastructure” management measures such as flowage easements and levee set-backs that can jointly produce environmental and flood damage reduction benefits. Further, unlike single objective FDR plans, such combined plans can be recommended based on a subjective judgment that the combined non-monetary environmental benefits and monetary economic benefits of a plan outweigh plan costs. Only a few such project plans have been recommended and authorized, however.

2.1.1 Project Development Process

A prospective new local O&M project or project modification typically begins with a request for assistance from a local or state government entity. Generally, congressional actions to provide the USACE with study authorities and then study appropriations are needed to initiate project studies, which include reconnaissance and feasibility studies. In a reconnaissance study, which is conducted at full federal expense, the USACE examines the nature of the problem in order to determine the federal interest in pursuing a feasibility study. The feasibility study is a detailed planning study that requires a non-federal sponsor who agrees to pay 50% of study costs and who signals a willingness to share the cost of eventual project implementation. The maximum federal cost share is 65% for implementing inland flood damage reduction projects as well as coastal storm damage reduction projects, including

the initial construction for a beach nourishment project (but for the subsequent re-nourishment of beach projects, the maximum federal cost share is 50%).

The feasibility study phase may end with a recommendation by the Chief of Engineers for federal involvement in implementing a specific project plan. This is known as the Chief's Report, which is transmitted to the Assistant Secretary of the Army for Civil Works, the Office of Management and Budget, and the Congress. Based on the Chief's Report, the Congress may choose to authorize a project plan in a Water Resource Development Act. After a project plan is authorized by Congress, a request for a specific amount of appropriations for project implementation may be included in the annual President's budget request to Congress. Congress may then include some level of appropriations for project implementation in annual Energy and Water Development Appropriations Acts.

Exceptions to the typical authorization and appropriations process outlined above are made for relatively small local O&M projects that fall within the USACE' Continuing Authorities Programs (CAP). The CAP is a group of legislative authorities that allow the USACE to study, adopt, and proceed directly to project implementation without further congressional authorization, based on the availability of funds. CAP projects that relate to F&CSDR include Section 205 projects (small flood damage reduction projects), Section 103 projects (small hurricane and storm damage reduction projects), and to a lesser extent Section 14 projects (small emergency bank protection works) and Section 208 projects (measures to reduce flood damages caused by debris and minor shoaling of channels).

Congressional authorization of a project does not necessarily mean that the project will receive federal construction funds, however. Project authorizations over the years have far outpaced the level of federal appropriations provided. Currently, this construction "backlog" includes hundreds of authorized activities with estimated federal funding needs of over \$60 billion. This backlog includes \$22 billion in activities that have been included in the President's budget but have yet to be completed (of which F&CSDR projects account for roughly \$8.5 billion), and \$38 billion for other "active" projects which have yet to be included in the President's budget.

2.1.2 Planning Framework

The USACE follows guidance set out in the 1983 *Economic and Environmental Principles and Guidelines for Water and Related Land Resource Implementation Studies*, commonly known as the "Principles and Guidelines" (P&G), for the formulation, evaluation and selection of project plans to recommend for federal involvement. The USACE' *Planning Guidance Notebook* (PGN) provides further guidance for implementing the P&G as well as related policy guidance. In general, this USACE guidance requires that a prospective F&CSDR project plan must show positive net economic benefits to be recommended for federal involvement, where the primary economic benefit measure considered is expected property damages avoided (planning studies must also estimate and consider residual property damages that would occur with the project in place).

Prior to the mid-1980s, USACE policy required F&CSDR planning to formulate plans that could prevent flood discharges resulting from the "Standard Project Flood" (or Hurricane) representing the most severe combination of meteorological and hydrologic conditions considered reasonably characteristic of the

geographical region involved. Then a new policy was implemented that stipulated that F&CSDR plans would be evaluated and recommended based on their expected performance, as calculated using a risk-based (probabilistic) analytical approach for evaluating plan benefits and costs, rather than a defined degree of protection.

Current USACE policy does not specify any minimum level of project performance that must be provided by F&CSDR projects. However, if a non-federal sponsor desires a maximum level of protection (LOP) that is just sufficient to meet FEMA flood insurance program requirements (relating to controlling the discharge associated with the 1% annual chance flood), and that performance level has higher net economic benefits than plans providing a lower LOP, USACE policy allows that plan to be recommended. Many communities have sought and secured USACE projects at design levels just sufficient to provide protection against the 1% annual chance flood, which enables community members with federally-backed or regulated mortgage loans to avoid the mandatory purchase of flood insurance.

USACE planning guidance requires that attention be paid to any flooding of properties that could result from implementation of a recommended project plan. When a project plan would result in such “induced flooding,” guidance says that mitigation of that flooding should be investigated and implemented when economically justified, when there are overriding reasons of safety or economic or social concerns, or when it is determined (by USACE lawyers) that the induced flooding rises to the level of a real estate “takings” of private property rights. If a takings determination is made, then it becomes a project requirement to mitigate or compensate for damages associated with induced flooding, which may involve, for example, building property-specific ring levees or paying the affected landowners for flowage easements. Such takings determinations are rare, however. Any residual damages associated with remaining induced flooding with or without mitigation measures in place are to be accounted for in the economic analysis and displayed and discussed in the feasibility study report.

In the WRDA of 2007, Congress directed the Secretary of the Army to develop revisions to the P&G to reflect certain goals, principles, and concepts outlined in the act. The process to revise the P&G began in the Bush Administration and then continued into the Obama Administration. The latter tasked the Council for Environmental Quality (CEQ) to convene an interagency team to complete revisions to the planning principles that would be made applicable to all federal agencies that undertake water resource projects. In 2009, CEQ published a draft of the revised principles in the *Federal Register* for public review and comment, and a subsequent revised draft was completed in 2011. Among other changes, the 2011 draft elevates environmental and social goals to co-equal status with economic development, emphasizes “nonstructural” management measures in plan formulation, and gives standing to both monetary and non-monetary measures of plan effects in plan evaluation, comparison, and selection. In 2013, CEQ released the final “Principles and Requirements” as well as draft interagency guidelines that are to be used by federal agencies to develop agency-specific procedures. However, the USACE has been prohibited by congressional report language to expend agency funds on the development of USACE-specific planning procedures.

Meanwhile, the USACE has embarked on a “Civil Works transformation” initiative that is meant to change the agency’s business model to address contemporary challenges. One pillar of that initiative is

“planning modernization” that seeks to streamline the management process for project feasibility studies. Planning modernization is introducing changes to the study management process that, among other things, seek to ensure that studies are scoped with a target goal for completion within three years at a cost not greater than \$3 million while not compromising the quality of required planning steps and analyses.

2.1.3 Project Partnership Agreement

To be eligible for federal construction dollars, an authorized local O&M project must have a project partnership agreement in place. This is a legally binding agreement between the federal government and the non-federal sponsor that describes the project and the responsibilities of each party, including their respective construction cost shares. Under these agreements, non-federal sponsors agree to all project management when construction is complete, including operation and maintenance as well as any repair, rehabilitation, and replacement that may be needed. Other required non-federal sponsor responsibilities include participation in the FEMA’s National Flood Insurance Program, and preparation and implementation of a floodplain management plan designed to reduce the potential impact of future flood events in the project area. However, the USACE does not appear to have the ability to enforce the development and implementation of local floodplain management plans. Further, this local requirement is not written into the operation and maintenance manuals for projects that the non-federal sponsors are required to follow when completed projects have been turned over to them for management. Thus, compliance with this local requirement is not reviewed as part of the annual routine inspections conducted by the USACE for these projects (the purpose and scope of the routine inspections are outlined later in this review).

2.1.4 Funding

Table 3 shows construction general (CG) appropriations over the period 2006-2010 for local O&M projects. In 2010, CG appropriations for cost-shared F&CSDR projects were allocated across 126 specifically-authorized projects and 53 CAP projects; roughly one-half of these are new projects and the other half are modifications to existing projects.

The data illustrate that federal construction funding for local O&M projects has fallen fairly significantly over recent years at the same time that total F&CSDR construction appropriations (as reported in Table 2) have increased more significantly. Local O&M projects accounted for roughly 85% of F&CSDR construction appropriations in 2006, but only about 65% in 2010. This is due to the sharply increased share of CG funding allocated to the USACE Dam Safety Program in recent years, as will be outlined in Section 2.2.

Table 3. Construction General Appropriations for Local O&M Projects, FY2006-FY2010 (thousands of \$)					
Activity	FY2010	FY2009	FY2008	FY2007	FY2006
Specifically Authorized	511,906	522,618	589,597	699,228	666,289

Projects					
CAP Projects (Sec. 205 and Sec. 103)	41,658	42,585	46,740	75,600	47,000
Total	553,564	565,203	636,697	774,828	713,289

2.1.5 Evaluation and Reporting of Program Performance

For program performance measurement and reporting, each year the USACE calculates estimates of the value of property damages prevented by USACE-built flood damage reduction projects and presents those estimates in an *Annual Flood Damage Report to Congress* (AFDR). The AFDR present estimates of the value of property damages prevented by USACE flood damage reduction infrastructure by state and region in a given year (and cumulatively over all years in which the infrastructure was in place), as well as estimates of the number of lives lost and the value of property damages that actually resulted from flooding in that year.

The USACE contracts with the National Weather Service (NWS) to provide the data on the value of actual property damages as well as lives lost due to flooding in any year (including river and coastal flooding as well as storm water and other flooding) for reporting in the AFDR. Flood damage assessment and reporting is not a central mission of the NWS, however, and the agency relies on its field offices to manually collect and compile data on flood damages from numerous sources, including damage assessments done by municipal emergency managers, insurance agents, FEMA, USACE districts, and the USDA (which collects self-assessments of crop damages reported by farmers), among others. Given the wide variability in the types and sources of flood damage data and the lack of central clearinghouse for data collection, evaluation, and aggregation, the loss totals compiled by NWS and reported in the AFDR are characterized as only preliminary approximations.

Estimates of property damages prevented by F&CSDR projects in any year are calculated by USACE districts as the difference between model predictions of flood water levels and associated property damages that would be realized with USACE flood damage reduction infrastructure in place, and predictions of damages that would be realized in the absence of that infrastructure, given measures of actual river stages in that year. These model predictions rely on the estimation and use of derived stage-aggregate damage functions associated with both with- and without – infrastructure scenarios. The stage-aggregate damage functions show the value of damages to floodplain structures (and property) that would occur with different river stages. These functions are derived from the aggregates of depth-damage functions for different types of structures (e.g., residential structures with and without basements, different types of non-residential structures). The depth-damage functions relate the depth of flood water levels to the value of structure damages, given an inventory of floodplain structures that includes the number of structures of different types and their first-floor elevations, structure values, and the value of structure contents.

The estimation of damages prevented is done by individual USACE districts for the projects within their respective jurisdictions and then apportioned to states and regions for reporting in the AFDR. The AFDR for fiscal year 2009 reports that the value of property damages prevented by USACE projects in that year was \$29.5 billion. Based on the AFDR for fiscal years 2000-2009, the USACE reports that the average annual value of property damages prevented by USACE infrastructure over this ten year period was \$22.3 billion.

Many USACE districts continue to rely on stage-aggregate damage functions for calculating property damages prevented that were developed many decades ago, which introduces two types of potential error. First, the functions may not reflect current hydrologic and hydraulic conditions. Second, the functions include structure inventories that do not reflect changes in floodplain development since that time. The dollar values for the structures in these old inventories are updated for inflation, but the inventories likely do not accurately reflect the number and current market values of different types of structures currently in the floodplain. To address this problem as well as inconsistencies in the calculation procedures employed across USACE districts, the USACE' Hydrologic Engineering Center has developed new software capabilities for estimating damages prevented by USACE projects. Among the new capabilities is the ability to create updated inventories of floodplain structure in several ways, including use of parcel data and the Census block information included in HAZUS.

2.1.6 Permitting of Non-Federally Funded and Constructed Project Improvements

A non-federal project sponsor must obtain permit permission from the USACE before proceeding with a plan to make locally funded and implemented alterations to a federally-authorized, local O&M levee or other flood damage reduction project. USACE policies and procedures for the review and approval of such project alterations have been changing in recent years in response to contemporary efforts by non-federal sponsors to make levee improvements on their own.

Prior to 2006, proposed project alterations typically were reviewed and approved by USACE districts under authority of 33 U.S.C. Section 208.10 (Section 208), which pertains to project operation and maintenance responsibilities. In that year, USACE Headquarters issued a policy memorandum to the field to clarify that Section 208 review was applicable only for "relatively minor, low impact modifications, such as pipes or pipelines proposed to pass over or through a federal work, or a road or similar type of infrastructure improvement proposed to pass over a federal levee." According to the memorandum, the Section 208 regulations require that "no improvement shall be passed over, under, or through the walls, levees, improved channels or floodways, nor shall any excavation or construction be permitted within the rights-of-way, nor shall any change be made in any feature of the work without prior determination by the District Engineer that such changes will not adversely affect the functioning of the protection facilities."

Any proposed modification to a federal project that would involve significant changes to the authorized project scope, purpose or functioning cannot be approved by the district under Section 208, but instead must be forwarded through the applicable division to USACE Headquarters for approval by the Chief of Engineers under the authority of 33 U.S.C. Section 408 (Section 408). Section 408 permitting authority

derives from the Rivers and Harbors Act of 1899, as amended in 1985 to cover all USACE-built “public works.” Section 408 permit approval requires a demonstration that proposed project alterations “will not be injurious to the public interest and will not impair the usefulness of such work.”

In response to non-federal sponsor questions and concerns about permitting policy standards and required analyses, USACE Headquarters in 2008 issued a supplemental clarification memorandum that focuses primarily on flood damage reduction projects. That memorandum stipulated that proposed changes to levee systems that are limited to “restoring the authorized level of protection or improving the structural integrity of the system and that do not change the authorized structural geometry or hydraulic capacity” may be approved by USACE districts under Section 208 authority. All other project changes, including levee realignments, raisings, and degradations were to be approved by Corp Headquarters under Section 408 authority. The 2008 memorandum also addressed potential grey areas relating to the applicable review and approval process in any case as follows:

“In instances where it is not clear if the proposed alteration/modification is within the authority delegated to the District Engineer for approval in accordance with 33 CFR 208.10 or when the proposed alteration/modification requires approval by the Chief of Engineers, there must be an engineering analysis conducted with consideration of the full range of loading conditions to determine the impact of the alteration/modification on system performance (flood elevations and structural integrity). Such alterations/modification include non-federal tie-ins, ramps, riverside landscaping, retaining walls, fill against a levee (such as railroad trestles and overbuild), bridges, relief wells, seepage berms, and stability berms. If the engineering analysis indicates that system performance is adversely impacted by the alteration/modification, then the proposed alteration/modification must be submitted for approval by the Chief of Engineers. The ‘system performance’ includes the portions of the watershed above and below the proposed site of alterations/modifications to the extent that adverse impacts can be identified. ‘Adverse impacts’ include any significant increase in risk to public safety.”

The 2008 memorandum states that non-federal proposals to degrade, raise, or realign existing USACE projects under Section 408 “should be evaluated as new construction of federal projects and the potential impact of these changes, including system impacts, must be evaluated in accordance with USACE regulations and policy.” Accordingly, Section 408 requires a “risk analysis” be applied to the required engineering analysis of the impacts of changes in hydrologic and hydraulic parameters on system performance that employs the risk-based (probabilistic) analytical approach used by the USACE for F&CSDR project planning applied. The risk analysis will be required only in the case of alterations: 1) for projects in which an ongoing or proposed USACE study considers alternative solutions; 2) that may impact levees involving USACE certification for NFIP purposes, and; 3) for which non-federal sponsors request or intend to request federal financial credit for work performed.

As outlined in the 2008 memorandum, the information to be submitted by permit applicants to the USACE districts for Section 408 review, include: 1) a detailed description of proposed work and statement of purpose and need; 2) a technical analysis of the adequacy of design that addresses geotechnical, structural, and hydraulic and hydrological conditions in the baseline and proposed

modified conditions, and operation and maintenance requirements; 3) a real estate analysis; 4) a discussion of residual risk; 5) a discussion of EO 11988 considerations, and; 6) documentation of NEPA and other environmental protection compliance. In addition, in cases in which no USACE investigations are ongoing, the non-federal sponsor is required to perform a “safety assurance review” involving external peer review of the proposed alterations and supporting analyses.

All documents submitted by the non-federal sponsor are to undergo “Agency Technical Review” at the district level, where a determination will be made on whether the proposal meets USACE engineering and safety standards and will not have significant adverse effects on the functioning of the project, before being forwarded up the chain of command for final review and approval. If the proposed alteration also requires a Clean Water Act Section 404 permit, the District Engineer will make the final permit decision following Section 408 approval by the Chief of Engineers.

A third Headquarters memorandum issued in 2010 announced that from that point forward Section 408 would be the sole authority used for approving locally funded and constructed alterations to federally-authorized projects that are operated and maintained by non-federal sponsors, and two categories of Section 408 approvals will be used—minor and major. A minor 408 approval relates to minor, low-impact project modifications that previously were considered under Section 208, and will be done at the district level. All other project alterations, including levee realignments, raisings, and degradations, require major 408 approval by USACE Headquarters. USACE districts will be responsible for making the determination on which Section 408 process is applicable in any particular case.

Several non-federal sponsors who are in the process of planning improvements to federally-authorized levee projects have complained about the new permitting policy and procedures. Among their stated concerns are: 1) lack of clarity for USACE districts on what types of project alterations require major 408 approval; 2) timing of the USACE determination on which 408 process is applicable relative to the percent completion of project design in any case; 3) applicable “risk transfer” standards for determining whether project changes impose significant adverse effects on system performance, and; 4) required analyses for and documentation of NEPA compliance. At the time of this writing, USACE Headquarters was working to make major revisions and updates to Section 408 policy and guidance.

2.2 Dam Safety Program

The USACE Dam Safety Program covers approximately 700 dams, including about 540 single purpose and multipurpose dams that include flood damage reduction as one authorized purpose. The stated purposes of the program “are to protect life, property, and the environment by ensuring that all dams are designed, constructed, operated, and maintained as safely and effectively as reasonably possible.” Life safety is the paramount goal. Most USACE investment in dam safety is for flood damage reduction (rather than navigation) dams and is focused on preventing potential loss of life that could result from dam failure.

Routine dam safety activities, such as operation, maintenance, monitoring, inspection, and incident reporting are executed at the district level. The districts also execute non-routine activities that are part of the Dam Safety Program portfolio risk management process (outlined below), with leadership

provided by USACE headquarters and with support from the USACE Risk Management Center (RMC). The RMC is a USACE center of expertise that, on behalf of USACE Headquarters, is responsible for developing policies, methods, tools, and systems to enhance the assessment and management of infrastructure risks and to improve management controls over dam and levee infrastructure decisions. The RMC is supported by the Modeling, Mapping and Consequence Production Center, which produces and applies hydrologic and hydraulic models, economic consequences models, and flood inundation mapping for risk assessment at USACE dams. USACE headquarters, with assistance from the RMC, is responsible for the prioritization and funding of non-routine activities. National oversight for Dam Safety Program activities is provided by a Dam Safety Steering Committee and a Senior Oversight Group.

2.2.1 Portfolio Risk Management Process

A few years prior to Hurricane Katrina in 2005, the USACE began moving away from a strictly engineering standards-based approach to dam safety management in favor of a “portfolio risk management” approach that defines a nationwide evaluation and management process for prioritizing the allocation of dam safety resources based on risks to human life (and to a lesser extent, risks to the economy and the environment) from the potential for dam failure. The process includes a series of risk-informed, hierarchical activities that are used to assess, classify, and manage the risks associated with dams in the USACE portfolio, and that generates various reports on risk assessment and risk management decisions for each dam. The process is being codified in revised program guidance that is nearing finalization.

Program activities are guided by so-called “tolerable risk guidelines” (TRG) for managing the failure risks at USACE dams. The USACE is currently working with the US Bureau of Reclamation (USBR), the Federal Energy Regulatory Commission, the Federal Emergency Management Agency, and the Tennessee Valley Authority to develop standard risk management guidelines for the nation’s dams. In the interim, the USACE is using an adaption of the USBR *Guidelines for achieving public protection in dam safety* issued in 2003 and the risk evaluation guidelines published by the Australian National Committee on Large Dams as the basis for USACE TRG. The guidelines are now being used to guide the process of examining and judging the significance of dam risks to life safety obtained using risk assessments; those judgments are then used to prioritize and guide risk management actions for the USACE portfolio of dams.

The TRG framework defines tolerable risks according to four conditions:

- Risks that society is willing to live with so as to secure certain benefits,
- Risks that society does not regard as negligible or something it might ignore,
- Risks that society is confident are being properly managed, and;
- Risks that are kept under review and reduced further when practicable.

Under the TRG framework, a dam is considered “adequately safe” when failure risk is between unacceptable (where the risk cannot be justified except in extraordinary circumstances) and broadly acceptable (where the risk is regarded as negligible) and essential USACE guidelines are met.

The framework considers four measures for evaluating whether the failure risk for some dam is not within the TRG, thus making the dam a candidate for risk reduction. Two of these are considered priority measures—annual probability of dam failure and life safety risk. A probability of failure that is less than 1 in 10,000 (0.0001) per year is considered tolerable, provided that the other tolerable risk guidelines are met. An annual failure probability above this tolerable level is considered unacceptable and signals that action is warranted to reduce risk.

The TRG for life safety risk consider measures for both individual and societal incremental life safety risks. The individual risk is represented by the probability of life loss for the identifiable person or group (by location) that is most at risk. For existing dams, individual risk is considered tolerable if the probability of life loss is less than 1 in 10,000 (0.0001) per year. Societal incremental life safety risk is expressed in two different ways—probability distribution of potential life loss and annualized life loss. The first uses a plot of the annual probability of exceedance of potential life loss versus incremental potential life loss due to failure as compared to the no failure condition. Thresholds are established in these plots to identify societal tolerable risk limits. Annualized life loss (ALL), is measured as the expected value (average annual) of incremental potential life loss resulting from dam failure. A measured ALL that is less than 0.001 lives lost per year is considered tolerable provided that the other tolerable risk guidelines are met.

In addition, the TRG framework includes a concept known as “as low as reasonably practical” (ALARP) for judging when further risk reduction may be warranted. Under ALARP, further risk reduction may be pursued unless that action is impractical or its cost is grossly disproportionate to the amount of risk reduction achievable.

2.2.1.1 Risk Screening and Classification

In 2005, the USACE began applying a “screening portfolio risk assessment” for all dams in the USACE portfolio to preliminarily rate their risks to life safety associated with dam failure based on five prescribed loading conditions (failure modes). Risk screening for each dam evaluates 1) the probability of dam failure using a project feature and relative performance ratings, and 2) annualized risk of potential life loss calculated using a simplification of a method used by USBR for estimating potential life loss based on available data on populations potentially at risk. The assessment represents a relative comparison system that produces performance and life risk index ratings that are not compatible (directly comparable) with the TRG framework.

The risk ratings are used to assign each dam to a “Dam Safety Action Class” (DSAC). The intent of the DSAC system is to provide consistent and systematic guidelines for appropriate actions to address dam safety issues. The classification of a dam is dynamic over time, potentially changing as project characteristics are modified or more refined information becomes available on potential loading, probability of dam failure, or life safety and other consequences of failure.

Five DSAC are specified: DSAC 1—Urgent and Compelling, DSAC 2—Urgent, DSAC 3—High Priority, DSAC 4—Priority, and DSAC 5—Normal. Dams cannot be assigned to DSAC 5 based on the risk rating data, however, since that data are not directly comparable with the TRG framework. In the future, dams will be reclassified as normal; when further risks assessments that produce information on risks that are comparable with the guidelines indicate that risks are tolerable and the dam meets all essential USACE guidelines.

Initial risk screening and DSAC classification has been completed on all USACE dams (including navigation dams). Roughly 300 of those dams were classified in DSAC 1, 2 and 3; these are viewed “actionable” projects that require further study and possible management actions, as outlined below.

2.2.1.2 Interim Risk Reduction Measures

For all dams that have been assigned to DSAC 1, 2, and 3, interim risk reduction measures (IRRM) plans are developed and implemented. IRRM are short-term measures taken to reduce the risk of catastrophic failure to the maximum extent reasonably practical until permanent repairs can be made or until further investigations find that a potential failure is improbable. The development of these measures for any dam are based on identified potential failure modes and the general consequences associated with each, and can include what are termed “structural and nonstructural measures.” Examples of structural measures include improved seepage collection systems and installation of grout curtains to slow seepage. Examples of nonstructural measures include continuous monitoring, development of warning systems and emergency exercises, and changes in operations such as reservoir pool restrictions or modifications to reservoir regulation plans.

2.2.1.3 Issue Evaluation Studies

For all dams initially placed in DSAC 2 and 3, a second-order risk assessment, called an “Issue Evaluation Study” (IES), is implemented to further investigate and document potential problems and to provide justification for whether to recommend a dam safety modification study. Dams placed in DSAC 4 undergo heightened monitoring and may eventually be recommended for an IES.

The objective of an IES is to evaluate dam safety issues using the TRG framework. It involves a probabilistic evaluation using existing data that includes a “potential failure mode analysis” to examine all failure possibilities specific to each dam. Event tree analysis is built on each potential failure mode. The IES also evaluates potential consequences of dam failure with a primary focus on loss of life. For the IES, the USACE developed a method for evaluating potential fatalities associated with different failure modes that is a simplified version of “LifeSim” (a spatially distributed dynamic modeling system developed for estimating dam-specific potential loss of life resulting from dam failure). That method estimates the magnitude of potential life loss based on characteristics of the dam failure event (that determine the extent, depth, and arrival times of waters downstream), the number and location of people threatened (after considering initial distribution, evacuation response to warnings, and degree of shelter), and empirical fatality rates based on shelter for the threatened population.

Based on the results of an IES, a dam’s DSAC assignment and IRRM plan are reviewed and modified as necessary. If the IES concludes that the estimated risk for a dam falls outside the TRG, the dam will be recommended, prioritized, and scheduled for a dam safety modification study. Those dams that initially were placed in DSAC 1 bypass the IES and proceed directly to prioritization and scheduling for a dam safety modification study.

2.2.1.4 Dam Safety Modification Studies

A dam safety modification study (DSMS) is roughly comparable to and follows the six-step planning process employed for a Civil Works feasibility study. The objective of a DSMS is to formulate, evaluate, and select among alternative management plans that can reduce risks to within the TRG. A DSMS involves a more in-depth probabilistic risk assessment. It examines all potential failure modes and life safety and other consequences to specify baseline risk (without IRRM in place) and the level of risk reduction achieved using alternative management plans, where potential loss of life is estimated using the simplified version of LifeSim, or the full model when deemed necessary. The result of a DSMS is a decision document that recommends a specific alternative to be implemented in a dam safety modification project. Upon approval of a DSMS report, a dam modification project is prioritized for funding and implemented when Congress provides the funds. In October 2010, eight dam safety modification projects were under construction.

2.2.2 Funding

Table 4 shows the increasing budgetary importance of the Dam Safety Program over recent years. In 2010, the modification of USACE dams accounted for almost one-half of appropriations for F&CSDR construction, whereas in 2006 its share was roughly 13%. Moreover, a preliminary USACE assessment indicates that roughly \$26 billion could be needed for the study and modification of all USACE dams (including navigation dams) that have been placed in DSAC 1-3. This may suggest that the Dam Safety Program will continue to command a large share of CG appropriations in years to come.

	FY2010	FY2009	FY2008	FY2007	FY2006
Dam Safety Modification Projects	454,523	258,706	221,081	163,084	93,400
Issue Evaluation & Dam Safety Modification Studies	49,100	50,000	38,376	15,000	15,000
Risk Screening & Classification	17,106	13,923	9,348	6,300	4,458

2.3 Levee Safety Program

In 2007, the USACE began standing-up a USACE Levee Safety Program (LSP) as a national program modeled on the USACE Dam Safety Program. The LSP is now in the developmental stage, with the

mission to “work with others to assess, communicate, and manage the risks to people, property, and the environment from inundation that may result from breach (either prior or subsequent to overtopping), or malfunction of components of levee systems.” As in the Dam Safety Program, life safety is the paramount goal, although exactly what this means in the levee safety context is a matter of ongoing discussions.

The LSP includes development and maintenance of a levee database as well as various routine and non-routine activities that are part of the LSP portfolio risk management process. These activities are reviewed in turn below. In general, the USACE districts have responsibility for leading and executing the routine activities. Prioritization and funding of non-routine activities will be centrally led by USACE Headquarters, and non-routine activities will be jointly executed by the districts, Headquarters, the USACE Risk Management Center, and other supporting USACE research and operating entities such as the Modeling, Mapping, and Consequences Production Center. National oversight is provided by a Levee Safety Steering Committee and a Senior Oversight Group.

2.3.1 USACE Levee Portfolio and Database

The USACE levee portfolio addressed by the LSP includes approximately 2,000 levee systems, or about 14,000 miles of levees, that fall within three categories:

1. USACE operated and maintained levee systems (hereafter referred to as *USACE O&M levee systems*). These include levees for which the USACE has direct authority to operate and maintain (as well as repair and rehabilitate, as necessary), under existing authorities. These include USACE-built and managed levees such as the MR&T project levees and other levees that Congress has directed the USACE to operate and maintain (about 2,000 levee miles).
2. Federally-authorized, non-federal sponsor operated and maintained levee systems (hereafter referred to as *local O&M levee systems*). These are levee systems that were designed and built by the USACE (or transferred to the USACE by Congress) and then turned over to non-federal sponsors who are now responsible for operation and maintenance and other management (about 10,800 levee miles).
3. Non-federal levee systems in the USACE Rehabilitation and Inspection Program (RIP) (hereafter referred to as *Non-federal levee systems*). These are levee systems currently enrolled in the RIP that were designed and built by non-federal entities that are responsible for operation and maintenance and other management (about 2,000 levee miles).

Prior to 2006, the USACE did not maintain a national-level inventory or database of levee systems within the USACE portfolio. In May 2006, the USACE began an inventory of levee systems and other flood damage reduction projects and the development of a national levee database (NLD). The purpose of the NLD is to serve as a national source of information to facilitate and link LSP activities that are generating information on levee status and risks in order to promote risk communication and management. The NLD is being populated with information on the location and status of levee systems, including system attributes relating to initial design and construction, the record of system operation, maintenance, and

repair over time, as well as the areas they serve, including populations and the estimated value of property in those areas.

Initial development of the NLD focused on levee systems within the USACE portfolio. However, pursuant to congressional direction in Title IX Section 9004(b)(1) of WRDA 2007 (also known as the Levee Safety Act of 2007), the NLD will eventually include location information on levees managed by other federal agencies, as well as any information that can be obtained from state and local governments on non-federal levees that are not within the USACE portfolio.

2.3.2 Portfolio Risk Management Process

The LSP is being modeled on the portfolio risk management process now being used in the USACE Dam Safety Program to guide and prioritize risk assessments and management actions for levee systems. The process includes various routine processes that are now being implemented; these include routine and periodic inspections as well as risk screening and classification for levee systems within the USACE portfolio. The LSP envisions that the results of the routine activities will be used to prioritize levee systems for various proposed non-routine actions relating to more in-depth risk assessment and possible management actions. However, unlike the Dam Safety Program, the LSP does not employ the TRG framework for guiding non-routine activities.

As in the Dam Safety Program, the proposed non-routine activities focus on risks to human life associated with levee system failure. This risk is defined as the sum of risks from three possible “inundation” scenarios associated with the following levee failure modes: 1) breach prior to overtopping, 2) overtopping with subsequent breach, and 3) malfunction of levee system components. A fourth inundation scenario that does not involve levee failure—overtopping without subsequent breach, is also considered in the non-routine activities, but for risk communication purposes only. The sum of risks from all four inundation scenarios represents the total residual risks associated with a levee system.

It is important to recognize that there are significant differences between the USACE Dam and Levee Safety Programs relating to management and financial responsibility for the projects within their respective portfolios as well as the risk management capabilities of these projects that have implications for applying the proposed non-routine processes to the USACE levee portfolio. The Dam Safety Program covers mostly dams for which the USACE has full management authorities and responsibilities. Further, the primary focus of that program is on reducing failure risks to within the program’s tolerable risk guidelines through hazard reduction measures (dam modifications) that the USACE can implement if provided project-specific appropriations for this purpose. In light of the potentially catastrophic consequences that could result from the uncontrolled release of a dam reservoir pool, the USACE Dam Safety Program focuses on implementing dam modifications where necessary to ensure that dam failure is highly unlikely as well as providing recommendations to downstream communities on measures they could take to reduce potential consequences were a failure to occur.

The evolving LSP, on the other hand, covers many levee systems for which the USACE has limited or no standing study and management authorities or financial responsibilities beyond routine inspection.

Moreover, the LSP works from the recognition that all levee systems, regardless of their elevations and structural integrity, are subject to overtopping (with or without subsequent breach) as well as potential breach or malfunction prior to overtopping. This reality turns attention to opportunities for reducing life safety risks in the communities served by levee systems through not only levee repairs and upgrades but also the reduction of population exposure and vulnerability. Since responsibility for land use management and emergency evacuation is vested at the local level (with some degree of oversight possible at the state level), the LSP operates under the premise that the ability to reduce levee risks to life safety through exposure and vulnerability reduction rests with local governments and floodplain occupants. For these reasons, the USACE LSP stresses “shared responsibility and accountability” for the reduction and then management of life safety risks in communities served by levee systems, and focuses on USACE authorities to assess and communicate risks and provide advice on risk management measures.

The LSP is now implementing the routine activities while the USACE processes and roles in implementing and funding the proposed non-routine LSP activities are being further explored and developed. The ongoing routine activities and the proposed non-routine activities are outlined in turn below; the different types of levee “assessments” they include are summarized in the appendix to this overview.

2.3.2.1 Routine Activities

2.3.2.1.1 Standardized Routine Inspections

Prior to the establishment of the LSP, the USACE’ main interaction with local O&M and non-federal levee systems involved USACE-led, visual inspections under two separate programs—the Inspection of Completed Works Program (ICW) and the Rehabilitation and Inspection Program (RIP), which focused on different categories of levee systems within the USACE portfolio. The ICW involved annual USACE-led inspections of local O&M flood damage reduction projects (not just levee projects). The RIP was used to inspect non-federal flood damage reduction projects enrolled in the RIP. Enrollment in the RIP provides the opportunity for the sponsors of eligible levee systems to receive, pursuant to PL 84-99, federal funding assistance for the repair of these systems were they to be damaged by floods or coastal storms (hereafter referred to as PL 84-99 assistance).

The intent of the routine inspections conducted under both the RIP and ICW programs is limited to ensuring that the projects are properly operated and maintained by non-federal sponsors, which is the condition for continued eligibility for PL 84-99 assistance (the inspections do not include the type of engineering assessments that would be needed to evaluate project performance or integrity). Despite this common purpose, prior to the LSP the programs were guided by different regulations that prescribed inconsistent rating systems and inspection criteria.

Soon after Hurricane Katrina, the USACE standardized the routine inspection criteria, procedures, and rating system for all levee systems within the USACE portfolio, and the LSP was given responsibility for conducting all routine inspections (with the participation of the non-federal sponsor or other entity responsible for system O&M). The routine inspections are now more comprehensive than those

conducted in the past and are intended to inform the LSP portfolio risk management process. Nevertheless, the new routine inspections (which are also referred to as continuing eligibility inspections) remain visual and focus primarily on ensuring proper system operation and maintenance by non-federal sponsors for the purpose of determining whether a system can remain “active” in the RIP, and thus remain eligible for future PL 84-99 assistance.

The routine inspections, which are to be conducted annually, employ a standard checklist and an automated inspection tool. USACE districts began using these in 2007, and the inspection results are linked directly to the NLD.

The routine inspections employ a new rating system that includes three evaluation designations for levee system O&M: acceptable, minimally acceptable, and unacceptable. Systems receiving a rating other than acceptable require action by their non-federal sponsors in order to remain eligible for PL 84-99 assistance. The inspection checklist is used by USACE inspectors to evaluate and rate individual items of a system; if any item receives an unacceptable rating, raters have discretion to give a system an overall rating of minimally acceptable or unacceptable. If a system receives an overall rating of minimally acceptable, the system items that received an unacceptable rating must be corrected within two years; otherwise, system O&M would then be rated as unacceptable.

An unacceptable rating is given if one or more checklist items are rated as unacceptable and, in the judgment of USACE inspectors, would prevent the system from performing as intended. If a levee system is given an unacceptable rating in a routine inspection, it is placed in “inactive” status in the RIP, and notification of system deficiencies and the new RIP status is given to the non-federal sponsor, the relevant locality and state, as well as FEMA. Systems that are placed in inactive status in the RIP immediately become ineligible for PL 84-99 assistance and remain so until the noted deficiencies are corrected by the non-federal sponsor, as determined by a subsequent USACE inspection.

As a result of the new rating system, in 2007 the sponsors of 122 levee systems were notified that system O&M had been deemed unacceptable by the USACE, and 63 of these systems did not make the necessary corrections during a one-year grace period that was provided and were placed in inactive status in the RIP. In 2009, the USACE placed an additional 114 levee projects in inactive status in the RIP as a result as unacceptable ratings given by the USACE in routine inspections conducted since 2007.

As part of the process to standardize the routine inspections, in 2006 the USACE began a review of agency policy and standards for the management of woody vegetation on levees in the USACE portfolio, and signaled that it would strictly adhere to those standards in the O&M inspection ratings for those levees. The management standards are meant to address USACE concerns that woody vegetation could inhibit O&M inspections and emergency access for flood-fighting. In 2009, the USACE published an “Engineering Technical Letter” (ETL 1110-2-571) to clarify existing vegetation management standards. The ETL requires that levee land-side slopes, crowns, and upper third of river-side slopes be kept free of vegetation, and (in the absence of a variance) the remainder of the system kept free of woody vegetation that is 2” or greater in diameter. In that same year the USACE began to strictly adhere to the

standards in O&M inspections, leading some levee systems to receive unacceptable O&M ratings and thus loss of eligibility for PL 84-99 assistance.

As a second policy component, the USACE in 2010 published in the *Federal Register* a draft “Policy Guidance Letter” (PGL) that would update existing variance policy for levee vegetation management standards. The draft PGL proposes a process and criteria to allow levee sponsors to adopt alternative paths to realize the functionality of the ETL standards while also achieving environmental goals.

As a third policy component, a 2011 USACE headquarters memorandum to the field announced policy for the development and implementation of a “system-wide improvement framework” (SWIF). The SWIF is meant to provide a process for levee sponsors to develop and implement, in collaboration with the USACE and federal resource agencies, a plan for making system-wide improvements to a levee system in a prioritized way (including the correction of unacceptable inspection items), while maintaining eligibility for PL 84-99 assistance and meeting Endangered Species Act (ESA) and other federal environmental requirements. Once a levee sponsor’s “Letter of Intent” to use the SWIF is approved by the USACE, a levee sponsor will be given up to two years to develop an improvement plan, and after that period ends, the continued eligibility of a levee system for PL 84 99 assistance will be dependent on the levee sponsor’s progress toward meeting milestones defined in the plan.

These policy developments relating to vegetation management standards for levee system O&M have not been favorably received by some non-federal project sponsors and environmental advocacy groups, particularly in California and Washington. Among the expressed concerns is that the ETL standards do not account for regional differences, will result in considerable local expense for vegetation removal, and will put states and communities at odds with ESA mandates and other environmental requirements. And comments submitted on the draft (PGL) variance policy complain that the requirements for localities to secure a variance from the ETL standards are unjustifiably burdensome.

2.3.2.1.2 Periodic Inspections

In 2009, the LSP created a new type of inspection that is now being conducted on all USACE O&M levee systems as well as local O&M levee systems. These “periodic inspections,” which are to be undertaken once every five years, include but go beyond the routine inspection focus on ensuring proper system O&M by non-federal sponsors. Specifically, the periodic inspections are intended to:

- Verify proper O&M for the purpose of determining continued eligibility for PL 84-99 assistance (the periodic inspection substitutes for the routine inspection in years in which the former is conducted);
- Develop a preliminary understanding of potential performance and safety of the system;
- Identify system features that may require further engineering evaluation or monitoring over time, and;
- Improve the Corp’s ability to communicate overall levee system condition and associated risks.

Periodic inspections involve three parts: 1) collection and review of system documentation and available data and information on system condition and performance history; 2) a field inspection similar to but more detailed than that done for a routine inspection, performed by a multidisciplinary team and led by a licensed professional engineer with experience in the design, construction, and operation and maintenance of levee systems, and; 3) an inspection report that documents inspection findings and provides conclusions and recommendations that, upon approval, are posted to the NLD.

The report provides an overall rating for system O&M (acceptable, minimally acceptable, or unacceptable) as well as ratings for each system feature. However, only the O&M rating has implications for RIP status and thus eligibility for PL 84-99 assistance. An unacceptable O&M rating is communicated to the relevant locality and state as well as FEMA.

In 2009, USACE contractors began conducting periodic inspections on local O&M levee systems in the ICW program. These inspections were accelerated using \$90 million in “stimulus” funds provided by the American Reinvestment and Recovery Act of 2009. It is expected that these inspections will continue through 2012. USACE guidance says that periodic inspections for non-federal levees enrolled in the RIP will be conducted only as directed by USACE headquarters, and there are no current plans for conducting periodic inspections on these systems.

2.3.2.1.3 Risk Screening and Classification

Analogous to the process used in the USACE Dam Safety Program, risk screening and classification of all levee systems within the USACE portfolio is now being pursued for risk communication purposes and to guide and prioritize potential further risk assessments and management actions. Risk screening, which focuses on risk to human life of system failure, is being supported by application of a Levee Screening Tool (LST) that is a web-based system developed specifically for classifying levee systems according to life safety risk. The LST consists of an electronic database that uses information contained in the NLD and a limited engineering assessment of system features to produce a risk index rating for each system, where potential loss of life is estimated using a simplified version of “Jonkman’s Method” (Delft University, The Netherlands).

The LST uses available information to produce a performance index rating for levee systems based on the probability of system breach when faced with water loading to the top levee elevation (that is, the possibility of breach or component malfunction prior to water overtopping the system) as well as a performance index rating relating to the probability of overtopping with subsequent breach. The performance index ratings are combined with estimates of the potential life safety consequences of such system “failure” in order to rate systems according to relative risk. The risk associated with overtopping without breach is also reviewed and communicated to levee sponsors, but does not factor into the risk ratings.

The risk ratings, together with other relevant available information and expert judgment, are used to place each levee system in a “Levee Safety Action Class” (LSAC) modeled after the classification system employed by the USACE Dam Safety Program. Five LSAC assignments are specified that relate to

“urgency of action”: LSAC 1—Very High, LSAC 2—High, LSAC 3—Moderate, LSAC 4—Low, and LSAC 5—Normal.

Application of the LST by USACE districts and use of the results for LSAC assignment by the Levee Safety Senior Operating Group involve significant discussion and judgment calls. The non-federal agencies that are responsible for levee management are invited to participate in compiling the information used to apply the LST and to review the LST results. Because the LSAC assignments are based on the best information available at the time, the classification for any levee system may change as further investigations move forward as part of the non-routine activities, as described below.

2.3.2.2 Proposed Non-Routine Activities

The proposed LSP non-routine activities that are now being developed are outlined below. These include reconnaissance and feasibility phase risk assessment studies as well as potential interim and long-term risk reduction actions.

2.3.2.2.1 Risk Communication and Planning Non-Routine Activities

Once the LSAC assignment has been made for a levee system, the relevant USACE district will communicate the assignment and the screening estimate of risk to the non-federal sponsor of the system. In the case of USACE O&M levee systems, the USACE districts will lead the effort to communicate risk to the affected communities. For local O&M levee systems and non-federal levee systems, the non-federal sponsors will lead the effort to communicate risk to the affected communities, with assistance provided by USACE districts. Once the LSAC information has been communicated, the USACE district will work with non-federal sponsors and stakeholders to define next steps and roles for any subsequent non-routine activities.

2.3.2.2.2 Interim Risk Reduction Measures

Interim risk reduction measures (IRRM) are actions taken to reduce the likelihood or consequences of levee system failure while long-term risk reduction solutions are being pursued. As in the USACE Dam Safety Program, the USACE will recommend IRRM for all levee systems that receive an assignment of LSAC 1, 2, or 3. The IRRM can include what are termed “structural and nonstructural measures.” Examples of structural measures include improving toe drains for seepage, building seepage berms, and increasing erosion protection. Examples of nonstructural measures include temporarily changing the operation of upstream reservoirs to reduce flood flows and developing warning and evacuation plans.

2.3.2.2.3 Reconnaissance Phase: Base Condition Risk Assessment

This proposed study, which is akin to a reconnaissance study for a prospective civil works project, would apply to levee systems that receive a LSAC 1-4 designation. It would rely on a more in-depth probabilistic risk assessment than that conducted for LSAC designation to examine whether there is a federal interest in proceeding to a feasibility phase levee safety risk management (LSRM) study. The main objective of this initial study would be to obtain a base condition risk estimate for determining

whether or not a LSRM is warranted. The results of the base condition risk assessment would also be used to confirm or modify the LSAC assignment, reevaluate the potential effectiveness of IRRM and recommend changes when justified, and to communicate risk to the relevant community.

It is anticipated that the scope and rigor required for a base condition risk assessment will be based on the complexity of levee safety issues for any levee system, and the ability to identify and evaluate the potential failure modes for the system using existing data, analyses, and performance history. The assessment is intended to achieve a defensible, risk-informed justification for completion of the reconnaissance phase, including securing a non-federal cost share partner for a feasibility phase study in the case of local O&M levee systems. The results of the base condition risk assessments will also be used to prioritize feasibility phase studies for USACE O&M levee systems and local O&M levee systems.

2.3.2.2.4 Feasibility Phase: Levee Safety Risk Management Study

The proposed LSRM study would be roughly comparable to and follow the six-step planning process employed for a Civil Works project feasibility study, with the main difference being that the LSRM study would emphasize risk to life safety associated with system failure. A LSRM study would result in a decision document that reassesses base condition life safety risks, evaluates alternative risk reduction plans, and presents the rationale for a recommended plan. Determination of the recommended plan would be made jointly by all entities that have financial or administrative responsibility for implementing the management measures included in the plan.

For USACE O&M levee systems, the project congressional authority and source of risk would determine the study approach applied by the USACE. Where the major source of inundation risk for USACE O&M levee systems is breach prior to overtopping, the USACE would apply existing policy and procedures under its Major Rehabilitation Program. For local O&M levee systems, a non-federal cost share sponsor would be required, and USACE participation in and financial contribution toward implementation of recommended management plans would require congressional authority and then appropriations directed to individual projects.

2.3.3 Funding

2.3.3.1 Routine Activities

The routine activities have been funded through several sources, including regular and supplemental (FCCE) appropriations as well as stimulus (ARRA) funds. Table 5 shows funding for the levee inventory and certain routine activities in years 2006-2010.

Table 5. Appropriations for Selected USACE Levee Safety Program Activities (thousands of \$)					
	FY2010	FY2009	FY2008	FY2007	FY2006
National Levee Inventory & Database	9,503	9,282	10,000	0	30,000 (FCCE)

Inspection Standards Development	1,692	1,652	1,664	0	0
Routine Inspections	27,376	26,202	11,403	13,416	8,643
Periodic Inspections	0	90,000 (ARRA)	NA	NA	NA

2.3.3.2 Funding for Non-Routine Activities

For USACE O&M levee systems, O&M appropriations to the USACE will be used to plan IRRM and implement those that the USACE has authority to undertake. For local O&M levee systems as well as Non-federal levee systems, however, the responsibility to plan and implement IRRM falls with the non-federal sponsors. Upon request, the USACE districts will provide technical advice on the options for IRRM for these systems as allowed for by USACE authorities and resources. The USACE is exploring using its Flood Control and Coastal Emergencies authorities (under PL 84-99) and other USACE programs, such as Floodplain Management Services Program and Planning Assistance to the States Program (each of which is reviewed later) to provide USACE technical assistance for IRRM planning.

It is anticipated that the level of USACE involvement in and potential federal funding for the proposed reconnaissance and feasibility phase studies and any recommended risk reduction plan would vary by the type of levee system involved. For USACE O&M levee systems, the USACE has standing authorities to study deficiencies in completed projects and implement management actions to correct them under its Major Rehabilitation Program. It is envisioned that the reconnaissance and feasibility phase risk assessment studies for USACE O&M levee systems will be funded at full federal expense using USACE O&M appropriations; however, construction of project modifications recommended by those studies would require congressional appropriations for any individual project.

For local O&M levee systems, it is envisioned that the USACE' "Review of Completed Projects" (section 216) authority could be used to implement risk assessment studies using USACE O&M appropriations, to the extent available. Section 216 provides the USACE with general authority to review completed projects when deemed advisable due to changed physical, economic, or environmental conditions. This authority provides for full federal funding of a reconnaissance phase study and 50% federal/50% non-federal cost sharing for a feasibility phase study. USACE involvement in modifications to completed local O&M levee projects would require congressional authority and then appropriations directed to each specific project.

For non-federal levee systems (i.e., those not federally-authorized and built by the USACE), the USACE has no standing authorities that allow for USACE involvement in or funding for risk assessment studies and project modifications to reduce risks. Thus, USACE involvement in the study of a Non-federal levee system would require new project-specific study authority provided by Congress, and USACE involvement in any recommended project modification would require new congressional construction authority and then appropriations for each individual project.

In the current federal budget environment, there are severe limits on potential federal dollars for modifications to levee systems that are not managed by the USACE. This suggests that the sponsors of such projects would largely be on their own when it comes to funding and implementing project improvements, which in the case of local O&M projects, would require USACE approval (as discussed earlier in Section 2.16).

2.4 Technical and Planning Assistance

Two long-standing programs, the Floodplain Management Services Program and the Planning Assistance to States Program, provide technical and planning assistance to localities, states, and other federal agencies. These programs are notable among USACE F&CSDR programs in that they focus largely on providing technical and planning services support for local floodplain management efforts intended to reduce the exposure and vulnerability of people and assets to flood hazards and increase their resiliency to flood events.

2.4.1 Floodplain Management Services

The objective of the Floodplain Management Services Program (FPMS) is to foster public understanding of flood hazards and the floodplain management options for reducing community exposure and vulnerability to those hazards. It authorizes the USACE to provide, upon the request of non-federal agencies and other federal agencies, information, technical services, and planning assistance and guidance for identifying the magnitude and extent of flood hazards, mitigation planning, and floodplain management.

Program expenditures are authorized to a ceiling of \$15 million annually. Upon request and subject to availability of funds, program services are provided to non-federal public agencies free of charge; however, the program receives many more requests for assistance than can be implemented using program appropriations. If a state or local agency has a need for assistance and is not allocated limited program funds, they can obtain assistance on a reimbursable basis. Program services are also provided to FEMA and other federal agencies on a 100% reimbursable basis under interagency agreements established through the USACE "Support for Others" program.

The program grew out of the Flood Control Act of 1960, which authorized the USACE to compile and disseminate information on floods and flooding to states and localities upon request. It became a full-fledged USACE program staffed at the district level after the Flood Control Act of 1966 raised the program expenditure ceiling and authorized the USACE to provide expanded technical services and support to states and localities as well as federal agencies. This followed the recommendations of House Document 465 (published in 1966) that called for federal actions "to provide technical assistance to managers of floodplain property" and to help states and localities "to coordinate and plan new developments in the floodplain."

In its early years the primary program activity was conducting "floodplain information reports" that provided floodplain delineation and information on flood hazards. In later years the program focus

shifted to providing analyses for the Flood Insurance Administration in support of the NFIP through reimbursable project orders.

Since the mid-1970s, the program has focused on providing technical services and planning assistance for state and local governments. Technical services include the development and interpretation of site-specific data on obstructions to flood flows, flood formation, and timing; flood depths or stages; floodwater velocities; and the extent, duration, and frequency of flooding and potential damages with and without floodplain management measures in place. The program also houses the USACE “National Nonstructural and Flood Proofing Committee” that provides technology transfer on management measures such as relocation, elevation, and flood proofing of structures. Planning assistance support is provided by “special studies” on all aspects of floodplain management, including floodplain delineation and flood hazard evaluation; floodplain management; dam break analysis; hurricane evacuation; flood warning and preparedness, regulatory floodway; flood damage reduction; urbanization impacts; storm water management; flood proofing and inventory of flood-prone structures.

Program activity is linked to a variety of FEMA programs and activities. FPMS work assists communities in developing floodplain management plans required for NFIP participation, and provides data and information that supports NFIP levee certification documentation developed by others. The program provides assistance to communities who are competing for pre-disaster FEMA hazard mitigation grants, including developing cost-benefit evaluations for proposed mitigation measures. And FPMS work assists communities in developing hazard mitigation plans that are a condition for community eligibility for federal disaster assistance. The program has also provided floodplain modeling and mapping services for FEMA map modernization efforts and in support of flood insurance studies and rate maps.

2.4.2 Planning Assistance to States

The Planning Assistance to States Program (PAS) provides the USACE with authority to assist states and tribal entities in the preparation of comprehensive plans for economic development and the conservation of water and related land resources. Program expenditures are authorized to a ceiling of \$10 million annually, and federal allotments to any one state or tribe are limited to \$2 million annually. Planning studies are cost shared on a 50% federal, 50% non-federal basis.

Planning study assistance is requested by states and tribes and the PAS program accommodates as many requests as possible with limited program funds. The program funds studies dealing with many types of water resources planning issues; those that relate most directly to flood risk management include dam safety studies, flood damage reduction studies, floodplain management studies, and coastal zone management studies. One example of a current study funded by PAS is California’s Awareness of Floodplain Mapping Program, which was initiated to assist California communities with initial identification of flood hazard areas that are not currently mapped by FEMA.

2.4.3 Funding

As shown in Table 5, the FPMS and PAS programs are funded at relatively low levels that together account for only a small fraction of overall USACE F&CSDR spending.

Table 5. Appropriations for F&CSDR Technical & Planning Assistance Programs, FY2006-FY2010 (thousands of \$)					
Program	FY2010	FY2009	FY2008	FY2007	FY2006
Floodplain Management Services	8,059	8,600	6,856	5,625	6,407
Planning Assistance to States	7,161	6,593	6,395	10,000	5,727

2.5 USACE-FEMA Interagency Coordination

The National Flood Insurance Program (NFIP), which is administered by FEMA, provides property owners in participating communities with the opportunity to purchase federally-underwritten flood insurance in return for local government implementation of minimum floodplain management standards. Participating communities must have their levee systems “accredited” by FEMA in order for those levees to be shown on FEMA flood maps as providing protection from the one-percent annual chance flood. Such accreditation means that the area behind the levee will not be mapped as a high-risk “Special Flood Hazard Area,” which would trigger mandatory flood insurance purchase and floodplain management requirements. To obtain accreditation, a community must submit levee “certification” documentation to FEMA signed by a professional engineer or federal agency with responsibility for levee design and construction that provides evidence that levee design, operation, and maintenance systems provide reasonable assurance that the levee provides protection against the one-percent annual chance flood event.

2.5.1 Flood Protection Structure Accreditation Task Force

The Senate Report accompanying the Consolidated Appropriations Act of 2012 (PL 112-74) states in part, “FEMA is directed to convene a joint task force with USACE to better align NFIP levee accreditation requirements with levee inspections performed by or for USACE such that information and data collected for either purpose can be used interchangeably to the maximum extent practicable toward satisfying levee accreditation requirements.”

This charge was extended in Section 100226 of the Biggerts-Waters Flood Insurance Reform Act of 2012 (PL 112-141), which called for FEMA and the USACE, in cooperation with the National Committee on Levee Safety, to establish a Flood Protection and Accreditation Task Force. It states, “The task force shall develop a process to better align the information and data collected by or for the USACE of Engineers Inspection of Completed Works Program with the flood protection structure accreditation requirements so that (i) information and data collected for either purpose can be used interchangeably; and (ii) information and data collected by or for the USACE of Engineers under the Inspection of Completed Works Program is sufficient to satisfy the flood protection structure accreditation requirements.” Toward that end, Congress directed that the task force “shall consider changes to” the information collected during USACE inspections as well NFIP accreditation requirements, and “shall gather and

consider ... recommendations from interested persons in each region.” The act requires that the task force submit an interim report to Congress by January 2, 2013, and a final report by July 6, 2013.

The USACE and FEMA have combined the two task forces into one in order to leverage resources, and its implementation plan envisions that the task force will develop short-term recommendations (relating to actions that could be implemented within one year) as well as long-term recommendations. The plan also says that the task force will consider USACE and FEMA policies and procedures beyond USACE levee inspections and FEMA accreditation requirements, such as current and proposed activities within the USACE LSP and FEMA’s “Risk MAP.”

2.5.2 NFIP Levee Certification

Historically, the USACE has been involved in certifying local O&M levee systems for the NFIP. Prior to 2006, USACE districts would often issue certification letters to FEMA at the request of communities served by local O&M levee systems based on data from USACE design documents and inspection reports. The USACE and FEMA have since discontinued that practice.

In 2010, the USACE issued new policy and procedural guidance for what it now refers to as “levee system evaluation” (LSE) performed by the USACE for NFIP certification purposes. The policy stresses that levee system evaluations for NFIP certification are the responsibility of the communities seeking accreditation, but the USACE can participate in limited cases that are consistent with 1) USACE authorities for using discretionary funds, and 2) statutory restrictions on performing reimbursable work for non-federal entities if that work could be provided by the private sector. Under current policy, the USACE may budget for and perform evaluations for USACE O&M levee systems or levee systems that are part of a Civil Works project under construction. The policy also notes other situations in which the USACE may perform a LSE on a reimbursable basis, including for local O&M levee systems, when requested by non-federal sponsors and consistent with USACE authorities (at least some USACE districts are currently conducting LSE for Federally-authorized/local O&M levee systems). The policy also says that for levee systems in which the USACE has previously provided a certification letter, the USACE will notify the levee sponsor and FEMA that the USACE will consider the letter determination invalid after 3 years from the date the new policy was issued. USACE policy stipulates a maximum 10-year validity period for a completed LSE.

The USACE LSE approach was developed with concurrence by FEMA and is consistent with FEMA NFIP regulations. However, the LSE goes beyond the minimum requirements of FEMA regulations for NFIP certification to evaluate system performance using the risk analysis (probabilistic) framework applied in F&CSDR project planning, whereas FEMA regulations allow certification based on a deterministic approach. Further, the USACE LSE is to include statements about levee system residual risks and possible safety concerns that serve a risk communication purpose that is not relevant for NFIP levee accreditation.

2.5.3 Silver Jackets

The Silver Jackets Program was created in recent years to support state efforts to address their flood risk management priorities by 1) increasing state awareness and understanding of the full range of federal programs available to support their efforts, and 2) ensuring that federal agency staff work together to assist states in developing comprehensive approaches for flood risk management.

The program operates at the state level. A state Silver Jackets team includes representatives from the USACE and FEMA, the state NFIP coordination office, and the state hazard mitigation office as standing members and lead facilitators. Other agency representatives may vary based on current team focus and activities, and a team may expand or contract depending on its focus areas and priorities.

The program was first initiated in Ohio to establish federal and state agency collaboration on flood risk management issues. The Ohio team charter was signed in 2005, and neighboring Indiana established a team in 2006. These pilot states have served as models for the establishment of teams in other states nationwide. Some states had already developed state teams and then requested USACE support for the teams through Silver Jackets. At the time of this writing, 22 states had active interagency teams, and there were ongoing efforts to establish teams in the remaining states.

The Silver Jackets Program creates a framework for developing and maintaining interagency partnerships for flood risk management at all levels of government on a continuous basis. The operational goals of a state Silver Jackets team include:

- Define a process for interagency communication and coordination;
- Leverage available resources (e.g., data and information, staff and funding) among agencies;
- Create or supplement a mechanism to collaboratively address flood risk management issues;
- Increase and improve flood risk communication and outreach;
- Provide assistance in implementing high priority actions such as those identified in states' hazard mitigation plans, and;
- Facilitate strategic, life-cycle planning to reduce flood risk.

The program is managed and funded through the USACE' "National Flood Risk Management Program," which is an umbrella program that focuses on fostering coordination and collaboration within and among the flood risk management programs and authorities of the USACE and with those of FEMA, other federal agencies, and state and local agencies. Staff resources for participating in a state Silver Jackets team are the responsibility of each participating agency. Resources for flood risk management activities associated with any team are to be secured through the individual programs of each agency within the constraints of available budgets.

3 Emergency Management Program

The purpose of the Emergency Management Program (EM) is to enable the USACE to prepare for, respond to, and help communities to recover from natural disasters and other national emergencies. Thus, unlike the F&CDSR program that focuses primarily on proactive flood hazard reduction, the EM

program prepares for and reacts to flood events and focuses primarily on promoting resilience—that is, the ability of people and assets to return to pre-flood conditions. The program operates under authorities granted by PL 84-99 and the Robert T. Stafford Disaster Relief and Emergency Assistance Act, as outlined below.

3.1 PL 84-99 Activities

Under PL 84-99, known as Flood Control & Coastal Emergencies (FCCE), the USACE is authorized to undertake:

1. Disaster preparedness activities, such as the inspection of Non-federal F&CSDR projects enrolled in the USACE Rehabilitation and Inspection Program (RIP), preparation of hazard response plans, training of response personnel, and the purchase and deployment of response equipment and supplies;
2. Emergency operations, including supplementing state and local flood-fighting efforts and the provision of emergency water supplies, and;
3. Recovery activities, such as the repair of eligible Federally-authorized/local O&M F&CSDR projects and Non-federal F&CSDR projects enrolled in the RIP that have been damaged by floods and storms.

3.2 Stafford Act Activities

The EM program provides emergency response support to FEMA and other federal agencies under the Stafford Act. Upon the Presidential declaration of a major emergency or national disaster, the USACE supports FEMA in carrying out the National Response Framework (NRF). Under the NRF, the Department of Defense has designated the USACE as the primary agency for planning, preparedness, and response under Emergency Support Function #3 (Public Works and Engineering). In this role the USACE supports FEMA on a reimbursable basis in the provision of temporary power to critical public facilities, temporary water supplies and ice, debris removal, and infrastructure assessments, among other activities.

3.3 Funding

The EM program received regular appropriations for FCCE in only one year since 1999. When funding for FCCE has been provided by Congress in recent years it has been through supplemental appropriations. Table 6 presents FY 2010 supplemental Civil Works appropriations allocated to FCCE and other accounts for activities in response to floods, coastal storms, and other natural disasters.

The vast majority of supplemental appropriations provided for FCCE are typically used for the repair of F&CSDR projects that have been damaged by floods and coastal storms, and for flood response activities (flood-fighting assistance). Funds are made available for the repair of local O&M F&CSDR projects (built by the USACE) as well as non-federal F&CSDR projects (not built by the USACE) that are active in the RIP and that meet certain eligibility conditions. These can include projects such as levee systems, flood damage reduction dams, and other flood damage reduction infrastructure that meet certain criteria.

Local O&M projects are automatically enrolled in the RIP when construction is completed, while enrollment for a Non-federal project is at the request of the non-federal sponsor and begins with a one-time inspection performed by the USACE, called an Initial Eligibility Inspection (IEI). The IES is a visual inspection that evaluates project performance capabilities as well as O&M and preparedness. (For example, agricultural levees must provide at least a five-year level of protection, and urban levees a ten-year level of protection.) An “acceptable” IEI rating provides a project with active status in the RIP making it eligible for PL 84-99 assistance if damaged by a flood. A minimally acceptable rating also provides a project with active status, but continuation of that status depend on the non-federal sponsor correcting deficiencies noted in the IEI within a prescribed timeframe. The IEI is now performed as part of the USACE Levee Safety Program (LSP), and as discussed earlier, a project must receive “acceptable” ratings in subsequent routine inspections conducted annually by the LSP in order to maintain active status in the RIP.

Table 6. FY 2010 Supplemental Appropriations for Flood Control & Coastal Emergencies (FCCE) and Other Accounts		
Appropriations Account	2010 Funding (thousands \$)	Overview of Funded Activities
Flood Control & Coastal Emergencies (FCCE)	20,000	The vast majority of FCCE funds are typically used for the repair of eligible non-federal (not built by the USACE) F&CSDR projects and Federally-authorized/local O&M F&CSDR projects that are active in the USACE Rehabilitation & Inspection Program (RIP) and that have been damaged by natural disasters. Limited FCCE funds are used for the routine inspection of non-federal F&CSDR projects enrolled in the RIP; for planning, training, and other preparedness measures to ensure USACE readiness to respond to floods, hurricanes, and other natural disasters; and to support emergency response operations, including advance measures, flood fighting, and providing emergency water supplies.
Construction General (CG)	0	CG funds are used to modify, as made necessary by recent natural disasters, Civil Works projects that are currently under construction.
Operation & Maintenance (O&M)	173,000	O&M funds are used to dredge navigation projects in response to, and repair damages to USACE O&M Civil Works projects caused by, natural disasters.
General Investigations (GI)	5,400	GI funds are used to modify ongoing Civil Works project planning studies as made necessary by recent natural disasters,
Mississippi River & Tributaries (MR&T)	18,600	MR&T funds are used to dredge navigation channels and repair project infrastructure in the Mississippi River alluvial valley below Cape Girardeau, Missouri, as made necessary by natural disasters.
Total	\$217,000	

To be eligible for PL 84-99 assistance for repairing damage caused by a flood or coastal storm, a project must have “active” status in the RIP, repair must have positive net economic benefits as determined by a USACE analysis, and repair costs must be at least \$15,000. For projects that meet these conditions, the USACE will pay the full costs of engineering and design studies. The USACE will also pay 80% of construction costs for the repair of Non-federal projects, and 100% of construction costs for local O&M projects (see Box 2).

The USACE is now in the process of revising policy guidance for the EM program that could potentially introduce changes in the RIP with respect to allowable uses of RIP funds. One would change the minimum cost threshold for repair from \$15,000 to \$50,000. A second change would incorporate cost-shared “resiliency” measures in project repair that could improve a project’s ability to withstand overtopping and reduce the damaging effects of erosion and scour. Another change would make program funds available, when requested by non-federal sponsor, to investigate and plan a nonstructural alternative to repair before a project is damaged. Under the latter two changes, the program would assume the costs of added activities in the short term with the expectation of reduced future program cost exposure.

Table 7 shows total appropriations provided by Congress for USACE EM program activities for fiscal years 2004-2010. In addition to supplemental appropriations for FCCE to respond to natural disasters, minor amounts of regular appropriations have been provided annually over recent years for the National Emergency Preparedness Program (NEPP), which focuses on enabling the USACE to prepare to accomplish its “continuity of operations and continuity of government responsibilities” during national or regional emergencies.

	FY2010	FY2009	FY2008	FY2007	FY2006	FY2005	FY2004
FCCE	20,000	1,169,890	3,152,855	1,561,000	5,407,989	200,000	0
NEPP	6,652	5,458	4,674	5,000	4,950	5,000	6,000
Total	26,652	1,175,348	3,157,529	1,567,000	5,413,939	205,000	6,000

Table 7 illustrates two important points about FCCE funding. First, supplemental appropriations provided for FCCE can swing widely from year to year depending on the occurrence of major floods, coastal storms, and other natural disasters. In years in which there are no major recent natural disasters, the USACE may receive no or only a small amount of appropriations for FCCE, as was the case for FY2004, FY2005, and FY2010. Following Hurricane Katrina, on the other hand, the USACE received supplemental FCCE appropriations totaling over \$11 billion during the four-year period 2006-2009.

Box 2: Repair Assistance for F&CSDR Projects Enrolled in the Rehabilitation and Inspection Program (RIP)

The RIP provides for USACE rehabilitation assistance for F&CSDR projects enrolled in the RIP that have been damaged by floods and storms. The program defines the types of projects that can be eligible for rehabilitation assistance, and specifies the minimum O&M requirements for qualifying project. For a qualifying project, rehabilitation assistance is limited to restoring/repairing the project to its condition immediately prior to the flood (e.g., to pre-flood height and cross-section in the case of levee systems). The principal purpose of rehabilitation assistance is to ensure that projects continue to provide reliable flood damage reduction. The principal benefit to non-federal project sponsors of enrollment in the RIP is the potential for receiving federal assistance to help repair damaged projects.

Qualifying projects include certain levees, channels, flood control dams, retention basins, pump stations, and some underground tunnels constructed for flood control. Projects must meet all of the following criteria:

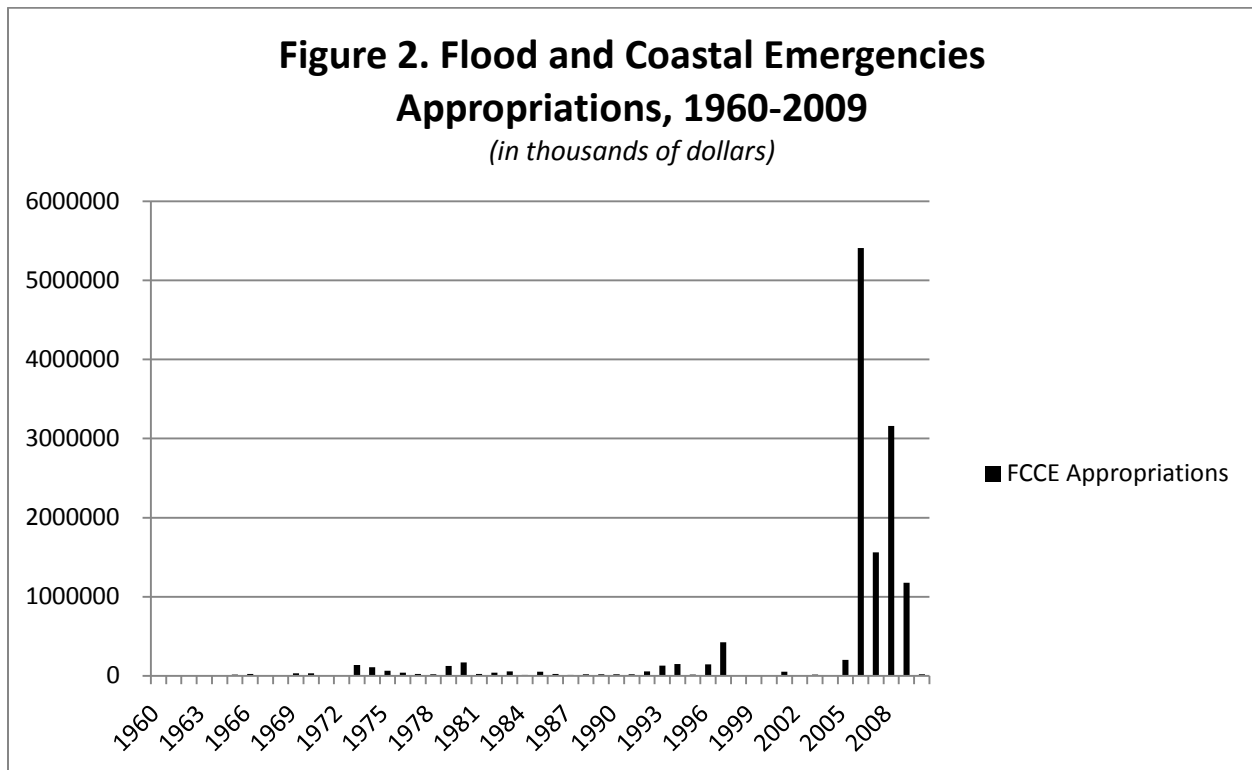
- Principal project function is to protect people or property from floods.
- Project has a non-federal sponsor that has legal and financial capability to provide the required cost share and all required lands, easements, rights of way, and relocation and disposal areas (LERRD).
- Project must be completed, provide reliable protection, and be technically sound.
- Agricultural levees must provide at least a 5-year level of protection and urban levees at least a 10-year.
- Levees must be primary, not secondary, means of flood damage reduction.
- Project must have been constructed in accordance with applicable federal, state, and local laws, codes, ordinances, and permits.

To be eligible for repair assistance, a project must: 1) have active status in the RIP, 2) be damaged by a flood or coastal storm, 3) repair must have positive net economic benefits, and 4) repair costs must be at least \$15,000. If these requirements are met, then a cooperation agreement is prepared that includes the following provisions for cost sharing:

- The USACE will pay 100% of the costs of investigation reports and engineering and design.
- For Non-federal projects, the USACE will pay 80% of construction and contingency costs, and the non-federal sponsor will pay 20%, which can include cash or in-kind contributions. The sponsor will pay for all LERRD, betterments, repairs of deliberate levee cuts, repairs that are not the least-cost alternative as determined by the USACE, and repairs for any maintenance deficiencies uncovered through RIP inspections that were still outstanding at the time of project damage.
- For USACE O&M and Federally-authorized/local O&M projects, the USACE will pay 100% of repair costs.

If a damaged project is deemed eligible for rehabilitation assistance, the sponsor could instead request a Nonstructural Alternative Project (NSAP) in lieu of structural repair. This option allows a project sponsor to use the federal funds that would have been authorized for structural repair to instead restore the floodplains/floodways that previously existed (e.g., the money could be used to acquire land, remove structures, utility connections, and levee reaches, and restore natural habitats). A sponsor would typically request this option only when the sponsor no longer wanted to rely on the project for flood damage reduction, or repair is not shown to have positive net economic benefits (there is no economic justification test for a NASP). To date, a NSAP has been chosen in only two cases, one in California and one in Iowa.

Second, supplemental FCCE appropriations provided in reaction to natural disasters have reached unprecedented levels in recent years, largely as a result of Hurricane Katrina. Though the USACE received relatively minor amounts of supplemental appropriations for FCCE in fiscal years 2005 and 2010, total supplemental FCCE appropriations provided over the six year period 2005-2010 (\$11.5 billion) exceeded total regular appropriations provided for proactive F&CSDR over the same period (\$9.5 billion). Figure 2, which shows annual appropriations provided for FCCE over the period 1960-2010, illustrates the explosion of emergency supplemental FCCE funding since 2005.



Supplemental appropriations allocated to non-FCCE accounts (as shown in Table 6) do not fund the EM program although they serve a similar purpose as FCCE funds devoted to the repair of F&CSDR projects active in the RIP that have been damaged by floods and storms. Specifically, these monies are used for modifying ongoing Civil Works project planning studies and project construction, and for implementing unexpected O&M needs for existing USACE O&M projects that have been made necessary by recent natural disasters. For example, supplemental appropriations allocated to the O&M account are used to fund the unplanned dredging of navigation channels and the repair of existing USACE O&M projects that made necessary by recent floods and coastal storms.

Table 8 shows total supplemental appropriations for FCCE and non-FCCE accounts received over the period FY2005-FY2010. The data illustrate that in addition to the billions provided to FCCE for the repair

of F&CSDR projects in Southeast Louisiana damaged by Hurricane Katrina, the USACE also received over \$5 billion in supplemental CG appropriations to upgrade these projects so that they provide a degree of protection sufficient for accreditation under the NFIP (\$1.5 billion of this amount was allocated to pay for the non-federal cost shares for the project upgrades, which is to be repaid over a 30-year period).

Table 8. Total Supplemental Appropriations for Response to Natural Disasters, by Funding Account, FY2005-FY2010 (Thousands \$)						
Account	FY2010	FY2009	FY2008	FY2007	FY2006	FY2005
FCCE	20,000	1,175,348	3,157,529	1,561,000	5,407,989	200,000
CG	0	0	4,435,500	36,500	650,817	0
O&M	173,000	42,875	1,038,344	3,000	330,717	200,000
GI	5,400	0	0	8,165	40,600	0
MR&T	18,600	0	99,990	0	153,750	0
Total	217,000	1,218,223	8,731,363	1,608,665	6,583,840	400,000

4 Attachment: Different Types of USACE Levee Assessments

Assessment Name/ History, Frequency, and Levee Systems Covered	Purpose and Description
<p>1a. Initial Eligibility Inspection (IEI)</p> <p>Long-standing practice now done within the USACE Levee Safety Program (LSP)</p> <p>Initial inspection for Non-federal levee systems when their sponsors seek enrollment in the USACE Rehabilitation & Inspection Program (RIP)</p>	<p>Purpose: An IEI is used to determine if a Non-federal levee system qualifies for enrollment in the RIP, which provides eligibility for PL 84-99 rehabilitation assistance if the system is damaged by floods and storms.</p> <p>Description: Visual assessment that evaluates technical capabilities of systems for providing a minimum of 5 year level of protection for agricultural levees and 10 year protection for urban levees (based on levee elevation and cross-section in relation to 5 or 10 year flood stages) as well as O&M and preparedness.</p>
<p>1b. Routine Inspection (RI, also known as Continued Eligibility Inspection)</p> <p>Long standing practice previously done under two separate USACE programs but now standardized and done within the USACE LSP</p> <p>Annual inspection for all levee systems in the USACE portfolio</p>	<p>Purpose: RI for USACE O&M levee systems is meant to identify problems with O&M that may require corrective action by the USACE. Inspection of Federally-authorized/local O&M levee systems and Non-federal levee systems is used to determine the adequacy of system O&M performed by their sponsor as a condition for continued eligibility for PL 84-99 assistance, and to communicate O&M deficiencies to non-federal sponsors.</p> <p>Description: Visual assessment of levees based on a checklist that focuses on whether O&M is being done in conformance with USACE requirements as specified for the levee system. Systems are given inspection ratings of acceptable, minimally acceptable, or unacceptable which are communicated to non-federal sponsors. The inspection results are stored in the USACE national levee database (NLD) and feed into risk screening and classification assessments (item 3 in this table).</p> <p>An “acceptable” rating provides a system with “active” status in RIP making it eligible for PL 84-99 levee repair assistance if damaged by a flood. A “minimally acceptable” rating also provides a system with active status but continuation requires sponsor to correct USACE-specified deficiencies within a prescribed timeframe. An unacceptable rating makes a system inactive in the RIP program and thus ineligible for PL 84 99 assistance until deficiencies are corrected. An unacceptable rating is communicated to the relevant locality and state as well as FEMA.</p>
<p>2. Periodic Inspection (PI)</p> <p>New inspection process within the USACE LSP. First round started in 2009 and will continue into 2012</p> <p>To be done every 5 years for USACE O&M levee systems and Federally-authorized/local O&M levee systems, but not Non-federal levee systems</p>	<p>Purpose: The PI is intended to 1) verify proper O&M for the purpose of determining continued eligibility for PL 84 99 assistance (the PI substitutes for the routine inspection in years in which the former is conducted), 2) develop a preliminary understanding of system performance, 3) identify system features that may need further engineering evaluation or monitoring, and 4) communicate to non-federal sponsors levee system condition and associated risks.</p> <p>Description: The PI involves a) a visual inspection using a checklist that includes but goes beyond the routine inspection checklist, and b) a document review that examines all available system</p>

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	<p>documentation, including design documents, as-built drawings, survey data, previous inspection reports, flood insurance studies and NFIP certifications, FEMA flood insurance rate map, and history of system deficiencies and repairs. If the visual inspection finds settlement or subsidence, a survey of levee elevation is done.</p> <p>A PI report provides an O&M system rating for the routine inspection portion of the PI, as well as PI ratings (acceptable, minimally acceptable, or unacceptable) for each system feature. However, only the O&M rating has implications for RIP status and eligibility for PL 84-99 assistance. All PI results are stored in NLD and feed into risk screening and classification assessments (item 3 in this table).</p> <p>An unacceptable rating for O&M is communicated to the relevant locality and state as well as FEMA. If the levee system was previously certified by the USACE for NFIP purposes, the PI report will include “a discussion of any impacts to the certification, including a recommendation for decertification if necessary.”</p>
<p>3. Risk Screening & Classification</p> <p>New process done within the USACE LSP. First round started in 2009 and is expected to take three years to complete.</p> <p>Applies to all systems in the USACE portfolio. Now being done for the first time, but individual systems will be re-assessed in future when warranted by relevant new system information that becomes available</p>	<p>Purpose: The risk screening assessment rates levee systems in terms of relative system failure risk for risk communication purposes and to guide and prioritize potential further risk assessment (item 4 in this table) and possible interim risk reduction measures. Based on the screening assessment, levee systems are placed within five Levee Safety Action Classifications (LSAC) representing different levels of potential risk. The results are communicated to the non-federal sponsor and recorded in the NLD.</p> <p>Description: Screening is being done by a Levee Safety Senior Oversight Group (LSOG) using the results of a levee screening tool that combines information in the NLD (including population and property at risk) and results from the routine and periodic inspections, with a limited engineering assessment. The product is a relative risk rating for levee systems based on the combination of a) annual probability of the flood event that will result in system failure (breach with or without overtopping, or malfunction of components), and b) consequences of system failure with potential life loss a priority concern.</p>
<p>4. Reconnaissance plus Base Condition Risk Assessment (R+BCRA)</p> <p>This is a proposed assessment that applies to USACE O&M levee systems and Federally-authorized/local O&M systems that have a high priority for further study based on their LSAC designation, subject to availability of funds (and a non-federal cost share</p>	<p>Purpose: The proposed R+BCRA is intended to evaluate in more detail levee system risks to life safety in order to provide the basis for recommending whether further study of risk and potential actions to reduce risk in a “Levee Risk Management Study” (item 5 in this matrix) is warranted.</p> <p>Description: This is a more refined risk assessment than that associated with risk screening. It would examine system performance and base condition risks to life safety.</p>

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partner for Federally-authorized/local O&M systems)	
<p>5. Levee Safety Risk Management Study (LSRM)</p> <p>This is a proposed assessment that applies to USACE O&M levee systems that are high priority for further study and potential management action based on the R+BCRA. Can also apply to Federally-authorized/local O&M systems based on R+BCRA results, if provided with congressional study authority and funding and if there is a non-federal cost-share partner</p>	<p>Purpose: The proposed LSRM study is a shared planning activity to reassess base condition risks to life safety and formulate and evaluate alternative plans for reducing risk, and then recommend a plan for possible federal involvement.</p> <p>Description: LSRM studies would be similar to feasibility studies and major rehabilitation studies. There is no minimum level or degree of protection in a LSRM analysis. Instead the analysis measures baseline risks and reduced and residual risk to life and property associated with each alternative.</p>
<p>6. Levee System Evaluation (LSE)</p> <p>Represents new (2010) USACE policy and procedures for USACE assessments for NFIP Levee certification. This supplants previous long-standing USACE practice of writing levee certification letters to FEMA (at the request of non-federal sponsors) based on design documents and inspection reports. New policy says the USACE will notify the levee sponsor and FEMA that the USACE will consider any outstanding USACE letter determinations to be invalid at the earliest of 3 years from the date of the new policy or when the letter is 10 years old.</p> <p>USACE policy says levee certification is the responsibility of the affected community, but USACE will conduct and pay for LSE for USACE O&M systems and systems that are part of a Civil Works project now under construction.</p> <p>Policy says the USACE may do an LSE for Federally-authorized/local O&M levee systems on a reimbursable basis, but only when consistent with statutory restrictions on performing</p>	<p>Purpose: The LSE is a new name for NFIP levee certification packages submitted by the USACE on behalf of communities. It is a technical finding on whether there is a reasonable assurance that the levee system will exclude the 1% annual chance flood. The purpose of LSE is to determine how flood hazard areas behind levees are mapped on flood insurance rate maps issued by FEMA for NFIP purposes. The USACE LSE process has a distinctly different assessment purpose than do the RIP and the LSP. USACE participation in an LSE is at the request of individual communities and is not considered part of the LSP</p> <p>Description: The LSE considers design and construction documentation, results from routine and periodic inspections, flood event performance records, field inspection, technical analysis of hydrology, hydraulics, electrical and mechanical components, geotechnical and system evaluations, and study of residual risk and public safety.</p> <p>The LSE calls for application of the risk analysis framework used for Civil Works planning for flood damage reduction projects. Analysis of likelihood that the system will meet NFIP accreditation requirements is reported as follows: 1) levee systems with less than 2 feet of freeboard will not meet NFIP requirements; 2) Levee systems with freeboard of 2-3 feet can meet requirements if the LSE demonstrates that there is at least a 95% assurance that the structures will contain the 1% annual chance flood; 3) For levee systems with at least 3 feet of freeboard, there must be at least a 90% assurance that the 1% chance annual flood will be contained. And regardless of freeboard, if a LSE finds a levee system has less than 90% assurance of containing the 1% annual chance flood, that system will be reported as not meeting NFIP accreditation</p>

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work that can be done by the private sector.	<p>requirements.</p> <p>All USACE LSE findings, including statements about residual risks and safety concerns that are not directly relevant for NFIP accreditation, are reported to the local community and FEMA. An LSE is valid for no more than 10 years, and USACE can invalidate an LSE finding and report it to FEMA within the 10 year period if system circumstances change.</p>