

CALFED BAY-DELTA PROGRAM**Office Memorandum**

Date: January 2, 1996
To: Steve Yaeger
From: Michael Norris
Subject: Summary memo on conditions of levees in the Delta as they apply to different standards

You presented me with a memo on a "possible levee inventory/study" in response to continued disposal of Bay dredge material on Delta levees. You asked me to attempt to address some of the items in the memo including current levee standards for Delta islands. Six items were listed in the memo as follows:

1. The current status of Delta levees (cross section, heights, etc);
2. The volume of material needed to bring Delta levees to the Corps PL-99 agricultural levee standards;
3. The location of sites that could be used for storage of dredged material;
4. Location and estimation of volume of materials proposed to be dredged in the next 10 years within the Delta;
5. The characteristics of that material; and
6. The costs of dredging in the Delta, the costs of imported dredge material from out of the Delta, and the costs of importing alternative construction materials into the Delta for levee maintenance.

I contacted Bill Forsythe, Curt Schmutte, Dave Lawson, Lynn O'Leary, and John Cook and they provided me with lots of information. It is my understanding that Schmutte is also preparing some sort of a response to the "levee inventory/study" memo. I will attempt to address the first two points in the memo. Some of the other points may or may not be answered in a similar memo that is being prepared by Curt Schmutte's group.

The Reclamation Board (Rec Board) is a possible source of information about Delta levee cross sections and other questions about levee standards. However, the Rec Board would only have information about levees within their jurisdiction that their unit regularly inspects. If one is to do an inventory of the status of Delta levees (cross sections, heights, etc), one might want to look into different standards of levee construction and attempt to see which islands fall into which category. The following are some common standards that are presented on pages 10 and 11 of the Division of Planning bulletin entitled Actions and Priorities, Delta Flood Protection Act, Eight Western Delta Islands. Additional discussion and information can be found in the Bay Delta Oversight Council (BDOC) Briefing Paper on Delta Levee and Channel Issues from December of 1993 and the Levee and Channel Technical Advisory Committee (TAC) report

from October of 1994.

Agricultural Standards:

Bulletin 192-82 Standard. This Department of Water Resources (DWR) standard was the result of a long-term study and report that was published in 1982. It requires a landside slope that varies with depth of peat. The range is from 3:1 to 7:1. Also, 16' crown width, a waterside slope of 1' vertical for 2' horizontal, and a freeboard of 1.5' above the 300-year flood is required.

Public Law (PL)-99 Standard. This Corps of Engineers (Corps) 1987 standard for non-federal systems requires a landside slope that varies with height of levee and depth of peat. The range is from 3:1 to 5:1. Also, 16' crown width, a waterside slope of 1' vertical for 2' horizontal, and a freeboard of 1.5' above the 100-year flood is required.

Hazard Mitigation Plan (HMP) Standard. This Federal Emergency Management Agency (FEMA) standard requires a landside slope of 1' vertical for 2' horizontal, a 16' crown width, a waterside slope of 1' vertical for 1.5' horizontal, and a freeboard of 1' above the 100-year flood is required. DWR endorses this standard and reimbursement for work occurs under the DWR Delta Levee Subventions Program or the Special Projects Program for the Eight Western Delta Islands.

Urban Standards:

Bulletin 192-82 Standard. This DWR standard requires a landside slope that varies with depth of peat. The range is from 3:1 to 7:1. Also, 16' crown width, a waterside slope of 1' vertical for 2' horizontal, and a freeboard of 3' above the 300-year flood is required.

FEMA Standard. This standard is the one used for a levee design to be certified by the National Flood Insurance Program. It requires a landside slope that can be variable but must be certified for proof of structural stability. Also, 16' or more crown width, a waterside slope of 1' vertical for 2' horizontal, and a freeboard of 3' or more (4' is required at bridge crossings for example) above the 100-year flood is required.

FEMA HMP Discussion:

The standard that most islands are seeking is the HMP Standard which became a FEMA requirement after levee failures on 17 islands and tracts during the Presidential Disaster floods of 1982, 1983, and 1986. Lawson believes most islands meet this standard but this may not be technically supported in writing by any agency. Some islands don't quite meet it or fall short by one item. A DWR Interim Report on the Status of Sacramento - San Joaquin Delta Flood Hazard Mitigation Plan done in September of 1990 judged 22 islands as meeting 100% HMP status. A FEMA report done two years later did not concur. 47 of 52 islands were inspected by a joint FEMA-OES (Office of Emergency Services) operation during August through November of 1991 and a letter dated 1-13-92 (attached) indicates Rindge Tract, Tyler Island, Stark Tract, and Glanville made the HMP cut. Medford Island, Quimby Island, Walnut Grove, and Little Mandeville Island were not inspected and Staten Island was awaiting certification. Numerous other islands that do not participate in the Delta Levee Subventions Program were not inspected so one cannot easily say whether or not they would meet the standard. 42 islands did not meet HMP certification based on the 1992 FEMA letter although most lacked an "all-weather road" (a requirement not discussed in the 1990 DWR report) or else they would have passed. Some other

deficiencies include blocked levee crown access, levee crown elevations below HMP criteria, and unstable foundation material that delayed completion of backfilling subsided areas. Follow-up was recommended but there is no subsequent letter from FEMA nearly four years later. More current work (3-27-95) by DWR's Subventions and Flood Management Section at Central District indicates 31 islands meet the HMP criteria (including an all weather surface road) although this should be considered "unofficial information". Since that time, Little Mandeville island (one of the 31) suffered a summer levee failure that has still not been repaired so it would no longer meet the criteria. It should be noted that the surveys by FEMA/OES and DWR were similar but not identical. The DWR survey included Winter, Prospect, Boggs, Medford, Quimby, Little Mandeville, and Weber Islands as part of their group of 47 islands surveyed whereas the FEMA/OES survey did not. Conversely, the FEMA/OES survey included Bradford, Hotchkiss, Sherman, New Hope, Bethel, Rio Blanco, and Ehrheart Islands as part of their group of 47 islands surveyed whereas the DWR survey did not. The list of islands in the FEMA/OES survey actually totaled 52 but Staten Island was awaiting certification (suggesting some level of work had been done by FEMA in the past) and four other islands were listed as "not inspected". Of those four, three of them were covered by the DWR survey leaving Walnut Grove as the only island on either list that was actually not surveyed by either effort. Staten Island wasn't surveyed by DWR which is a little bothersome since the "as-built survey" referred to in the FEMA report should have been taken care of by the time the DWR memo was done three years later. In conclusion, the combined work means that a total of 55 islands were looked at by one or both survey efforts which is a good representation of Delta islands.

DWR Bulletin 192-82 Discussion:

The DWR Bulletin 192-82 standard is sought for work done through the DWR Special Flood Control Projects Unit and sometimes by individual reclamation districts on their own. McDonald Island, with funding from PGE, is attempting to rehabilitate their levees to Bulletin 192-82 standards. Bouldin and Bacon Islands are attempting to rehabilitate to Bulletin 192-82 standards with some reimbursement from Lawson's program. Curt Schmutte reports that the Bulletin 192-82 "1.3 Factor of Safety level" was used for the DWR projects on Sherman and Twitchell islands but the geometry standards of Bulletin 192-82 were not used. That work did not go all the way around the islands circumference anyway. Holland and Webb Tracts rehabilitated their entire levees to Bulletin 192-82 standards on their own with reimbursement from both Lawson and Schmutte's program and these two may be the ones one can classify as meeting the 192-82 standard. However, Schmutte reports that both those islands have had subsidence occur and additional work was necessary to bring them back up as well as other work on Webb to correct berm settlement. Whether or not other islands in the delta might meet Bulletin 192-82 standards for their levee systems is not closely monitored by DWR.

Corps PL-99 Discussion:

The Corps monitors the PL-99 standard for the Delta and John Cook from the Emergency Management Division at the Corps (557-6913) is the spokesperson for that program. Lynn O'Leary (557-6781) also provided information. O'Leary reports that a Sacramento - San Joaquin Delta California Draft Feasibility Report and Draft Environmental Impact Statement from October of 1982 estimated volumes of material needed to bring Delta levees up to federal project levee standards. O'Leary reports an upcoming "Sacramento-San Joaquin Delta Special Study"

may investigate bringing the levees on about a dozen or so Delta islands up to a standard better than PL-99 but that study is awaiting approval from Washington, D.C. and DWR to proceed. According to Cook, Holland and Byron Tracts meet the PL-99 standard and these are also the only two islands that are eligible for funds under the Corps "non-project" levee rehabilitation program under a 75% federal / 25% local cost-share arrangement. The Corps does an inspection every 2 years independent from other inspections to ensure the PL-99 standard is still being met. Federal flood control project levee systems are shown on page 40 of the DWR Sacramento - San Joaquin Delta Atlas and these levee systems are eligible for 100% Corps assistance for rehabilitation costs. The PL-99 design criteria was set up in 1987 for the non- project levee systems and it is not necessarily correct to say the project levees would also meet that same criteria (including geometry) because the project systems were constructed a long time ago to their own unique design standards in place at that time. Hence, they may or may not meet the 1987 PL-99 design standard although it is liking mixing apples and oranges if one compares the project and non-project systems. However, the federal project levees are reimbursed for maintenance work under the Corps PL-99 program so Ryer, Grand, Stewart, Hastings, Sutter, and Merritt Islands can be classified as PL-99 islands as long as one remembers the technical difference between the "federal project" and local non-project" flood control systems. The project levees are turned over after construction to the State (who themselves turn them over to local districts) and it is up to the State to ensure the levees have continued maintenance under an "O & M Agreement" they sign with the Corps. The islands are inspected regularly by the Reclamation Board and, if an unfavorable report resulted, then an island could get less than 100% funding for repairs according to Cook. It should be noted that Sherman Island (and other islands as well) includes project levees on a portion of the islands circumference. But it is not correct to say the entire island meets PL-99 certification because the levees on the east side are private levees which would not be to the same level of design or maintenance. It should also be noted that the PL-99 islands may well meet Bulletin 192-82 standards and vice-versa. No one has checked for this and there doesn't appear to be a reason to check since most cost-sharing reimbursement under the DWR Subventions/Special Projects Program is for work to attempt to achieve a standard (mostly HMP) and it doesn't require that a Delta island already be at a certain standard in order to be paid for maintenance or construction work.

FEMA 100-year Discussion:

Some islands meet the urban "FEMA 100-year" standard. These islands are shown on page 42 of the Delta Atlas. They include Grand Island, Pierson District, Hastings Tract, Rough and Ready Island, Brannan-Andrus Levee Maintenance District, Stark Tract, Walnut Grove, and Discovery Bay. These islands/developments already had a levee system that was recognized as providing a 100-year level of protection at the time FEMA studied the area for flood hazards. In addition, some areas have upgraded their levee systems and had them certified for 100-year flood protection so that their areas could be removed from the floodplain through the Letter of Map Revision (LOMR) process. Some of these areas include Mossdale, Smith Tract, Weber Tract, Bishop Tract, and Sargent Barnhart/Quail Lake.

These islands may or may not meet another standard such as HMP, PL-99, or Bulletin 192-82. It could be dangerous to assume that a FEMA 100-year levee would automatically meet HMP standard which is generally considered the beginning flood-reduction level of protection that a

district is attempting to achieve. HMP came about from passage of the Federal Disaster Relief Act of 1974 (Public Law 93-288) but the design standards for HMP were outlined in detail after the floods of the 1980s. The State of California Flood Hazard Mitigation Plan, dated September 21, 1986, discusses design criteria on page 13 of the report. The requirements are essentially the same on page 1 of a 1990 DWR report except that one criteria (all weather access roads) was omitted. The requirements for a FEMA 100-year levee are set forth in 44 CFR 65.10 and there does not appear to be any connection between the two sets of standards even if the FEMA 100-year standard is generally regarded as the ultimate one for a district to achieve. The FEMA standard is the one that allows for a property to be removed from the floodplain and the respective owner to no longer have to pay for flood insurance premiums on their homes and businesses so there may not be a reason for one of the reclamation districts to check for another standard in these cases.

It should be noted that there are FEMA "working maps" that have been presented to the communities of San Joaquin County and the City of Stockton. These maps shows areas that were not previously susceptible to flooding (or were removed by LOMR) as now being susceptible to 100-year flooding from the east to the west. This is due to a recently completed study by the consulting firm of Schaff and Wheeler out of San Jose that identified new sources of 100-year flooding. Certain Delta islands were removed from the 100-year floodplain by upgrading their levee systems to prevent flooding from the west to the east but not the reverse. If these maps are eventually printed in the form they are presently in, this action would have the effect of rescinding some of those LOMRs (such as Smith, Weber, and Sargent Barnhart) which would put large populated areas back in the floodplain.

Summarization:

Based on all this information, the following table (considered unofficial information) can be constructed. All of the islands that are checked as meeting a standard should have known geometry such as cross sections and levee profiles or else they would not be listed in that standard. The 1992 letter from FEMA and the 1995 DWR memo indicate a check was made for levee geometry/cross sections for HMP classification. In addition, levee heights may be inferred from the amount of freeboard for that standard above the flood level being designed for.

<u>Island Name</u>	<u>RD No.</u>	<u>HMP Standard</u>	<u>Bulletin 192-82 Standard</u>	<u>Corps PL-99 Standard</u>	<u>FEMA 100-Yr. Standard</u>
Bacon	2028	X	pending?		
Bethel Island MID					
Bishop	2042	X			X
Boggs District	404	X			
Bouldin	756		pending?		
Brack	2033				
Bradford	2059				
Brannan-Andrus LMD	2067	X			X
Byron	800	X		X	
Canal Ranch	2086				
Coney	2117	X			
Deadhorse	2111	X			
Discovery Bay					X
Ehrheart	813				
Egbert	2084				
Empire	2029				
Fabian	773				
Fay	2113				
Glanville	1002	X			
Grand	3			X	X
Hastings	2060			X	X
Holland	2025		X	X	
Holt	2116				
Hotchkiss	799				
Jersey	830				
Jones, Lower	2038	X			
Jones, Upper	2039	X			

<u>Island Name</u>	<u>RD No.</u>	<u>HMP Standard</u>	<u>Bulletin 192- 82 Standard</u>	<u>Corps PL- 99 Standard</u>	<u>FEMA 100- Yr. Standard</u>
King	2044	X			
Libby McNeil	369				
Liberty	2093				
Little Mandeville	2118				
Mandeville	2027	X			
McCormack-Williamson	2110				
McDonald	2030	X	pending?		
Medford	2041				
Merritt	150			X	
Mildred	2021				
Mossdale	17				X
Naglee	1007				
New Hope	348				
Orwood	2024				
Palm	2036				
Pescadero	2058	X			
Pierson	551				X
Prospect	1667				
Quimby	2090	X			
Rindge	2037	X			
Rio Blanco	2114				
Roberts, Lower	684	X			
Roberts, Middle	524				
Roberts, Upper	544				
Rough and Ready					X
Ryer	501			X	
Sacramento County	1002				
Sargent-Barnhart	2074				X
Sherman	341				
Shima	2115	X			
Smith Ranch	1608				
Smith	1614	X			X
Stark	2089	X			X
Staten	38	pending?			
Stewart	2062			X	
Sutter	349			X	
Terminous	548	X			
Tinsley	2108				
Twitchell	1601	X			
Tyler	563	X			
Union, East	1	X			

Island Name	RD No.	HMP Standard	Bulletin 192- 82 Standard	Corps PL- 99 Standard	FEMA 100- Yr. Standard
Union, West	2	X			
Van Sickle	1607				
Veale	2065				
Venice	2023	X			
Victoria	2040	X			
Walnut Grove	554				X
Webb	2026	X	X		
Weber	828	X			X
Winter	2122				
Woodward	2072	X			
Wright-Elmwood	2119	X			

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