

TC550.5.N48

M53B65

no. 7

1999


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NEW ORLEANS DISTRICT

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MISSISSIPPI RIVER AND TRIBUTARIES

BONNET CARRÉ SPILLWAY STRUCTURE

PERIODIC INSPECTION REPORT NO. 7

9 SEPTEMBER 1999

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CEMRC-ET-EG (CEMVN-ED-G/26 January 01) (11-2-240a) 3rd End
Stagg/ts/5644
SUBJECT: Mississippi River and Tributaries, Bonnet Carre
Spillway Structure, Periodic Inspection Report No. 7, 9
September 1999

DA, Mississippi River Commission, Vicksburg, MS 39181-0080
2 May 2001

FOR Commander, New Orleans District, ATTN: CEMVN-ED-GE

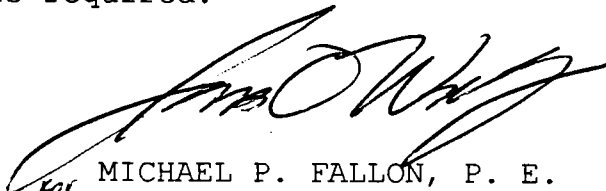
1. The following comments are in response to the 2nd endorsement. The paragraph numbers refer to like numbered paragraphs.

a. Paragraph 1b. In an effort to work with Operations, it has been requested at the periodic inspections we have attended and also at the Joint Dam Safety Committee Meetings, that we adopt the ranking system used by Operations. By using their ranking system, there should be less confusion as to which recommendations should be accomplished first and the importance of a timely response to the recommendations. Enclosure 6 is a copy of the ranking system we suggest that you use on future reports.

b. Paragraph 1.c. DIVR 1110-1-310, paragraph 11, page 6 states, "A thorough technical review of each inspection report shall be performed and included as an appendix to the report before submittal to CEMVD-ET-EG." This should be followed for all Corps-owned projects. For local interest projects, we agree with your concerns and suggest these be sent with the correspondence for the report as an enclosure.

2. If you agree with these comments, no further action on this chain of correspondence is required.

6 Encls
1-3. nc
4 & 5. wd
added one enclosure
6. as


for MICHAEL P. FALLON, P. E.
Chief, Engineering and
Construction Division



REPLY TO
ATTENTION OF

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P. O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

CEMVN-ED-G

26 January 2001

MEMORANDUM FOR Commander, Mississippi Valley Division,
ATTN: CEMVD-ET-EG

SUBJECT: Mississippi River and Tributaries, Bonnet Carré Spillway Structure, Periodic Inspection Report No. 7, 9 September 1999

1. Subject report is submitted for your information and concurrence (Encl. 1).
2. The Technical Review was conducted as outlined in Enclosures 2 and 3.

FOR THE COMMANDER:

Gerard S. Satterlee
GERARD S. SATTERLEE, JR., P.E.
Chief, Engineering Division

- 3 Encls
1. Periodic Inspection
Report No. 7 (3 cys)
 2. Quality Control Plan
 3. Design/Review Activities

CEMVD-ET-EG (CEMVN-ED-G/26 January 01) (11-2-240a) 1st End
Stagg/ts/5644
SUBJECT: Mississippi River and Tributaries, Bonnet Carre
Spillway Structure, Periodic Inspection Report No. 7, 9
September 1999

CDR, Mississippi Valley Division, Vicksburg, MS 39181-0080
7 March 2001

FOR Commander, New Orleans District, ATTN: CEMVN-ED-GE

1. The following comments are provided on the subject report:

a. Page IV-4. In the 2nd sentence, update the time range
"(1931 to 1990)."

b. Recommendations should be prioritized as stated in the
MVD Trip Report in Appendix A.

c. Appendix III. This appendix includes the District's
QCP. However, we were unable to locate in the report any ITR
comments and resolution thereof as typically included in
periodic inspection reports from other Districts. Comments by
the ITR team and resolution should be included in the report.

d. Plate BC-R4. You should furnish an HSS appendix for
this periodic inspection report of the format and content
described in CEMVD-ET-ES multi-memorandum subject Minimum
Hydraulic Steel Structures (HSS) Reporting Information in
Project Periodic Inspection Reports, dated 2 Feb 01. Aside from
the bridge elements, there appears to be at least one type FCM
and some other miscellaneous HSS on the projects. The
horizontal reaction beam (steel) for the timber needle support
is apparently a FCM.

e. Appendix G, Pedestrian/Crane Bridge Inspection Report.
Judging from the plates and photos, it appears that both the
north and south pedestrian/crane bridges contain fracture
critical members, as each is composed of only two main members,
i.e., structural channels spanning between the piers. The
bridge inspection report does not address these members as
FCM's. Although the bridge report was approved on 18 January
2000, appropriate paragraphs in the report should be expanded to

CEMVD-ET-EG (11-2-240a)


SUBJECT: Mississippi River and Tributaries, Bonnet Carre
Spillway Structure, Periodic Inspection Report No. 7, 9
September 1999

address a plan for inspecting these members in accordance with the requirements of Appendix B of ER 1110-2-111, Periodic Safety Inspection and Continuing Evaluation of USACE Bridges, 30 April 1997. The revised pages covering this plan can be submitted in your second endorsement to this chain. The bridge report need not be resubmitted, however, the revised pages of text should be inserted into the report for your permanent record.

f. Paragraph 5-03b(1) page V-2. This paragraph states "horizontal cracks were noted in several piers (riverside)". The "spall" identified in Photo No. 1 is actually one of the horizontal cracks at the construction joints mentioned in this paragraph and is the subject of a recommendation in paragraph 6-02b(3). This crack is apparently not deep enough to expose rebars as there are no rust discolorations on the pier. However, cracks such as the large crack in pier 290-291 should be sealed in the near future to help deter corrosion of the rebars.

2. Revised pages should be furnished for our files.

3 Encls
wd


MICHAEL P. FALLON, P. E.
Chief, Engineering and
Construction Division

CEMVN-ED-G (CEMVN-ED-G/26 January 01) 2nd End Mr. Chryssoverges/504-862-1009
SUBJECT: Mississippi River and Tributaries, Bonnet Carré Spillway Structure, Periodic Inspection
Report No. 7, 9 September 1999

CEMVN-ED

18 April 2001

→ For: Commander, Mississippi Valley Division, ATTN: CEMVD-ET-EG

The disposition of comments made in the 1st End follows. Paragraph numbers refer to like numbered paragraphs in the endorsement.

1a. Page IV-4. Concur. The typing error for the year 1990 has been changed to 1999. Please make this pen and ink change in your copies of the report.

1b. Concur. The remedial actions are already listed in priority. The remedial actions have also been grouped into the type of action required (repairs, routine work and future issues) to facilitate the actions required by Operations Division.

1c. Appendix III. The QCP in this appendix is for the Pedestrian/Crane Bridge inspection report which was submitted prior to the subject report. The QCP for the subject report is included in the general correspondence. ITR comments have never been included in any periodic inspect reports. We consider this an inappropriate practice to include this information in the report, especially since reports are furnished to local interest. A copy of the ITR can be E-mailed for your use.

1d. Plate BC-R4. The following paragraph has been added to the report on page IV-7:

4-04 Hydraulic Steel Structures. In accordance with ER 1110-2-8157, "Responsibility For Hydraulic Steel Structures", dated 31 January 1997, the structure was evaluated by NOD Engineering Division to determine fracture critical members, testing requirements and inspection frequency. The horizontal reaction beam (with associated connections to the pier) for the timber needle supports is considered a fracture critical member by definition (nonredundant member subjected to tensile stresses). The beams are rolled structural members and thus do not require NDT testing. Visual inspection of the member, the bolts and the pin connections are done during each periodic inspection. Each of the 350 bays contain one horizontal reaction beam. Because the small impact each individual bay contributes to the total structure, a failure of a reaction beam is not critical. Failure would not result in a probable loss of life.

Three copies of the revised page are furnished for your files. (Encl 4)

1e. Appendix G. It is stated in paragraph 4(b)1 on page 2 that the steel channel beams supporting the walkway concrete decks are fracture critical. The two beams for each bridge are rolled structural members and thus do not require NDT testing. It is further stated in paragraph 4(b)2 that the beams rest on bearing plates and lateral movement is prevented by anchor bolts penetrating

CEMVN-ED-G (CEMVN-ED-G/26 January 01) 2nd End Mr. Chryssoverges/504-862-1009
SUBJECT: Mississippi River and Tributaries, Bonnet Carré Spillway Structure, Periodic Inspection
Report No. 7, 9 September 1999

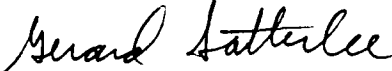
the pier. The beams have been initially inspected (again as per recent guidance on access bridges) and shall be re-inspected every five years. This five year inspection frequency has been approved as per your 1st endorsement dated 18 January 2000. No changes are required to the report.

1f. Paragraph 5-03b(1). Concur. Paragraph 6-02b(3) has been revised as follows: The spall on the west side of pier 290-291 should be sealed to deter corrosion of the rebars. Monitor the other spalls on the structure and report changes to Engineering Division.

Three copies of the revised page are furnished for your files. (Encl 5)

FOR THE COMMANDER:

5 Encls
Add 2
as


GERARD S. SATTERLEE, JR., P.E.
Chief, Engineering Division

**U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT
QUALITY CONTROL PLAN
PERIODIC INSPECTION REPORT**

Project Title: Mississippi River and Tributaries, Bonnet Carré Spillway Structure, Periodic Inspection Report No. 7, 9 September 1999

Authority: Authority to inspect the subject structure is provided by ER 1110-2-100, subject "Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures", dated 15 February 1995. The Periodic Inspection was performed in accordance with the subject regulation.

Quality Control Plan: The Quality Control is the function whereby policies, standards, procedures, and format are used to control the quality of the work produced.

Preinspection Brochure. A preinspection brochure was prepared in advance of the project inspection in order to familiarize inspection team members with the general features of the spillway structure and project history. The brochure included a checklist that was used during the inspection to highlight areas of concern.

Periodic Inspection Report. The Periodic Inspection Report presents the results and conclusions of the engineering inspection and data evaluation to evaluate the structural integrity and operational adequacy of the spillway structure. The report also presents recommended remedial actions to correct any noted deficiencies. The inspection and report were accomplished in accordance with the subject ER.

In-House Technical Review. The New Orleans District (NOD) performed an in-house review to achieve the desired quality control on various project tasks and to check for format, adequacy and accuracy of the report. A copy of the quality control plan is filed in General Engineering Branch. These reviews were conducted in-house because the necessary expertise was located within NOD. These reviews ensure the accuracy of the report and ensure the inspection and reporting was conducted in accordance with ER 1110-2-100. A copy of NOD's quality control plan with all endorsements to the report will be included with the file copy of the Periodic Inspection Report.

Periodic Inspection Team

New Orleans District

Joseph Chryssoverges	Gen Engr Branch (Inspection Coordinator)
Larry Dressler	Geotechnical Branch
Charles Laborde	Structures Branch
Barbara Garcia	Structures Branch
Dennis Strecker	Gen Engr Branch (Mechanical)
Daniel Bradley	Gen Engr Branch (Electrical)
Charlie Rome	Gen Engr Branch (Materials)

**U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT
QUALITY CONTROL PLAN
PERIODIC INSPECTION REPORT**

Dave Vossen	Gen Engr Branch (Materials)
Paul Salassi	Gen Engr Branch (Pedestrian Bridge Inspector)
David Elmore	Hydraulics & Hydrologic Branch
Patrick O'Brien	Hydraulics & Hydrologic Branch
Kirt Jacob	Operations Division (Foreman)
Steve Schinetsky	Operations Division
Tim Connell	Operations Division
Malcom Dove	CEMVD-ET-EG
Duane Stagg	CEMVD-ET-EG

Mississippi Valley Division

Malcom Dove	CEMVD-ET-EG
Duane Stagg	CEMVD-ET-EG


Technical Review Team

<u>Name</u>	<u>Function</u>	<u>Office</u>	<u>Ext</u>	<u>Registered</u>
Paul Salassi	Civil Engr Tech	ED-G	2714	Certified Tech
Louis Danflous, Jr.	C/General Engineering Br.	ED-G	2977	Yes/Civil
Joseph Chow	Review Team Manager	ED-E	2722	No/EI

**U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT
QUALITY CONTROL PLAN
PERIODIC INSPECTION REPORT**

DESIGN/REVIEW ACTIVITIES

<u>TASK</u>	<u>DATE COMPLETED</u>
Prepare preinspection brochure	11 August 1999
Preinspection meeting and finalize schedule for inspection	1 September 1999
Perform periodic inspection	9 September 1999
Assemble draft report	5 August 2000
Perform in-house review, and resolve Comments	12 September 2000
Prepare final report	23 January 2001
Submit report to MRC	26 January 2001



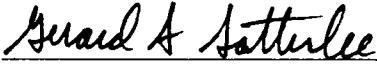
Joseph Chryssoverges,
Inspection Coordinator

24 January 2001
Date



Joseph Chow,
Technical Review Manager

24 JAN 01
Date



Gerard S. Satterlee, Jr., P.E.
Chief, Engineering Division

1/25/01
Date

*** 4-04 Hydraulic Steel Structures.** In accordance with ER 1110-2-8157, "Responsibility For Hydraulic Steel Structures", dated 31 January 1997, the structure was evaluated by NOD Engineering Division to determine fracture critical members, testing requirements and inspection frequency. The horizontal reaction beam (with associated connections to the pier) for the timber needle supports is considered a fracture critical member by definition (nonredundant member subjected to tensile stresses). The beams are rolled structural members and thus do not require NDT testing. Visual inspection of the member, the bolts and the pin connections are done during each periodic inspection. Each of the 350 bays contain one horizontal reaction beam. Because the small impact each individual bay contributes to the total structure, a failure of a reaction beam is not critical. Failure would not result in a probable loss of life. *

* revised April 2001

4-wheel drive rubber tire units with a bucket and dozer blade. As of August 2000, the excavators have been modified by replacing the rubber wheels with steel ones that fit the existing wheel hubs. Other modifications planned, but that have not been completed, include the addition a dragline winch. The winch will be powered from the dozer blade hydraulic circuit. The dozer blade will be removed. Additionally, the bucket will be replaced with a device for lifting the needles using the needles' lifting eye. Once fully modified, the operation using the excavators should be safer, quicker and accomplished using fewer people. Modifications should be completed by April 2001.

(7) The upper and lower guide levees will be raised to design grade during FY 2001 and FY 2002.

b. Normal Maintenance Work.

(1) Concrete walkway panels L322d, L226c, L92d, R38b, R147b, R332a, R333a and R338d that have small areas of missing and/or cracked area will be monitored and replaced as needed.

(2) The continued removal of accumulation silt from the riverside of the weir structure is helpful in reducing the potential for continued settlement of the structure.

* (3) The spall on the west side of pier 290-291 should be sealed to deter corrosion of the rebars. Monitor the other spalls on the structure and report changes to Engineering Division. *

* revised April 2001

Emergency: Designation means that a serious deficiency exists that needs to be resolved immediately. Emergency needs should be elevated to the current year program for quick response.

Urgent & Compelling: Deficiency work that has unsatisfactory risk associated with potential loss of life and property.

Critical: Work critical in nature but can be deferred for a short time period.

Major Deficiency: Work that is generally covered under operating and routine maintenance that needs to be resolved within 1 to 2 years.

Medium Level Deficiency: Work that needs to be resolved as soon as funding becomes available beyond the biennium.

Low Level Deficiency: Work at the structure and periphery features that need to be resolved during the next 5 years.

Ultra Low Deficiency: Work that is nice to have that can be deferred to the out years and will not get addressed unless the deficiency worsens and begins to affect the structure or operation more significantly.

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no.7

1999

MISSISSIPPI RIVER AND TRIBUTARIES

BONNET CARRÉ SPILLWAY STRUCTURE

PERIODIC INSPECTION REPORT NO. 7

9 SEPTEMBER 1999

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS

CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA



WEST ABUTMENT
BAY NO. 1

MISSISSIPPI RIVER

FLOODWAY

FLOW

EAST ABUTMENT
BAY NO. 350

HWY 628

OFFICE & WAREHOUSE

BONNET CARRE SPILLWAY

PHOTO TAKEN 4/15/87

BONNET CARRÉ SPILLWAY STRUCTURE

SUMMARY

Periodic Inspection No. 7 of the Bonnet Carré Spillway Structure was conducted on 9 September 1999 by representatives of the New Orleans District (NOD) and Mississippi Valley Division. The inspection of the pedestrian/crane bridges were also conducted at this time. Observations made during the inspection indicate the spillway structure and bridge components are in good condition, structurally sound and very well maintained. The structure has performed satisfactorily throughout the 63 years it has been in service.

Some remedial actions are required. The deficiencies noted are not critical and will be corrected as discussed in Section VI. Appendixes D thru F contain historical information with regard to past deficiencies, repair work and marine damage. Appendix G contains the initial pedestrian/crane bridge inspection report. MVD has approved the request to inspect the pedestrian/crane bridges on a five year interval.

The preparation of this report was impacted by the heavy workload imposed by the mandatory inspection of the access/pedestrian bridges, A-E selection process for a new contract and new in-house procedures for electronic sharing of periodic inspection information.

BONNET CARRÉ SPILLWAY STRUCTURE

PERIODIC INSPECTION REPORT NO. 7

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APPENDIX G:	Pedestrian/Crane Bridge Inspection Report

SECTION I – INTRODUCTION

1-01 Authority. Authority is provided by ER 1110-2-100, subject "Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures", dated 15 February 1995.

1-02 Purpose and Scope. The results and conclusion of the inspection and evaluation for assuring the structural integrity and operational adequacy of the spillway structure are presented herein. This report is supplementary to previously numbered reports.

1-03 Safety. The inspection was performed in accordance with the pertinent provisions of EM 385-1-1, "Safety and Health Requirements Manual," dated 3 September 1996 and other applicable recognized safe practices. Nothing in the inspection report shall be interpreted or construed as altering the provisions of the "Safety and Health Requirements Manual."

1-04 Previous Inspections. Past inspections of the Bonnet Carré Spillway Structure are included in the following reports:

<u>Report No.</u>	<u>Date of Inspection</u>
1	16 May 1968
2	1 November 1973
3	12 December 1978
4	2 August 1984
5	30 August 1989
6	30 August 1994

1-05 Datum Plane. Elevations in this report, except where otherwise indicated, are in feet and refer to the National Geodetic Vertical Datum (N.G.V.D.), formerly Mean Sea Level (M.S.L.).

SECTION II - PROJECT DESCRIPTION AND BACKGROUND

2-01 History, Location and Purpose. Surveys and preliminary investigations for the Bonnet Carré Spillway were begun in 1928. Construction of the spillway structure started in 1929 and was completed in 1931. The guide levees were completed in 1932 while the highway and railroad crossings were completed in 1936.

The structure is located 128 miles Above Head of Passes (AHP) on the left descending bank of the Mississippi River in St. Charles Parish, Louisiana. This is approximately 33 miles upstream of Canal Street in New Orleans. See Location Map on Plate 1A.

The Bonnet Carré Spillway is a vital element of the comprehensive plan for flood control in the Lower Mississippi Valley. This multi-state plan, called the Mississippi River and Tributaries Project (MR&T), provides flood protection for the alluvial valley between Cape Girardeau, Missouri and the mouth of the river. The Bonnet Carré Spillway is the southernmost floodway in the MR&T system. The spillway was built to protect the city of New Orleans from Mississippi River floods by lowering river stages through the discharge of excess floodwaters into Lake Pontchartrain and thence into the Gulf of Mexico. Specifically, its use was originally intended to prevent the water level from exceeding 20 feet on the Carrollton gage. This is a stage about 5 feet below levee grade.

The current function of the spillway is to protect New Orleans and other downstream communities during major floods on the Mississippi River. The decision to "open" the structure is the responsibility of the MRC president who has broad jurisdiction

over the entire MR&T Project. This decision is based on factors that indicate the mainline levees in New Orleans and other downstream communities will be subjected to unacceptable stress from the high water. Included in the complex decision process are environmental considerations, as well as hydrologic, structural, navigational and legal factors.

2-02 Description.

a. General. Bonnet Carré Spillway consists of:

1. Control Structure.
2. Stilling Basin (Fore apron).
3. Upper Guide Levee.
4. Lower Guide Levee.
5. Sedimentation Levee.
6. Floodway.

b. Control Structure. The inlet structure is a needle-controlled weir located approximately 1,300 feet from the riverbank. The weir is designed as a concrete gravity overfall dam of sufficient base width to resist the horizontal thrust at the bottom of the needles as well as the direct water pressure against the face. The structure is founded on untreated timber piling (65 to 70 feet in length) and has a riverside steel sheet pile cutoff wall 45 to 55 feet in depth. There are 350 bays, each 20 feet in width, that are separated by 2-foot thick reinforced concrete piers. These piers carry the loading for two "C" channel beam/concrete service bridges and furnish support for the upper end of the needle escape bars. The bridges serve as a craneway for the traveling cranes as well as a walkway for project personnel. There are 176 bays, in four groups, with weir crest at elevation 17.8 MLG and 174 bays in bays, in three groups, with weir crest at elevation 15.8 MLG. The weir crests are arranged symmetrically about the centerline, 44 bays at

elevation 15.8 MLG then by 44 bays at elevation 17.8 MLG, followed by 43 bays at elevation 15.8 MLG and ending with 44 bays at elevation 17.8 MLG. The bays are each closed by 20 creosoted pine needles whose actual cross-sectional dimensions are 8 x 11.5 inches (permit operation without binding) and whose lengths are 10 and 12 feet depending on the elevation of the weir crest.

c. Stilling Basin. The stilling basin is located immediately lakeward of the control structure. It is approximately 45 feet wide and consists of a shallow placed reinforced concrete slab with three rows of low concrete baffle piers. A steel sheet pile cutoff wall 25 feet in depth is located beneath the last row of baffle piers (furthest from the structure). Beyond the baffle piers is a 6-inch thick articulated concrete mat 175 to 225 feet wide that is underlain by an inverted filter of gravel, spalls and riprap.

d. Upper & Lower Guide Levees. The guide levees confine the flow within the floodway. Two different levee cross section designs were used. The levees in the upland portion of the floodway, between the river and U.S. Highway 61, utilized the standard MRC cross section of 1V on 3.5H on the floodside and 1V on 5.5H on the protected side. The "swamp levees", between U.S. Highway 61 and the lake, were designed with a broad base and flat slopes (1V on 15H) for construction by hydraulic placement.

e. Sedimentation Levee. The levee was used to deter the circulation of sediment-laden water between the river and the forebay during normal high waters and thus minimizes silt deposition between openings. A gap was left in the downstream end of the levee to permit flooding and drainage of the forebay. The levee has a five foot crown with 1V on 3H side slopes. The sedimentation levee was degraded during the dredging operations prior to the April 1975 spillway opening and has never been restored. In June

of 1975, the practice of removing sediment deposits from the spillway was expanded to include the forebay area. Dredging of the forebay area has not been required for the last three spillway openings.

f. Floodway. The floodway is approximately 7,700 feet wide at the river and gradually flares out to a width of 12,400 feet at the lake. High level crossings for the Yazoo & Mississippi Valley, the Louisiana & Arkansas, and Illinois Central Railroads; U.S. Highway 61 and Interstate 10 lie within the floodway.

g. Operating Machinery. Two identical traveling cranes are provided for removing and installing the needles. The model HC-48a cranes were manufactured in 1975 by Link Belt are powered by GM two cycle diesel engines. The engine alternators are high capacity and used to provide power for the crane lighting. The custom design gantry is driven by two high torque low speed hydraulic motors connected to two of the four wheels. The design capacity for the crane over the side without rail clamps or outriggers is 2,000 lbs. at a 12 foot radius. The dragline has a nominal capacity of 5,000 lbs. In addition to the cranes, there is also an engine driven rail car used to transport personnel and equipment along the structure. The cranes and rail car are operated weekly.

2-03 Pertinent Data. Pertinent data is tabulated below:

<u>Item</u>	<u>Measurement</u>
Project discharge capacity	250,000 cfs
Depth of riverside steel sheet piling	45 and 55 ft
Depth of lakeside steel sheet piling	25 ft
Timber piling length	65 to 70 ft
Sill elevation	15.8 or 17.8 ft MLG
Guide levee crown elevation	19.6 ft MLG
Guide levee length (total)	11.8 miles

Floodway elevation (river end)	12 ft MLG
Floodway elevation (lake end)	0 ft MLG
Floodway length	5.7 miles
Needles required	7,000
Concrete poured	130,000 cy
Riprap placed	105 tons
<u>Item</u>	<u>Measurement</u>
Steel sheet piling	583,000 ft ²
Timber piling	746,279 lin ft

2-04 Subsurface Conditions. The subsurface environment along the axis of the spillway structure generally consists of Holocene deposits varying in thickness from over 100 feet at the upstream end of the structure to approximately 50 feet at the downstream end. The Holocene deposits contain a 10 to 13 foot surface layer of medium to stiff natural levee clays with varying amounts of silt; underlain by point bar silts, silty sands and sands containing increasing amounts of clay toward the downstream end of the structure. The Holocene deposits are underlain by stiff Pleistocene clays.

2-05 Instrumentation. Reference markers have been installed on the structure for the purpose of checking differential settlement and possible tilt of the structure during high water periods. The reference markers are located along the top of the piers between the first two and last two bays, and every 10th monolith along the remainder of the structure. See Instrumentation Drawing Plates BCR-1 through BCR-3 for reference mark locations. Plumb bob surveys monitor the horizontal movements of the abutments and wingwalls on both ends of the structure.

a. Settlement Markers. Settlement markers are located at two points on each measured pier, one on the south (riverside) service bridge and the other on the north (lakeside) service bridge and are used for vertical control. The markers are numbered in

accordance with the bridge span numbering system and have a lettered suffix "N" and "S". See Instrumentation Drawing Plate BCR-4 for typical pier instrumentation layout.

b. Alignment Markers. Alinement markers are located on each measured pier along the centerline of the north service bridge and are use for horizontal control. These markers are also numbered in accordance with the bridge span numbering system and have a lettered suffix "A".

c. Plumb Bobs. The plumb bob stationary plates (top of wall) and base plates (face of wall - three feet above ground elevation) were installed in November 1989. Two sets of plates are located on each abutment and wingwall for a total of 12 devices. See Instrumentation Drawing Plate 6 for plumb bob layout.

2-06 Hydrologic Data. Water surface elevations are available during operation of the spillway from staff gages located upstream and downstream of the structure. Staff gages are also located along the upper and lower guide levees and the centerline of the floodway from the structure to the lake.

SECTION III - OPERATION AND MAINTENANCE DATA

3-01 Operation.

a. General. Bonnet Carré Spillway is normally operated to prevent stages and discharge at the Carrollton Gage from exceeding El. 20 and 1,250,000 cfs. The natural leveed channel of the Mississippi River at and below New Orleans is capable of safely disposing of a flood in which peak flow in that portion of the river does not exceed 1,250,000 cfs. When a flood larger than the above occurs, and it is deemed necessary that the spillway be brought into operation, it will be necessary that the opening of the spillway be started somewhat in advance of the river stage reaching 20 feet on the Carrollton Gage. Accordingly, in an average flood requiring the use of the spillway, it may be expected that operation will begin at stages in the vicinity of 19 feet with stages higher than 20 feet predicted. Previous floods requiring the operation of the spillway occurred in 1937, 1945, 1950, 1973, 1975, 1979, 1983, 1994 and 1997. See Appendix C for a summary of operating statistics.

b. Opening Procedure. Both cranes will be used in such a manner as to remove the needles from the bays in the most expeditious manner. A needle is removed by hooking the hoist line to the top of the needle and lifting vertically. When the needle clears the water, the dragline cable is hooked to the lower hook-up point and the needle is swung to a horizontal position. The upper end is then rested on the reaction beam and the lower end is hooked to the riverside service bridge.

c. Closing Procedure. The hinged bracket is latched to the lakeside reaction beam and a pin is inserted through the lifting strap to effect the rotation of the needle. The

dragline cable is attached to the lower hook-up point on the needle. Upon disconnecting the needle from the riverside service bridge, the dragline cable will control the vertical lowering of the needle into position in the structure. Once the gate bay is closed, a wire rope is immediately threaded through the upper hook and secured to prevent needle from being blown or kicked out. The needle keeper bars will be installed if the needles are not askew to prevent installation. Once the river stage drops to approximately 17.5 feet, it is safe for personnel to begin work from the structure sill in the high bays to align the needles and install the keeper bars. To properly align the needles, a worker must stand on the sill and pry the base of each needle into place. Alignment of the needles in the low bays can begin at approximate river stage of 15.5 feet.

d. Sequence of Operation. The bays shall be opened in accordance with the sequence shown in the enclosed table or with a schedule to be furnished daily by Engineering Division during the opening period. Closure of the bays shall be accomplished in reverse sequence of the enclosed table or in accordance with a closing schedule also to be furnished daily by Engineering Division.

e. Forebay Evaluation. The ground surface elevations in the forebay are evaluated with regard to the impact it has on achieving the design capacity of the structure. Commercial sand haulers remove deposits from the forebay as well as the floodway. Dredging has been required prior to past spillway operations to lower the forebay elevation to El. 5.

3-02 Maintenance and Operating Problems. There have been no major operating problems since the previous periodic inspection of the structure. See Appendix D for a summary of historical problems and deficiencies.

**BONNET CARRE' SPILLWAY
SEQUENCE OF OPERATION**

SEQUENCE	EAST CRANE BAY NO.		WEST CRANE BAY NO.	
1	349-345	5H*	344-340	5H
2	201-210	10L*	171-180	10L
3	261-270	3H & 7L	231-240	10H
4	150-141	10L	120-111	10H
5	90-81	3H & 7L	60-51	10L
6	320-311	10H	290-281	10L
7	260-251	10H	230-221	10H
8	200-191	10L	170-161	10L
9	140-131	1H & 9L	110-101	10H
10	80-71	10L	50-41	4H & 6L
11	30-21	10H	10-1	10H
12	330-321	10H	300-291	10L
13	280-271	10L	250-241	10H
14	220-211	1H & 9L	190-181	10L
15	160-151	10L	130-121	10H
16	100-91	10H	70-61	10L
17	40-31	10H	20-11	10H
18	339-331	9H	310-301	4H & 6L
19	350	1H		

- NOTES:
- a. Above table is base on simultaneous operation of both cranes
 - b. Closing sequence will be the reverse of above
 - c. "H" refers to high bays and "L" refers to low bays

3-03 Major Repairs. There have been no major repairs since the previous periodic inspection of the structure. See Appendix E for a summary of historical repairs.

3-04 Marine Accidents/Incidents. There have been no marine accidents since the previous periodic inspection of the structure. See Appendix F for a summary of historical marine accidents.

3-05 Actions on Deficiencies.

a. The following remedial actions have been accomplished by structure personnel since the last periodic inspection:

1. Previously repaired concrete patches on the riverside weir were chipped out and replaced with a non-shrink grout. A filler material was installed to prevent the grout from filling the expansion joint area.
2. Spalls in the lakeside weir of gate bays 12 and 16 were repaired with a non-shrink grout.
3. Vertical cracks in the piers were sealed with a silicon caulking compound.
4. The rust spot areas on pier 194-195 were sealed.
5. The exposed steel in bay 303 above the top of the weir and the spall in bay 232 were patched with a non-shrink grout in FY 1996.
6. The exposed waterstop in bay 306 was repaired.
7. The steel components of the bridges where paint was missing or having paint bubbles were repainted. The gate bay numbers were also repainted.
8. The fasteners for the rail clamps (safety bracket) on the cranes were tightened.
9. The gaps in the crane rails between bays 245 & 246 and between bays 246 & 247 were repaired.
10. Staff gages were reinstalled and repaired.
11. Concrete pedestal was removed from the forebay area in bay 305.
12. Damaged walkway panels were replaced.
13. Timber needle tops have been coated with an asphalt-like material.

14. The security fence has been repaired and an alarm installed.

15. The joint at the stringer of the lakeside bridge at bay 77 has been realigned in August 1999.

16. The large spall on the west abutment has a metal brace attached so that it does not fall. This spall is still a concern to Operations Division and they are seeking advice from Engineering Division to resolve this reoccurring issue.

b. The following remedial actions proposed from the last inspection have not been accomplished:

1. The joint between the riverside wingwall and the west abutment has not been sealed.

2. A feasibility to evaluate the settlement of the eastside of the structure has not been pursued. This item needs to be addressed. Approximately 1.5 inches of settlement has occurred between bays 280 and 350 during the past five years (1993 to 1998).

**SECTION IV - REVIEW OF DESIGN AND ANALYSIS OF
INSTRUMENTATION**

4-01 Review of Structural Design Criteria.

a. General. NOD has no records of the actual design hypothesis and calculations for the Bonnet Carré Spillway. One of the few items known is that the concrete weir structure was designed for a water elevation of 24. The maximum stage at the structure was 23.4, which occurred during the 1950 operation. It is believed that the design stresses were similar to that which is contained in EM 1110-1-2101, dated 1 November 1963 and tabulated below.

<u>Item</u>		<u>Item</u>	
concrete	Portland cement	reinforcing steel	Billet steel
fc	2,250 psi	Fy	40,000 psi
fc	778 psi	fs	18,000 psi
unit weight	unknown		
Structural steel	ASTM: A-7-24	Pile (timber)	Class B
Fy	33,000 psi	allowable	15 tons
fs	18,000 psi		

b. Revised Design Criteria. The following is a list of current structural design criteria:

(1) EM 1110-2-2104, "STRENGTH DESIGN FOR REINFORCED CONCRETE HYDRAULIC STRUCTURES," dated 30 June 1992 provides guidance for designing reinforced concrete hydraulic structures.

(2) ER 1110-2-1806, "EARTHQUAKE DESIGN AND EVALUATION FOR CIVIL WORKS PROJECTS," dated 31 July 1995 provides contains the current earthquake design criteria while

EM 1110-2-6050, "RESPONSE SPECTRA AND SEISMIC ANALYSIS FOR CONCRETE HYDRAULIC STRUCTURES," dated 30 June 1999 provides guidance on the use of response spectra for the seismic analysis.

c. Conclusions. The impacts of revisions to the design requirements are as discussed below:

(1) The concrete weir structure does not meet the current criteria. The allowable working stresses shown above are based on a similar percentage of compressive and/or yield strengths as required by the current criteria except for the reinforcement. Thus, the original structural safety factors appear to be approximately the same as those used in current design. The current requirements for temperature steel, bar development and splice requirements should have minimal effect on an analysis of the weir.

(2) The spillway structure was not designed for seismic accelerations. The current criteria places this project in Earthquake Zone 0. Structures in Zones 0 & 1 require a response spectrum analysis. The geotechnical design earthquake acceleration loading for this site is zero and therefore the original design is still valid since this load case is not critical.

4-02 Review of Geotechnical Design Criteria

a. General. Limited design information is available for review. A prior analysis of the pile foundation based on the design water level against the structure along with an impervious sheet pile condition resulted in a maximum pile group acting in compression. The original pile test records show a maximum allowable load per pile of 15 tons in compression.

b. Revised Design Criteria. The following is a list of current geotechnical design criteria:

(1) EM 1110-1-1904, "SETTLEMENT ANALYSIS," dated 30 September 1990, provides guide-lines for calculations of vertical displacements and settlement of soil under shallow foundations supporting various types of structures and under embankments.

(2) EM 1110-2-1901, "SEEPAGE ANALYSIS AND CONTROL FOR DAMS," dated 30 September 1986, presents the fundamental design principles and guidance concerning seepage considerations for design of new dams and the evaluation of existing projects.

(3) EM 1110-2-1913, "DESIGN AND CONSTRUCTION OF LEVEES," dated 30 June 1996, presents the basic principles used in the design and construction of earth levees.

(4) EM 1110-2-2906, "DESIGN OF PILE FOUNDATIONS," dated 15 January 1991, provides information, foundation exploration and testing procedures, load test methods, analysis techniques, allowable criteria, design procedures, and construction consideration for the selection, design, and installation of pile foundations.

(5) EM 1110-2-2502, "RETAINING AND FLOOD WALLS," dated 29 September 1989, provides guidance for the safe design and economical construction of retaining and flood walls.

c. Conclusions. Since the bearing capacity was not adequate to support the load of the structure, it was decided to support the concrete weir on untreated timber piles

varying in length from 65 feet to 70 feet. The seepage path created by the two lines of sheet pile below the spillway structure is in accordance with current seepage criteria. Considering that the structure has exhibited good service for many decades (1931 to 1990), it is assumed that the overall design is adequate. It should be mentioned that the excessive recent settlement of the concrete weir between bays 280 and 350 has begun in the early 1990's. The cause of this phenomena is not apparent.

4-03 Analysis of Instrumentation Data. The last set of instrumentation data was taken on 4 February 1998.

a. Settlement Reference Marks. The 1998 instrumentation data indicates a continuing trend of settlement across the entire structure. Total settlements since 1978 generally increase from ¾-inch on the west to 4 inches on the east. A tabulation of settlement since the previous survey performed in 1993, total settlements since June of 1978 and settlement rates since 1978 in inches per year are shown on the enclosed table.

b. Plumb Bob Survey. Plumb bob survey data was not obtained in 1991, 1992 and 1998 due to a build-up of sediments over the base of the structure which covered up the plumb bob base plates. See Instrumentation Drawing Plate 6. The recorded data indicates the top for both east and west abutments and wingwalls moved up to 0.75 inches away from the structure during the period 1989 to 1993. This rotation is opposite from the movement that would be expected from an abutment and retaining wall with 15 feet of backfill. The direction of movement for this historical data has been verified from the field notes.

BONNET CARRE SPILLWAY
 FEBRUARY 1998 INSTRUMENTATION SURVEY

REFERENCE MARKER NO.	FEB 1998		NOV 1993		JUNE 1978		SETTLEMENT SINCE NOV 1993 (FEET)		TOTAL SETTLEMENT SINCE JUNE, 1978 (FEET)		SETTLEMENT RATE SINCE 1978, IN-YEAR
	ELEV. (NGVD)	ELEV. (NGVD)	ELEV. (NGVD)	ELEV. (NGVD)	ELEV. (NGVD)	ELEV. (NGVD)	(+NUMBER INDICATES REBOUND)	(+NUMBER INDICATES REBOUND)	(+NUMBER INDICATES REBOUND)		
O-N	28.962	28.990	29.036	-0.028	-0.074	-0.09					
O-S	28.966	28.990	29.034	-0.024	-0.068	-0.08					
1-N	29.084	29.085	29.148	-0.001	-0.064	-0.08					
1-S	29.067	29.101	29.142	-0.034	-0.075	-0.09					
10-N	29.155	29.155	29.221	0.000	-0.066	-0.08					
10-S	29.094	29.138	29.172	-0.044	-0.078	-0.09					
20-N	29.152	29.174	29.229	-0.022	-0.077	-0.09					
20-S	29.098	29.153	29.188	-0.055	-0.090	-0.11					
30-N	29.151	29.171	29.220	-0.020	-0.069	-0.08					
30-S	29.131	29.186	29.209	-0.055	-0.078	-0.09					
40-N	29.190	29.205	29.243	-0.015	-0.053	-0.06					
40-S	29.143	29.198	29.214	-0.055	-0.071	-0.09					
50-N	29.159	29.186	29.224	-0.027	-0.065	-0.08					
50-S	29.136	29.196	29.208	-0.060	-0.072	-0.09					
60-N	29.155	29.184	29.207	-0.029	-0.052	-0.06					
60-S	29.130	29.175	29.188	-0.045	-0.058	-0.07					
70-N	29.194	29.225	29.266	-0.031	-0.072	-0.09					
70-S	29.137	29.200	29.228	-0.063	-0.091	-0.11					
80-N	29.149	29.192	29.221	-0.043	-0.072	-0.09					
80-S	29.108	29.170	29.195	-0.062	-0.087	-0.10					
90-N	29.117	29.181	29.225	-0.064	-0.108	-0.13					
90-S	29.112	29.174	29.165	-0.062	-0.053	-0.06					
100-N	29.153	29.199	29.236	-0.046	-0.083	-0.10					
100-S	29.116	29.170	29.205	-0.054	-0.089	-0.11					
110-N	29.140	29.182	29.225	-0.042	-0.085	-0.10					
110-S	29.124	29.174	29.204	-0.050	-0.080	-0.10					
120-N	29.136	29.187	29.240	-0.051	-0.104	-0.12					
120-S	29.128	29.175	29.218	-0.047	-0.090	-0.11					
130-N	29.119	29.157	29.210	-0.038	-0.091	-0.11					
130-S	29.106	29.156	29.194	-0.050	-0.088	-0.11					
140-N	29.105	29.155	29.185	-0.050	-0.080	-0.10					
140-S	29.096	29.151	29.177	-0.055	-0.081	-0.10					
150-N	29.092	29.129	29.180	-0.037	-0.088	-0.11					
150-S	29.044	29.107	29.129	-0.063	-0.085	-0.10					
160-N	29.108	29.167	29.211	-0.059	-0.103	-0.12					
160-S	29.044	29.116	29.211	-0.072	-0.167	-0.20					
170-N	29.104	29.144	29.190	-0.040	-0.086	-0.10					
170-S	29.128	29.191	29.221	-0.063	-0.093	-0.11					

BONNET CARRE SPILLWAY
FEBRUARY 1998 INSTRUMENTATION SURVEY

REFERENCE MARKER NO	FEB 1998		NOV 1993		JUNE 1978		SETTLEMENT SINCE NOV 1993 (FEET)		TOTAL SETTLEMENT SINCE JUNE 1978 (FEET)		SETTLEMENT RATE SINCE 1978, IN YEAR
	ELEV (NGVD)		ELEV (NGVD)		ELEV (NGVD)		(+ NUMBER INDICATES REBOUND)	(+ NUMBER INDICATES REBOUND)	(+ NUMBER INDICATES REBOUND)		
180-N	29.097		29.141		29.183		-0.044	-0.086	-0.10		
180-S	29.098		29.183		29.202		-0.085	-0.104	-0.12		
190-N	29.125		29.168		29.208		-0.043	-0.083	-0.10		
190-S	29.093		29.191		29.203		-0.098	-0.110	-0.13		
200-N	29.090		29.149		29.194		-0.059	-0.104	-0.12		
200-S	29.069		29.158		29.183		-0.089	-0.114	-0.14		
210-N	29.077		29.134		29.172		-0.057	-0.095	-0.11		
210-S	29.054		29.153		29.169		-0.099	-0.115	-0.14		
220-N	29.069		29.143		29.193		-0.074	-0.124	-0.15		
220-S	29.075		29.166		29.195		-0.091	-0.120	-0.14		
230-N	29.029		29.104		29.152		-0.075	-0.123	-0.15		
230-S	29.041		29.133		29.158		-0.092	-0.117	-0.14		
240-N	29.051		29.141		29.198		-0.090	-0.147	-0.18		
240-S	29.004		29.101		29.146		-0.097	-0.142	-0.17		
250-N	29.039		29.121		29.179		-0.082	-0.140	-0.17		
250-S	28.994		29.116		29.156		-0.122	-0.162	-0.19		
260-N	28.989		29.079		29.217		-0.090	-0.228	-0.27		
260-S	28.996		29.114		29.138		-0.118	-0.142	-0.17		
270-N	29.038		29.124		29.175		-0.086	-0.137	-0.16		
270-S	29.029		29.148		29.178		-0.119	-0.149	-0.18		
280-N	28.979		29.077		29.147		-0.098	-0.168	-0.20		
280-S	28.942		29.071		29.213		-0.129	-0.271	-0.33		
290-N	28.927		29.069		29.158		-0.142	-0.231	-0.28		
290-S	28.932		29.071		29.146		-0.139	-0.214	-0.26		
300-N	28.930		29.026		29.129		-0.096	-0.199	-0.24		
300-S	28.872		29.007		29.104		-0.135	-0.232	-0.28		
310-N	28.832		28.977		29.103		-0.145	-0.271	-0.33		
310-S	28.806		28.962		29.076		-0.156	-0.270	-0.32		
320-N	28.805		28.942		29.094		-0.137	-0.289	-0.35		
320-S	28.780		28.924		29.080		-0.144	-0.300	-0.36		
330-N	28.795		28.927		29.104		-0.132	-0.309	-0.37		
330-S	28.757		28.909		29.075		-0.152	-0.318	-0.38		
340-N	28.790		28.929		29.120		-0.139	-0.330	-0.40		
340-S	28.736		28.888		29.089		-0.152	-0.353	-0.42		
349-N	28.552		28.650		28.895		-0.098	-0.343	-0.41		
349-S	28.525		28.700		28.859		-0.175	-0.334	-0.40		
350-N	28.249		28.375		28.575		-0.126	-0.326	-0.39		
350-S	28.189		28.323		28.561		-0.134	-0.372	-0.45		

VOID

See 2nd End
for IV-7

SECTION V - INSPECTION

5-01 Inspection Team. The field inspection of the Bonnet Carré Spillway Structure was conducted on 9 September 1999 by the following personnel from the New Orleans

District (NOD) and Lower Mississippi Valley Division:

Joseph Chryssoverges	Gen Engr Branch (Inspection Coordinator)
Larry Dressler	Geotechnical Branch
Charles Laborde	Structures Branch
Barbara Garcia	Structures Branch
Dennis Strecker	Gen Engr Branch (Mechanical)
Daniel Bradley	Gen Engr Branch (Electrical)
Charlie Rome	Gen Engr Branch (Materials)
Dave Vossen	Gen Engr Branch (Materials)
Paul Salassi	Gen Engr Branch (Pedestrian Bridge Inspector)
David Elmore	Hydraulics & Hydrologic Branch
Patrick O'Brien	Hydraulics & Hydrologic Branch
Kirt Jacob	Operations Division (Foreman)
Steve Schinetsky	Operations Division
Tim Connell	Operations Division
Malcom Dove	CEMVD-ET-EG
Duane Stagg	CEMVD-ET-EG

5-02 Orientation. A preinspection briefing was held on 1 September 1999 at the District headquarters building to discuss the inspection brochure, to finalize the inspection checklist and to determine the tasks required of field personnel. Prior to inspecting the spillway structure, the inspection team gave a brief orientation on the following features of the project: structural, foundation and soils, hydraulic and hydrologic, instrumentation, operations and maintenance and the plan for accomplishing the inspection.

5-03 Observations and Photographs.

a. General. The overall condition of the structure was good. In accordance with

ER 1110-2-111, "Periodic Inspection and Continuing Evaluation of USACE Bridges", dated 30 April 1997, the walkway accesses on the spillway structure are considered pedestrian bridges. Appendix G contains a copy of the pedestrian/crane bridge inspection report which was approved by MVD on 18 January 2000. This report concluded that the pedestrian/crane bridges are in good condition, structurally sound and safe for use.

b. Piers.

(1) Horizontal cracks were noted at the construction joints in several piers (riverside).

(2) Exposed reinforcement noted at the underside of pier 4-5 on the riverside of the structure.

(3) Spalls were located on the riverside of piers 176-177, 178-179, 179-180 and 273-274 at the construction joint.

(4) A significant spall with debris protruding out was noted on the west side of pier 290-291 just above the weir. See Photo No. 1.

(5) A spall is located on the riverside face of pier 190-191 near the waterline. See Photo No. 2.

c. Weirs.

(1) The condition of the weirs does not appear to have changed since the last inspection except for the placement of joint material in the patched areas.

(2) Several weir crests have a slight depression at the center of the bay. See Photo No. 3.

(3) Small spalls at the riverside expansion joint in bays 190 and 234.

(4) Crescent shaped cracks at the riverside expansion joint in bay 230.

d. Walkway Panels.

(1) The small lakeside panels which are over piers 159-160 (panel # L159e) and pier 171-172 (panel # L171e) have deteriorated to the point of being a safety hazard.

(2) The dimension of replacement smaller panels in the direction perpendicular to the walkway was dangerously shorter than the originals. It appears that the dimension of the larger panels was used when casting new short panels. The support for the short panels is opposite that for the larger panels, thus making this dimension is critical. See Photo No. 4.

(3) Several new panels were warped when cast so they did not rest squarely on their supports. A few rocked quite severely and could cause pedestrians to loose their balance.

(4) Reinforcement steel is exposed on the underside of several panels.

e. West Abutment and Wingwalls. The integrity of the abutment and wingwalls has not changed from the conditions reported in past inspections. The abutment and wingwalls monoliths are pile supported and have male/female shear keys. The abutment has a back face that is stepped for a horizontal length of 10 feet, has four rows of timber piles for support and has a 50 foot buried I-wall attached. The riverside wingwall has a back face that is sloped for a horizontal length of three feet then has a 2 foot horizontal segment and has three rows of piles for support adjacent to the abutment. The lakeside wingwall has a back face that is stepped for a horizontal length of four feet except adjacent to the abutment where it increases to six feet and has three rows of piles for support. The shear keys are arranged such that the male end of the lakeside wingwall fits

into the female lakeside end of the abutment and the male riverside end of the abutment fits into the female end of the riverside wingwall. Movements of the monoliths have resulted in the shearing of the female key on the downstream side of the abutment (See Photo No. 5) and the shearing of the female key on the upstream side of the riverside wingwall (see Photo No. 6). This damaged appears to have been caused by both wingwalls rotating toward the structure while the abutment has remained stationary. The riverside end of the abutment was checked during the inspection and found to be essentially plumb.

f. East Abutment and Wingwalls. No structural distress was noted even though the abutment has settled four inches since 1978.

g. Stilling Basin.

(1) The downstream end of the baffle block slab has two cracks approximately ten feet apart in the vicinity of bay 100. See Photo No. 7.

(2) One baffle block has a horizontal crack six inches from the top extending around its perimeter. See Photo No. 8.

(3) The distance from the water's edge in the basin to the vertical slop break in the baffle blocks at the edge of the articulated mattress were taken at random locations. These observations confirm the differential settlement of the eastern end of the structure to be approximately ½ foot as documented by the reference mark survey. This implies that the pile founded weir structure and the stilling basin (non pile supported) are settling at similar rates.

h. Escape Bar Connections.

(1) Numerous escape bar connections have rusted components: pads,

anchor bolts, nuts, angles and pins. Some anchor bolts and a retaining pin are badly corroded. See Photo Nos. 9, 10 and 11.

(2) The needle keeper straps were replaced with beams in 1997 and are in excellent condition.

i. Paint. Numerous locations of spot rust were observed on all of the exposed steel. Project personnel have been performing touch up painting for years. Some of these areas were painted over without proper sand blasting. See Photos Nos. 12, 13 and 14. The structure was last painted in 1979 by Swiss Craft Professional Painters at a cost of approximately \$400,000.

j. Cranes. The two cranes that are used to operate the structure were inspected and the following observations were made:

- (1) The mechanical components operated satisfactory.
- (2) Handrails near the operator's door were missing.
- (3) The cabs are corroded beyond repair. Numerous holes allow the entrance of rainwater.

Crane replacements have been purchased. Two hydraulic excavators are to be retrofitted with rail clamps, boom and winch to operate on the structure.

k. Embankments. The guide levees are in generally good condition with no signs of sloughing. The crowns contained numerous holes filled with standing water. The levees are below design grade (1973 flow line with three feet of freeboard). A 1997 profile indicates the upper guide levee crown is not below the 1973 flow line while the lower guide levee crown is about ½-foot below the 1973 flow line in the vicinity of Airline Highway. The 1983 profile for the highest stages in the spillway plots below the

1973 flow line. The following table provides a breakdown of the levee deficiencies.

Upper Guide Levee	
Station Limits	Max Ft Below Grade
99+00 to 108+00	1.5
118+90 to 119+90	1.7
130+50 to 134+50	1.0
136+00 to 172+00	2.8
174+00 to 210+00	2.5
270+00 to 323+00	2.4

Airline Highway near 136+10

Lower Guide Levee	
Station Limits	Max Ft Below Grade
68+00 to 70+00	1.8
70+50 to 71+50	1.0
72+50 to 73+50	0.8
86+00 to 88+00	3.5
97+50 to 101+50	1.6
103+00 to 111+00	2.2
113+00 to 117+00	1.0
129+00 to 197+00	1.8
216+00 to 221+00	1.0
227+00 to 278+00	2.6

Airline Highway near 87+97

l. Instrumentation Devices. An examination of both abutments and all wingwalls revealed no indication that stationary plates and base plates were installed. A review of the field notes indicate that measurements were taken at the top and at the base of the walls and abutments. This procedure does not allow for consistent and/or continually measurements to be taken since the riverside of the structure can get several feet of siltation (covering up the base) and the stilling basin has fluctuating water levels (measurements taken at water surface).

m. Gages.

(1) The downstream gage (Gage A) and the upstream gage (Gage B) have no identification. Gage A also needs to be lengthened so that stages below 22 feet N.G.V.D. can be read.

(2) Markings on the forebay and tailbay gages could not be easily read due to accumulation of dirt and weathering.

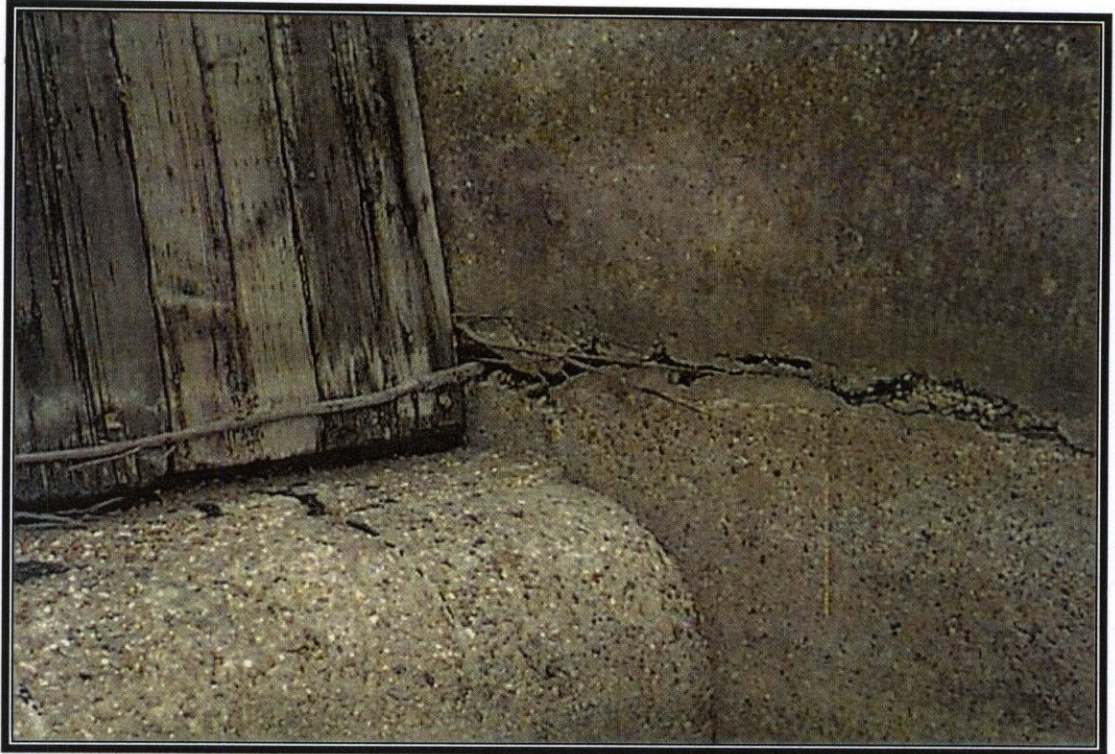
n. Vegetation. Vegetation has been kept under control. The following isolated areas were noted:

(1) Weeds were growing at the base of the staff gages.

(2) Willow trees were growing in the tailbay near the west end of the structure.

(3) Weeds were growing in several weir joints.

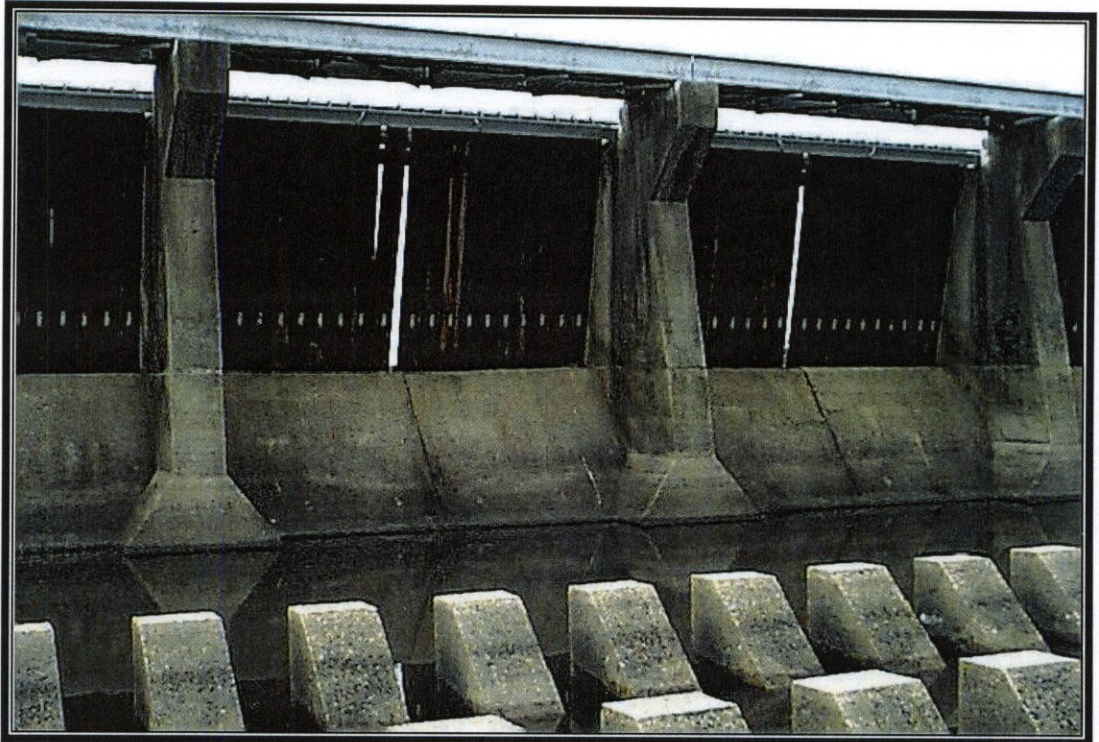
o. Timer Needles. The timber needles are in fair to good condition. Since the majority of the deterioration occurs at the top of the needles, a plan has long been established whereby the tops of the deteriorated long length needles are cut down for use as the shorter length needles. New timbers are purchased as needed to replace the deteriorated long length needles.



↑ PHOTO NO. 1 - A SIGNIFICANT SPALL WITH DEBRIS WAS NOTED ON THE WEST SIDE OF PIER 290-291 JUST ABOVE THE WEIR.

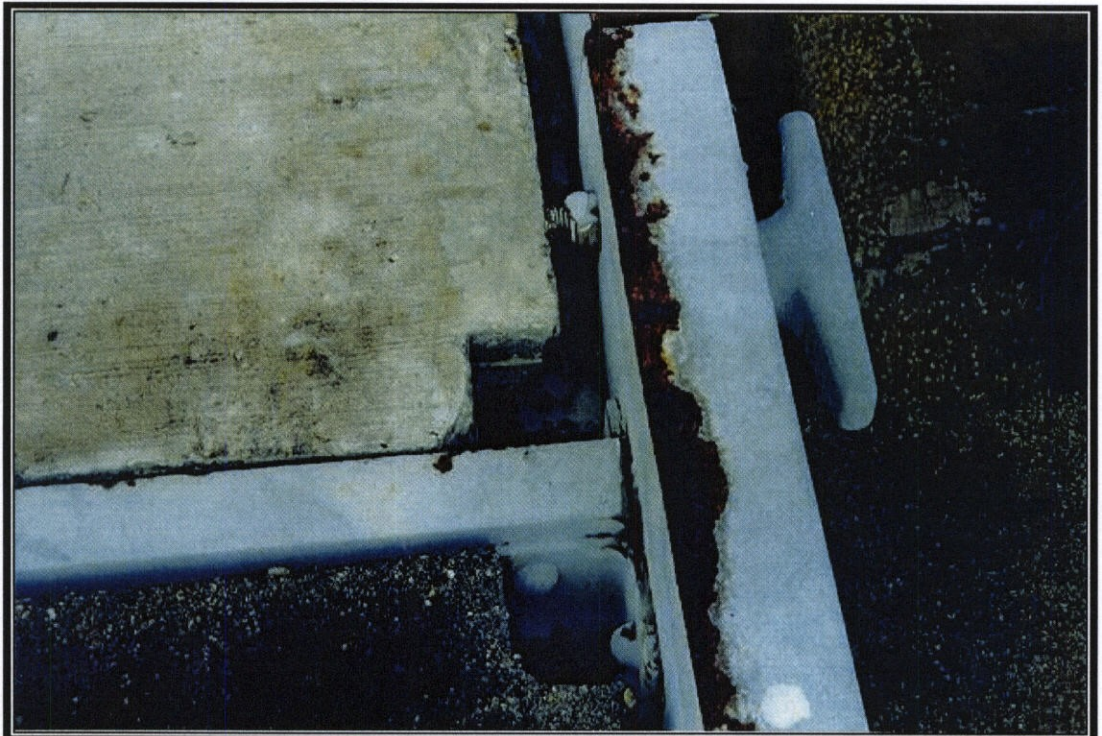
↓ PHOTO NO. 2 - A SPALL IS LOCATED ON THE RIVERSIDE FACE OF PIER 190-191 NEAR THE WATERLINE.





↑ PHOTO NO. 3 – DEPRESSION IN THE CENTER OF THE BAY AT THE WEIR CREST.

↓ PHOTO NO. 4 – SMALLER REPLACEMENT PANEL RESTING ON EDGE OF SUPPORT (R149e).





← PHOTO NO. 5
- SHEARED
FEMALE KEY
ON THE
DOWNSTREAM
SIDE OF THE
ABUTMENT.

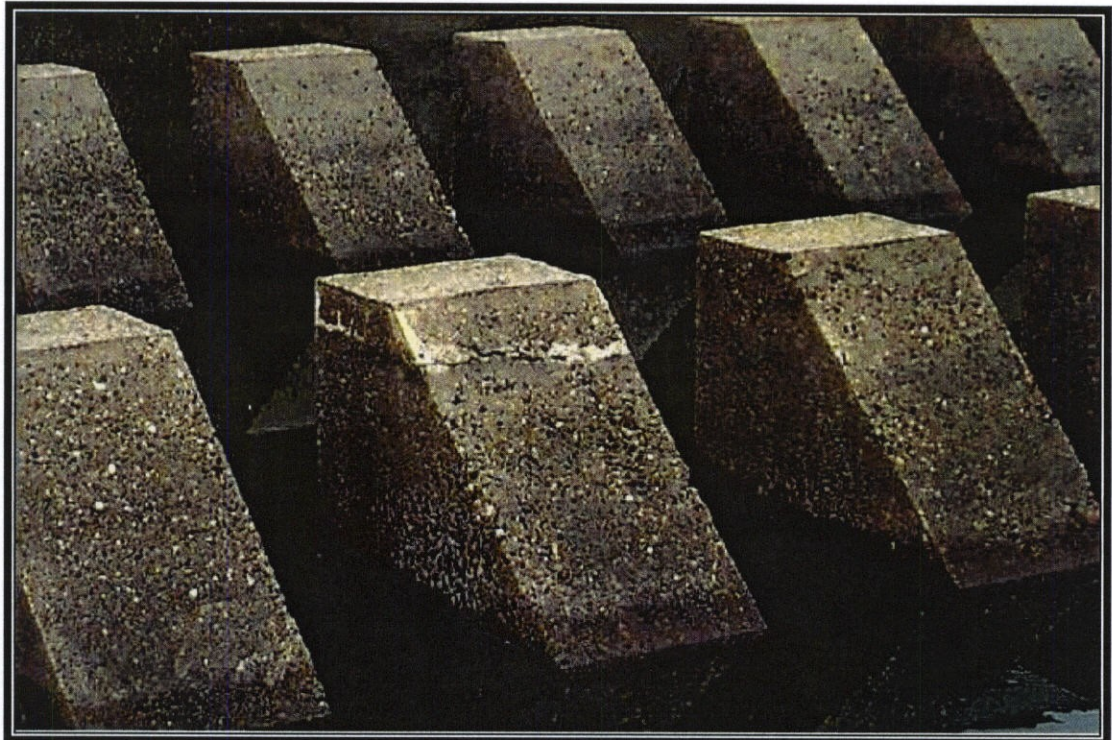
↓ PHOTO NO. 6
- SHEARED
FEMALE KEY
ON THE
UPSTREAM
SIDE OF THE
RIVERSIDE
WINGWALL.

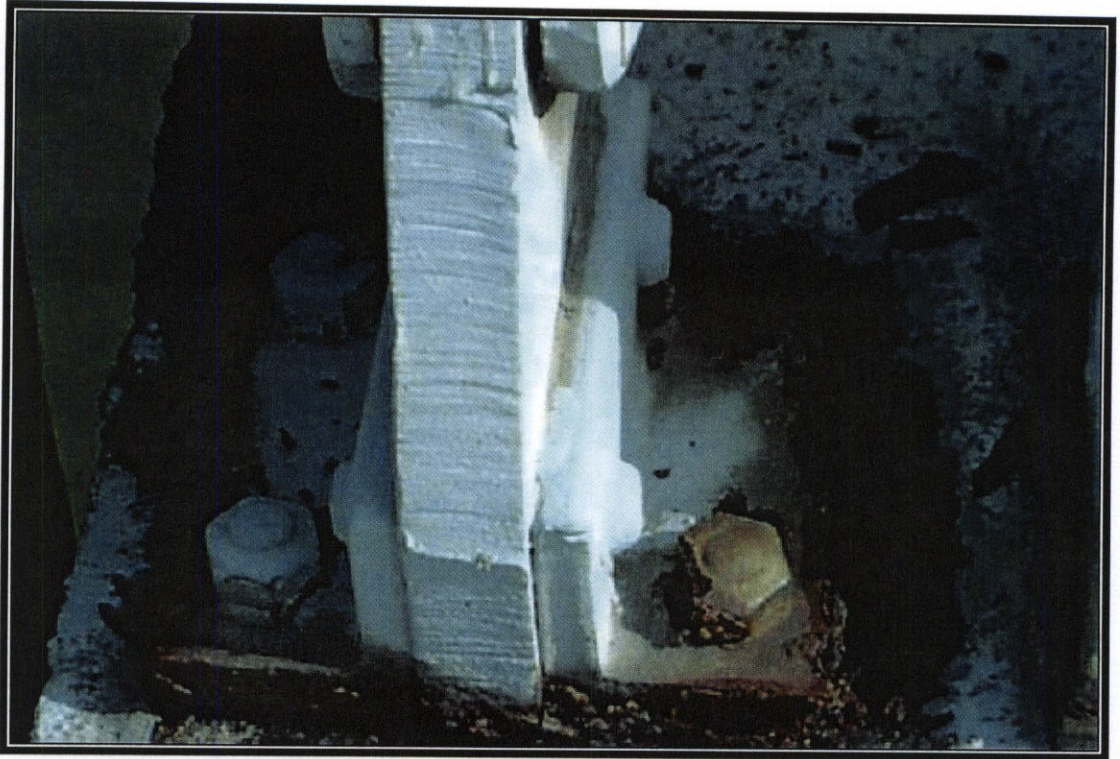




↑ PHOTO NO. 7 – ONE OF SEVERAL CRACKS AT DOWNSTREAM
END OF STILLING BASIN.

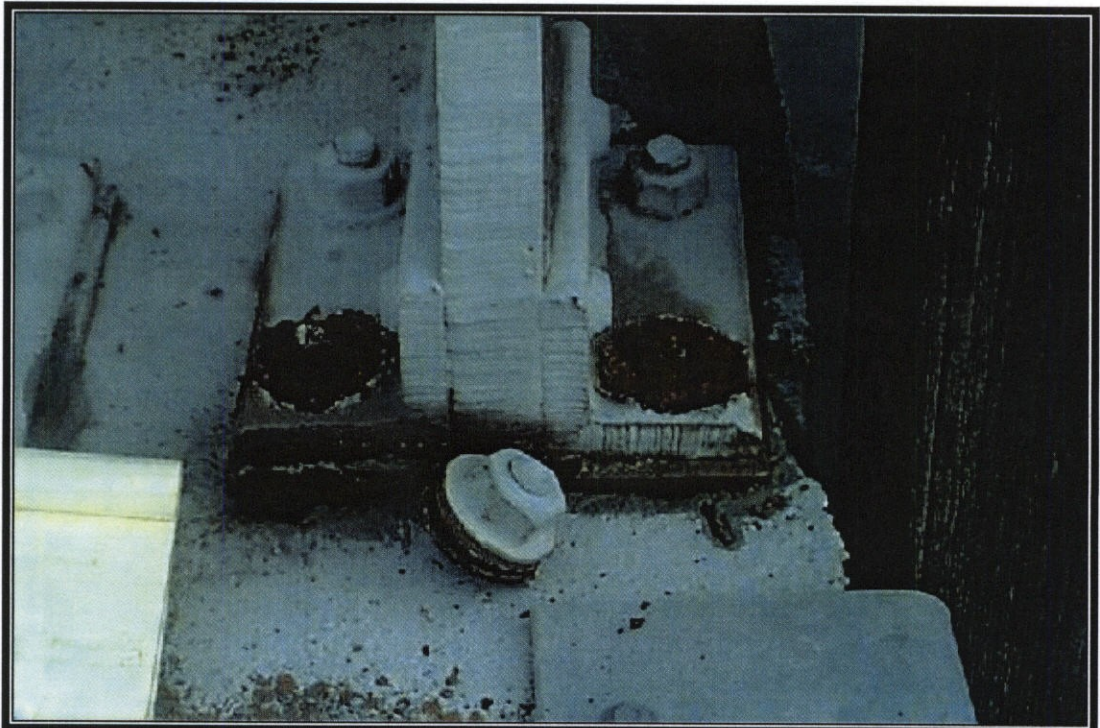
↓ PHOTO NO. 8 – HORIZONTAL CRACK THROUGH BAFFLE BLOCK
APPROXIMATELY SIX INCHES FROM THE TOP.

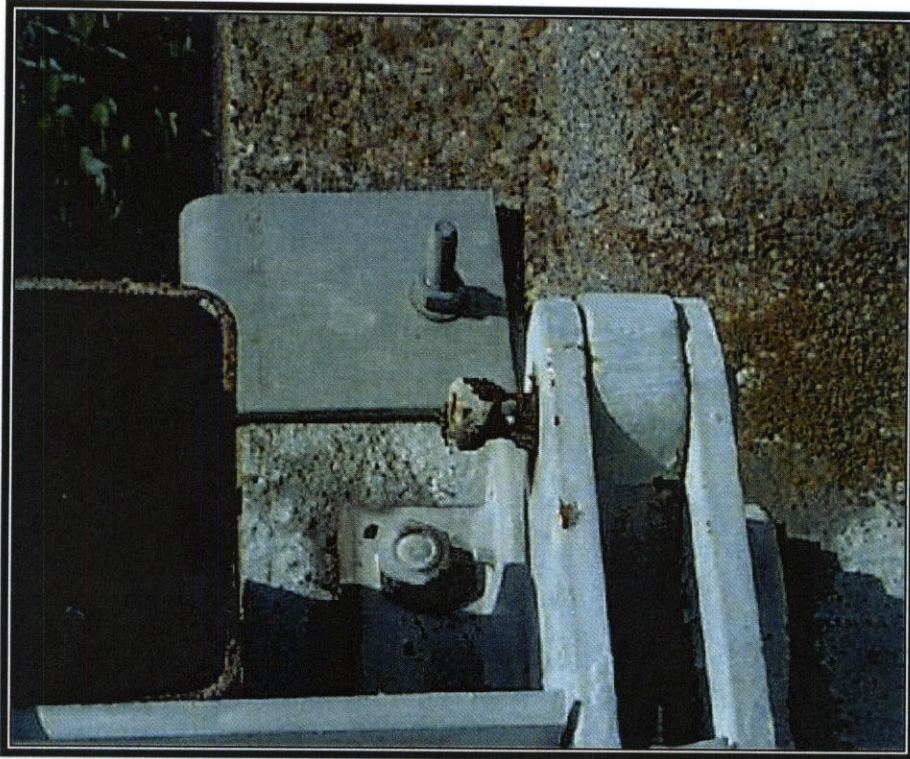




↑ PHOTO NO. 9 – RUSTING COMPONENTS ON THE ESCAPE BAR ANCHORAGE CONNECTIONS.

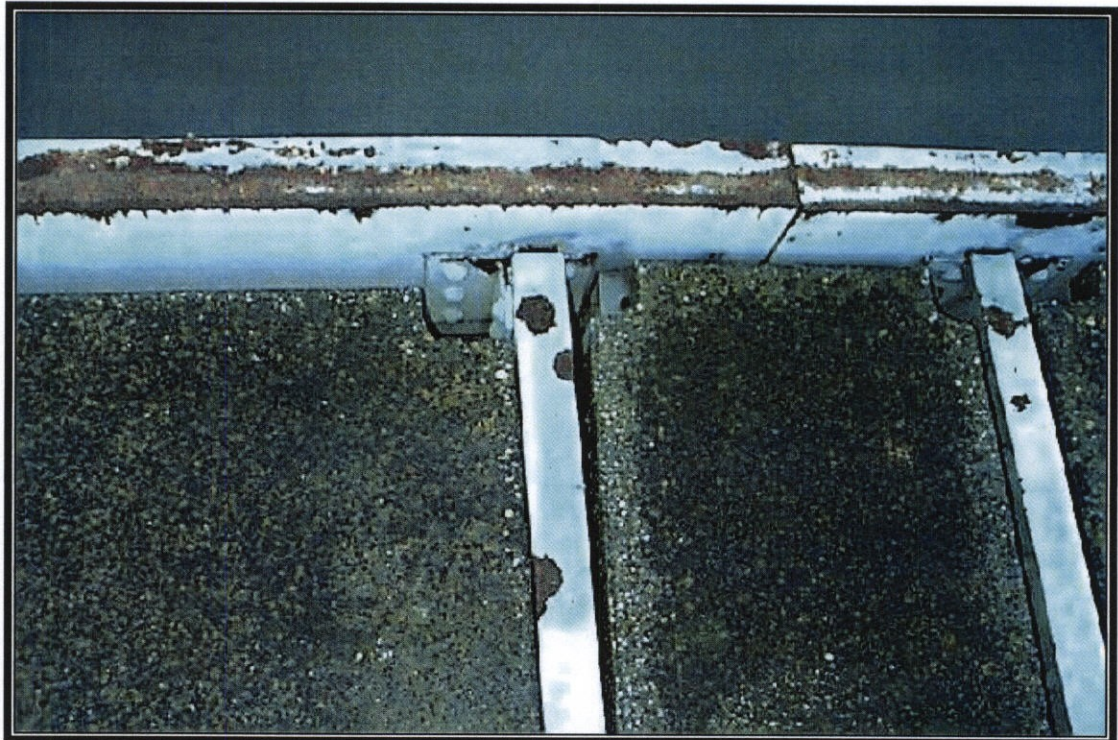
↓ PHOTO NO. 10 – DETERIORATED RIVERSIDE ANCHOR BOLTS ON THE ESCAPE BAR SUPPORT PADS.





↑ PHOTO NO. 11 – CORRODED PIN IN THE WEST ESCAPE BAR SUPPORT PAD OF BAY 165.

↓ PHOTO NO. 12 – TYPICAL RUST SPOTS ON CRANE/SERVICE BRIDGE.





↑ PHOTO NO. 13 – CLOSE-UP OF RUST ON CRANE/SERVICE BRIDGE COMPONENTS.

↓ PHOT NO. 14 – TYPICAL SPOT RUSTING ON THE C CHANNELS OF THE CRANE/SERVICE BRIDGE.



SECTION VI – CONCLUSIONS AND PROPOSED REMEDIAL ACTIONS

6-01 Conclusions. The Bonnet Carré Spillway Structure is structurally stable, maintained and in good operating condition.

6-02 Proposed Remedial Actions. All monitoring will be performed by lock personnel and the repair work will be accomplished by in-house staff or by a contractor.

a. Repairs/actions.

(1) The concrete walkway panels L171e and L159e were replaced and panel L40d was shimmed up by project personnel shortly after the inspection.

(2) The deterioration of the paint system has reach a state that the entire structure needs to be repainted. A contract to repaint the structure is tentatively scheduled for award in FY 2003.

(3) The joint between the riverside wingwall and the west abutment needs to be sealed with a flexible material to prevent water from freely entering the backside of the wingwall. This work will be accomplished while the remedial repairs to stabilize the wingwalls are being installed. This is tentatively scheduled for FY 2002.

(4) The damaged shear key on the west abutment (vertical spall) should be removed and repaired after the remedial work to prevent further movements of the wingwalls has been completed. The repair for the key consists of chipping away all unsound concrete, installing #6 epoxy coated dowels at 12 inches on center, setting up appropriate formwork and placing new concrete. The new concrete should be made with similar aggregate as was originally used (i.e. gravel

of the same maximum aggregate size). This will reduce thermal expansion differences. Additionally, the least amount of water possible should be used (maximum w/c ratio of 0.4) along with a high range water reducer to increase slump and facilitate placement. The bonding agent should be a mixture of latex and cement since epoxies have to be measured, mixed and carefully placed for successful bonding to occur. Also, epoxies need to be tacky when concrete is placed; otherwise, a bond breaking surface results. All materials shall meet appropriate ASTM standards.

(5) The anchor bolts for the escape bar require replacement if both existing bolts on the riverside of the pin are unsound. The repair method depends if the old ASTM A7 steel base plates are welded: (1) Weld a $\frac{3}{8}$ "x9"x1 $\frac{1}{2}$ " A36 steel plate to the existing base. Secure the new plate to structure using two $\frac{1}{2}$ " diameter Hilti adhesive anchor system with stainless steel anchor rods (minimum 6 $\frac{3}{8}$ " embedment), washers and nuts. OR (2) Secure a new $\frac{3}{8}$ "x9"x11" plate to the structure using four $\frac{1}{2}$ " diameter Hilti adhesive anchor system with stainless steel anchor rods (minimum 6 $\frac{3}{8}$ " embedment), washers and nuts. Four $\frac{7}{8}$ " Nelson studs should be attached to the plate and spaced such that the existing base can be bolted to the new plate. Similar type repair work using a welded plate has been document in Periodic Inspection Report No. 3. This work is scheduled for FY 2002.

(6) The existing Link Belt cranes have deteriorated to a condition that is beyond repair. Two Model 55W-3 excavators manufactured by Hyundai were purchased to replace the aging cranes. The excavators were supplied as standard

4-wheel drive rubber tire units with a bucket and dozer blade. As of August 2000, the excavators have been modified by replacing the rubber wheels with steel ones that fit the existing wheel hubs. Other modifications planned, but that have not been completed, include the addition a dragline winch. The winch will be powered from the dozer blade hydraulic circuit. The dozer blade will be removed. Additionally, the bucket will be replaced with a device for lifting the needles using the needles' lifting eye. Once fully modified, the operation using the excavators should be safer, quicker and accomplished using fewer people. Modifications should be completed by April 2001.

(7) The upper and lower guide levees will be raised to design grade during FY 2001 and FY 2002.

b. Normal Maintenance Work.

(1) Concrete walkway panels L322d, L226c, L92d, R38b, R147b, R332a, R333a and R338d that have small areas of missing and/or cracked area will be monitored and replaced as needed.

(2) The continued removal of accumulation silt from the riverside of the weir structure is helpful in reducing the potential for continued settlement of the structure.

(3) Monitor spalls on the structure (especially the one located on the west side of pier 290-291) and report changes to Engineering Division.

V O I D

*see 2nd End for
revised page*

(4) Provide bay numbers on the lakeside of the structure to facilitate the locations of items noted in future inspections. As a minimum, every 5th bay should be numbered. This will be done during FY 2001.

(5) The continued periodic removal of vegetation adjacent to the structure and around the base of the staff gages.

(6) The continued periodic removal of obstructions that have a negative impact on flow through the floodway (e.g. sediment, overgrowth of trees and debris around bridges).

(7) Cleaning and refurbishing of staff gages so that markings and identification labels can be read. This has been completed during FY 2000.

(8) Staff gage A needs to be lengthen so that stages below El. 22 can be read. This has been completed during FY 2000.

(9) The levee tops should be graded to allow water to drain from the crown. This has been completed during FY 2000.

(10) Monitor the sheared condition of the riverside wingwall key (west abutment) and report changes to Engineering Division.

6-03 Future Issues.

a. Settlement of Eastern Portion of Structure. Field observations indicated that the stilling basin may have a similar trend in settlement that is indicated by the instrumentation data on the weir structure. Reference marks will be placed near the endsill of the stilling basin between bays 200 and 350 (exact locations to be determined by Geotechnical Branch) so that settlement data can be obtained. Installation of these new reference marks and readings for all reference marks are scheduled for completion

by the end of the third quarter of FY 2001. Future readings should continue on a two year interval. The accumulation of this additional data is the first step in the study to evaluate the ongoing settlement.

b. West Abutment. Prior to repairing the west abutment, the wingwalls will need to be stabilized. Three ways to stabilize the wingwall are possible while keeping the current physical access as requested by Operations Division: (1) Install a tie-back system to provide a reaction near the top, (2) excavate the existing backfill and replace with a light weight aggregate to reduce the loads and (3) construct a rock berm in the forebay adjacent to the wall to resist additional wall movements. Hydraulics Branch is opposed to the third method since the rock berm will reduce the design flow capacity. Operations Division will fund this investigation in FY 2001. The outcome of the investigation will specify which of the two remaining proposed solutions will be implemented. The method, costs and time frame for accomplishing the repair work will be determined in the investigation.

c. Plumb Bob Survey. New instructions are being prepared to ensure that meaningful data can be acquired. A distance measured from the top of the wingwall/abutment will be specified so that future readings are taken at the same spot. An attempt will be made to use the 1993 data as an initial reading since distance from the top of wall to the readings were furnished (at water level). An adjusted value can be computed for the 1993 data even though the distances recorded will not be equal to the new distances (use ratio of distances).

d. Walkway Panels. A new form to fabricate the smaller replacement panels should be built and the old form destroyed. The support for the short panels is opposite that for the larger panels. The dimension of the form should be field verified.

6-04 Next Inspection. The next inspection for Bonnet Carré Spillway Structure is in September 2004. This date is in compliance with the established five year interval.

APPENDIX A

MVD TRIP REPORT

MEMORANDUM THRU

CEMVD-ET-EG
CEMVD-ET-ES
CEMVD-ET-EW
CEMVD-ET-ET
CEMVD-ET-C
CEMVD-ET-E

FOR Main Files

SUBJECT: Trip Report for Bonnet Carre' Spillway Structure

1. On 29 June 1999 the undersigned participated in the periodic inspection of Bonnet Carre' Spillway Structure, New Orleans District. Personnel participating in the inspection are listed in enclosure 1.

2. **Purpose of Inspection.** This inspection was made in accordance with the provisions of ER 1110-2-100, Periodic Inspection and Continuing Evaluation of Completed Civil Works Structures, 15 February 1995.

3. **Project Description.** A summary of the project description can be found in Enclosure 2 for the convenience of those reviewing this report.

4. **Observations and Recommendations.**

a. **General Comments.** Considering the age of this project and the reduction in Operation and Maintenance dollars, the project has been very well maintained. Most of the recommendations of the last inspection have been addressed. At the time of the inspection the inlet and outlet channels were both dry. Enclosures 1-2 should be left out of the inspection report.

b. **Specific Comments.**

(1) **Prioritization.** The District should prioritize the deficiencies noted during the inspection. This should be beneficial in helping the District prioritize items for O&M funding and repair. The district should also include a cost estimate for each of the recommendations.

(2) **West abutment wall.** The joint on the downstream end of the west abutment wall has a spalled area at the top of the wall. Project personnel stated this area has not changed for many years. Recommend removing the spalled concrete, placing dowels and patching this area with concrete. The joint on the upstream side of the abutment wall should be cleaned and sealed with a flexible sealer such as chemical grout to keep water from getting behind the wall during operation.

(3) **Repainting.** Project personnel have performed touch up painting over the years. The condition of the paint is such that a painting contract should be issued to paint the entire structure.

(4) **Settlement of the east end of the structure.**
The east-end of the structure has settled approximately 1.5-inches since 1993 and 4-inches since 1978. The settlement points were installed in 1978 therefore information is not available prior to this time. Consideration should be given to placing points on the endsill of the stilling basin, which is not pile founded, to determine if the rate of settlement of the stilling basin is different from that of the weir, which is pile founded. If the rate of settlement is consistent for both areas, it would indicate the entire area is subsiding and the settlement is not totally related to the weight of the structure.

(5) **Crack between bays 290-291.** A significant crack was noted on the upstream pier between bays 290 and 291. Project personnel should monitor this crack and any changes in the size of the crack reported to the district.

(6) **FLOODWAY.** Periodic checks should be made of obstructions (overgrowth of trees, debris around railroad bridge, buildup of sediment from flow through floodway), that may accumulate within the floodway. Obstructions should be removed if found to have an effect on flood flow-line which in turn could possibly endanger the guide levees.

(7) **LEVEES** Tops of the levees were very rough and had standing water. A motor grader should be used to grade the levees smooth to allow the water to drain from the top of the levee.

(8) **Next Inspection.** The next periodic inspection will be in 2004.

5. Action. No action is required by the Division Commander at this time. Those deficiencies requiring action should be corrected as described above. The New Orleans District will document the findings of this inspection in a report, for submission to this office.

DUANE STAGG
Geotechnical Eng.

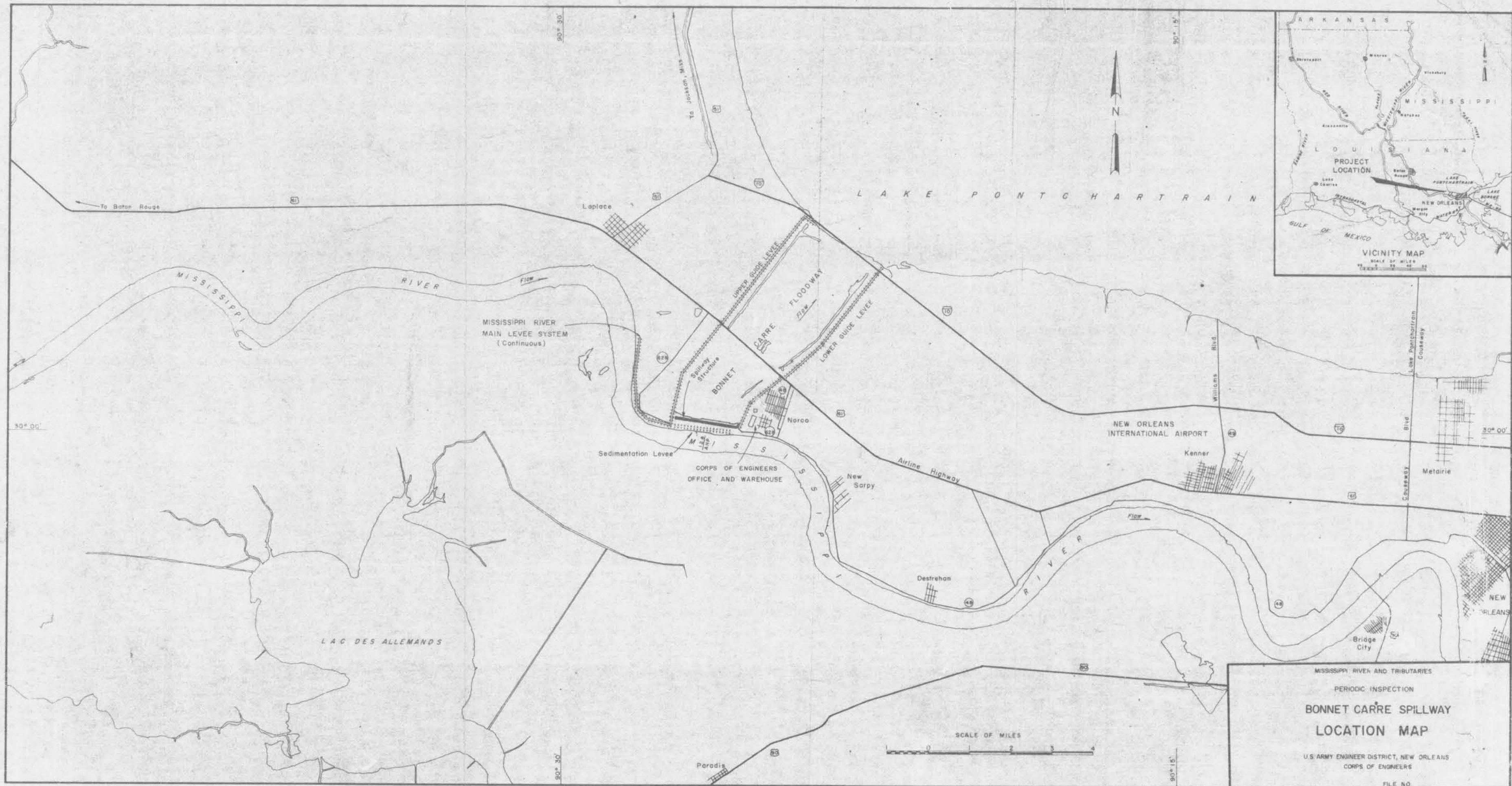
Malcolm Dove
Hydraulic Eng.

CF (3 Encls):
CEMVN-ED-GE (Mr. Joseph Chryssoverges)

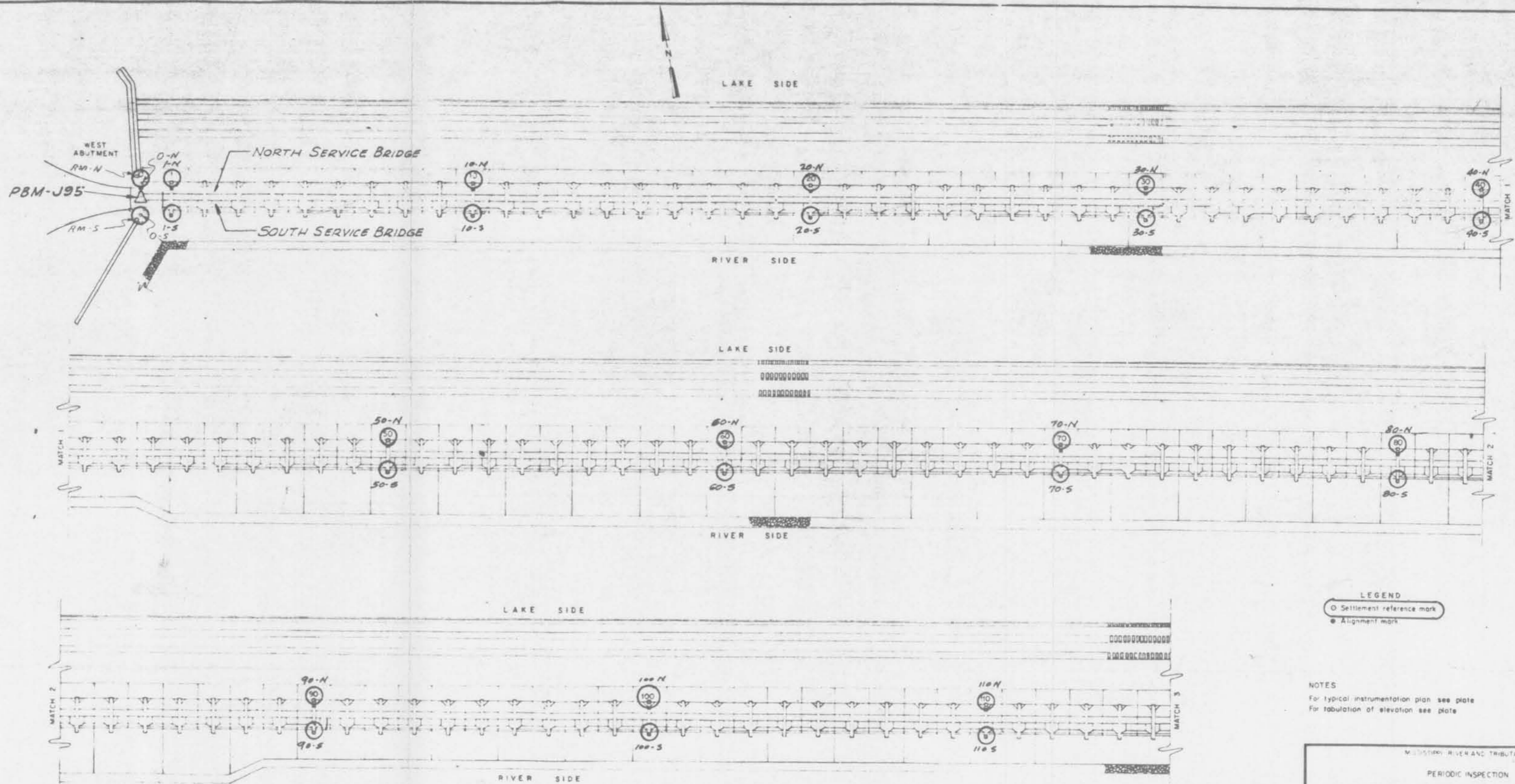
APPENDIX B

INDEX OF INSTRUMENTATION DRAWINGS

<u>NO.</u>	<u>TITLE</u>	<u>FILE NO.</u>
1A	Location Map	None
BCR-1	Location of Reference Marks (Sheet 1 of 3)	H-4-25739
BCR-2	Location of Reference Marks (Sheet 2 of 3)	H-4-25739
BCR-3	Location of Reference Marks (Sheet 3 of 3)	H-4-25739
BCR-4	Elevations and Details	H-4-25739
5	Settlement Reference Marks (Tabulation of Elevations)	None
6	Plumb Bob Survey	None



MISSISSIPPI RIVER AND TRIBUTARIES
 PERIODIC INSPECTION
**BONNET CARRE SPILLWAY
 LOCATION MAP**
 U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 FILE NO.



LEGEND
 ○ Settlement reference mark
 ● Alignment mark

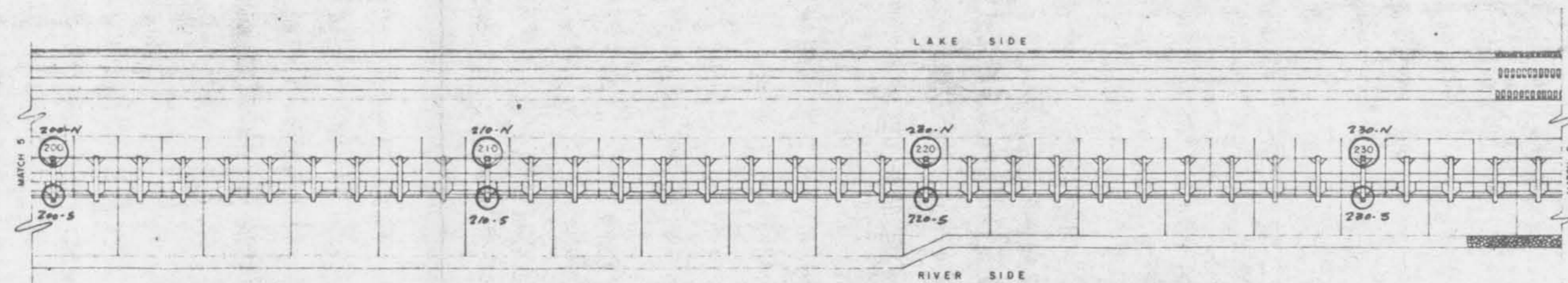
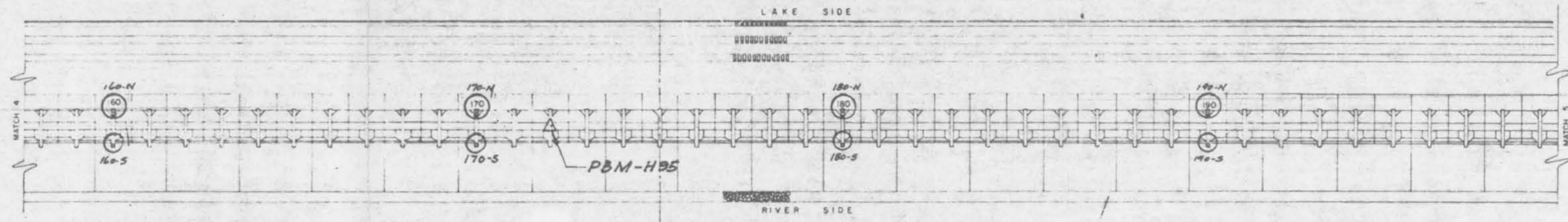
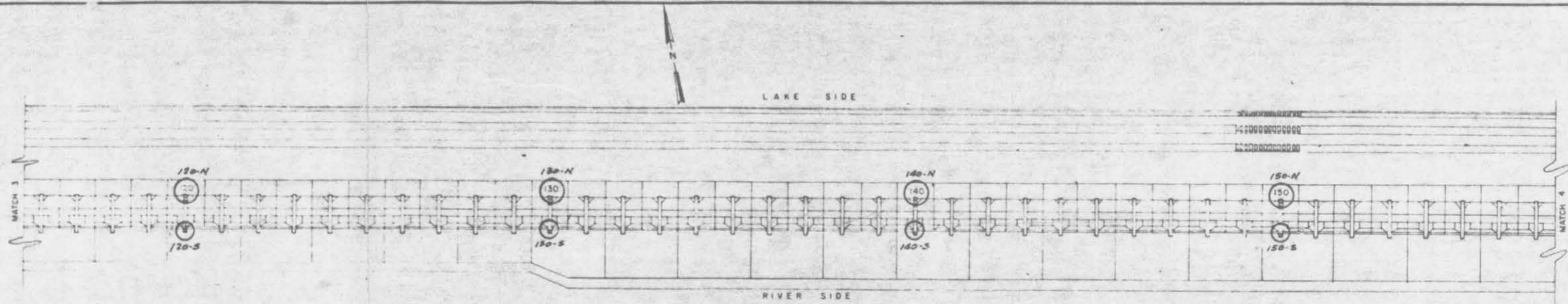
NOTES
 For typical instrumentation plan see plate
 For tabulation of elevation see plate

MISSISSIPPI RIVER AND TRIBUTARIES
 PERIODIC INSPECTION
**BONNET CARRE SPILLWAY
 PLAN
 LOCATION OF REFERENCE MARKS**
 U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS

SHEET 1 OF 3

FILE NO H-4-25739

PLATE BCR-1



LEGEND
 ○ Settlement reference mark
 ● Alignment mark

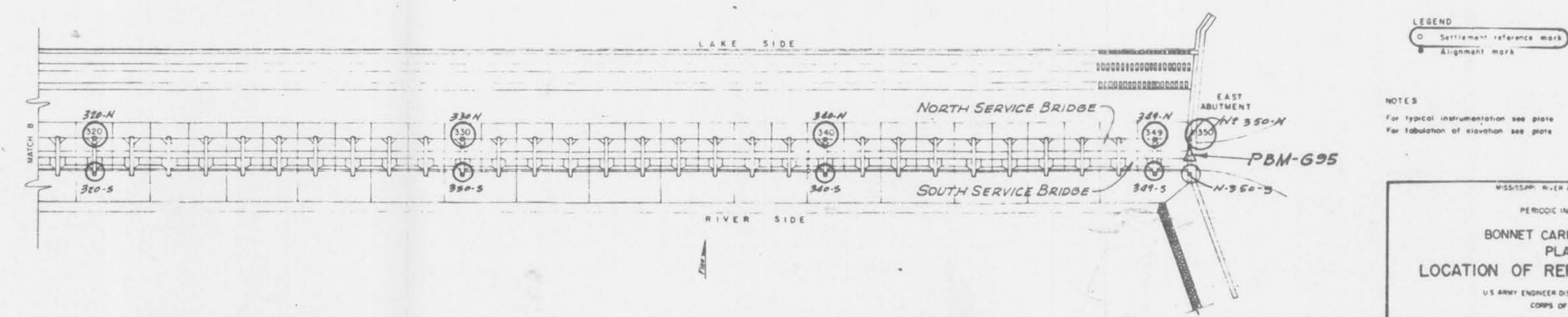
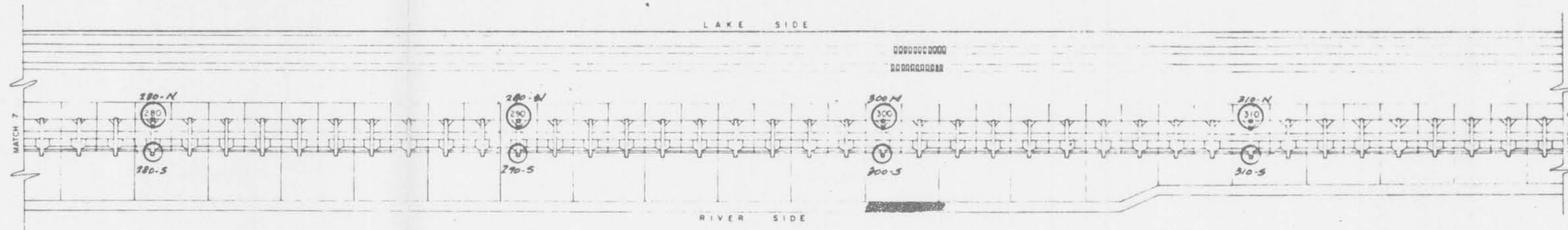
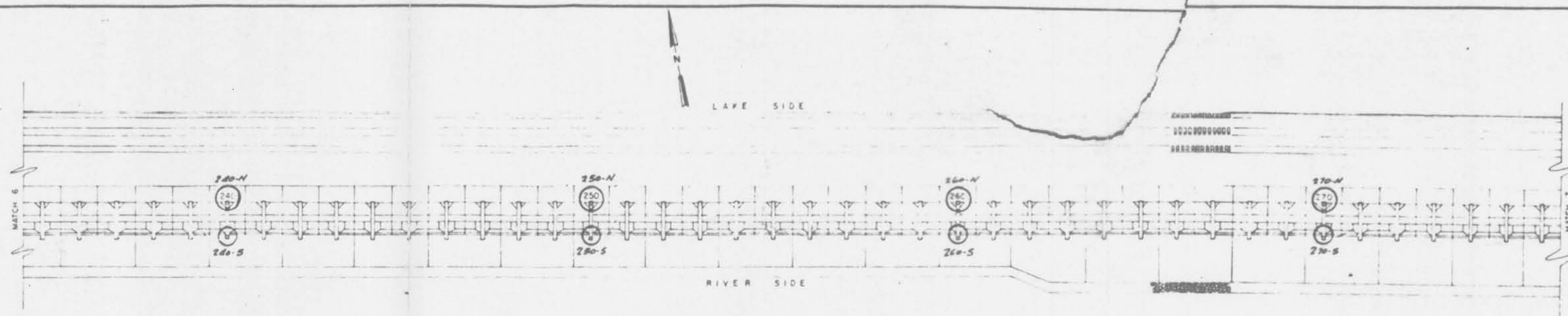
NOTES
 For typical instrumentation plan see plate
 For tabulation of elevation see plate

MISSISSIPPI RIVER AND TRIBUTARIES
 PERIODIC INSPECTION
**BONNET CARRE SPILLWAY
 PLAN**
LOCATION OF REFERENCE MARKS
 U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS

SHEET 2 OF 3

FILE NO. H-4-25739

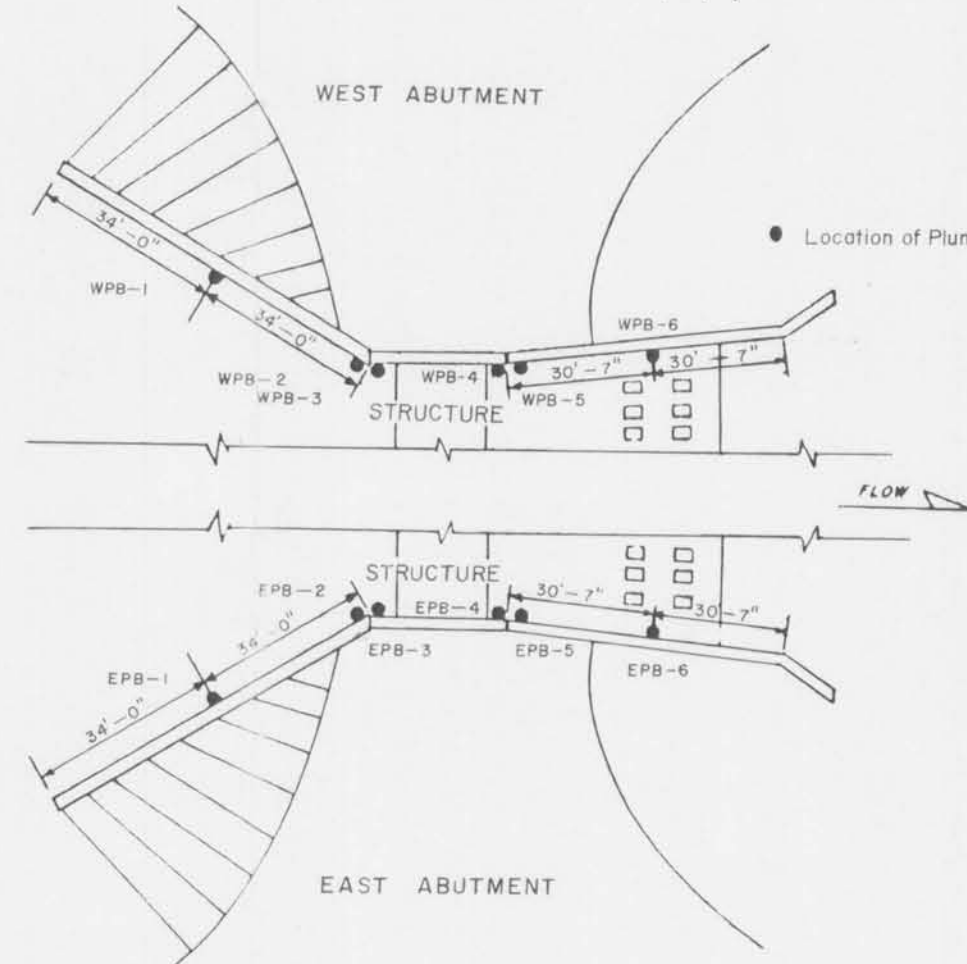
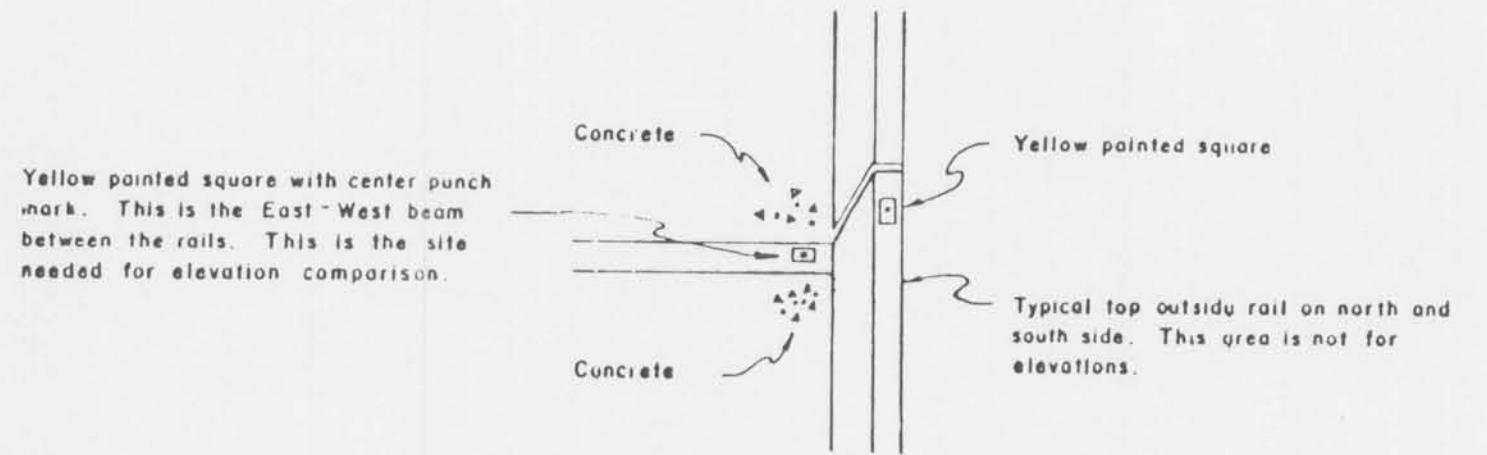
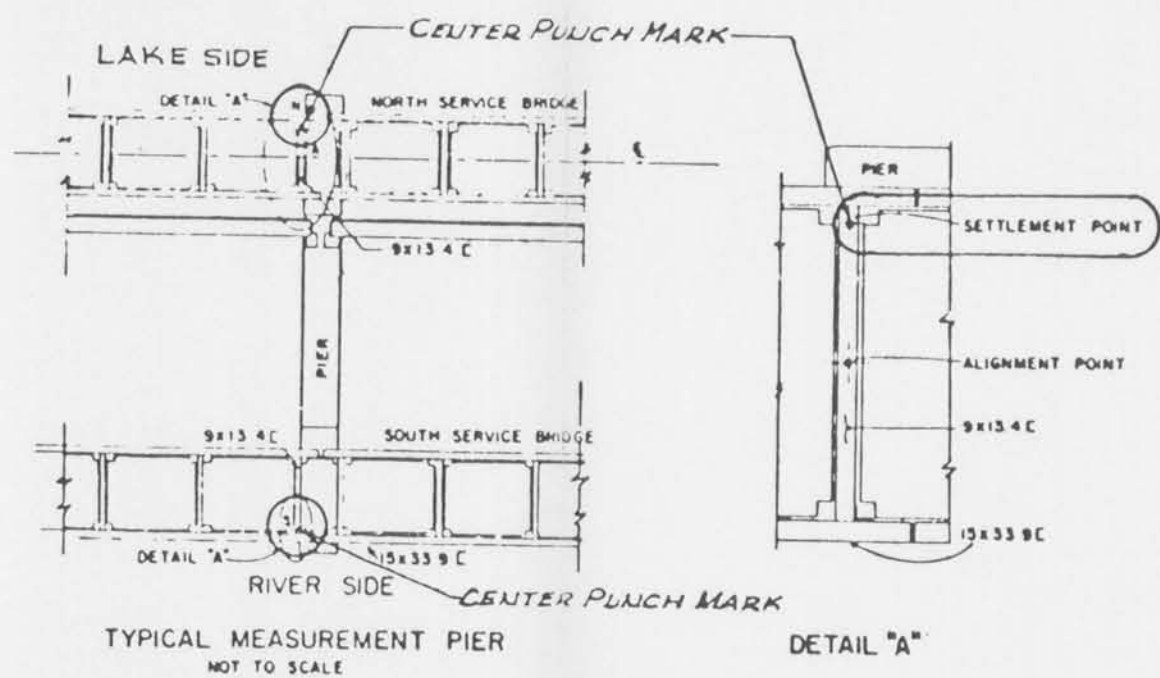
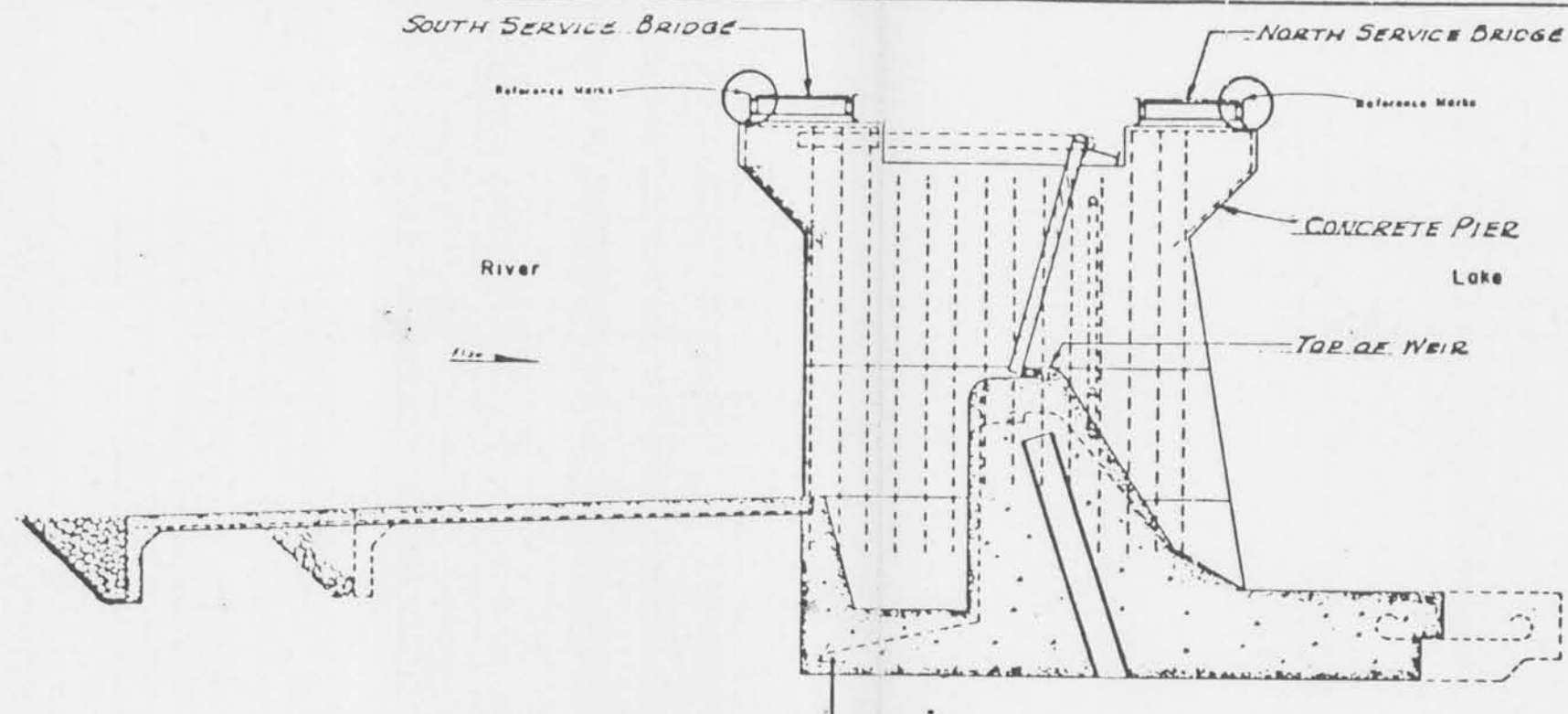
PLATE BCR-2



LEGEND
 ○ Settlement reference mark
 ● Alignment mark

NOTES
 For typical instrumentation see plate
 For tabulation of elevation see plate

MISSISSIPPI RIVER AND TRIBUTARIES
 PERIODIC INSPECTION
**BONNET CARRE SPILLWAY
 PLAN**
LOCATION OF REFERENCE MARKS
 U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 SHEET 3 OF 3 FILE NO. 4-25735



NOTE:
Plumb Bob Surveys WPB-4, WPB-5, WPB-6, EPB-4, EPB-5 and EPB-6 were taken over water.

PLUMB BOB SURVEY
NOT TO SCALE

MISSISSIPPI RIVER AND TRIBUTARIES

PERIODIC INSPECTION

BONNET CARRÉ SPILLWAY

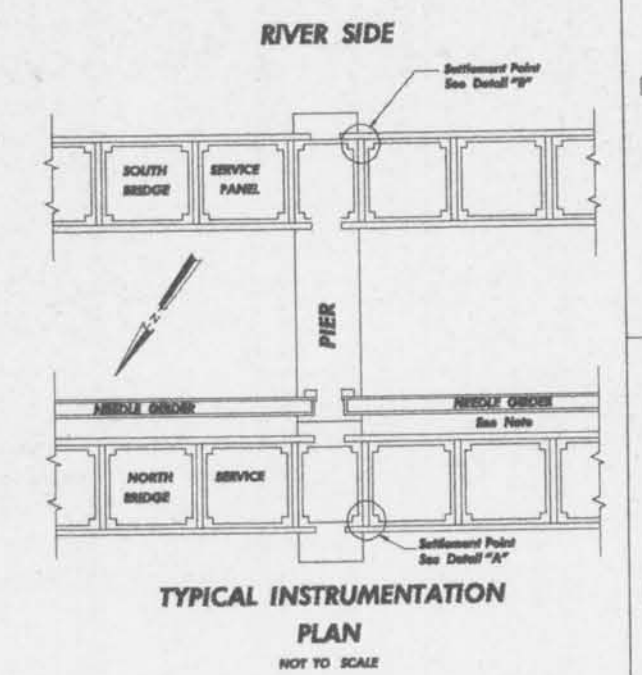
U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS

CORPS OF ENGINEERS

FILE NO. H-4-25739

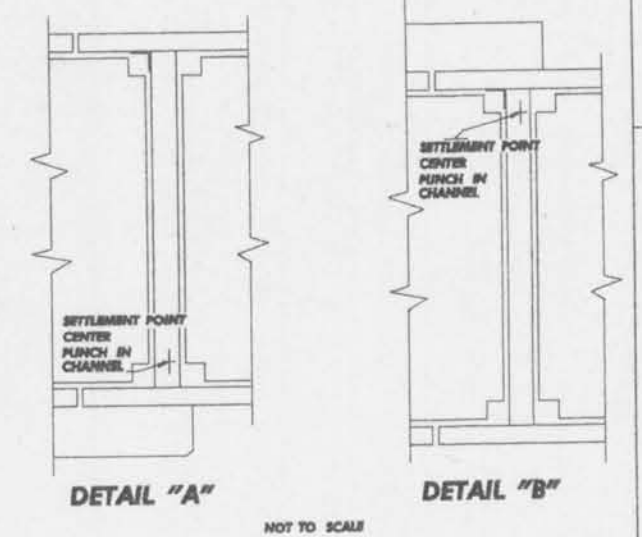
SETTLEMENT REFERENCE MARKS - ELEVATIONS IN FEET-N.G.V.D

Table with columns for NO. OF REFERENCE MARK, DATE ADJUSTED, ADJUSTED ELEVATIONS, and a grid of elevations for various marks (0-N to 170-S) across different observation dates from 1978 to 1998.



SETTLEMENT REFERENCE MARKS - ELEVATIONS IN FEET-N.G.V.D

Table with columns for NO. OF REFERENCE MARK, DATE ADJUSTED, ADJUSTED ELEVATIONS, and a grid of elevations for various marks (180-N to 350-S) across different observation dates from 1978 to 1998.



Notes: Original elevations adjusted +0.089 due to 1976-1977 EPOCH adjustment for PBM T-188. The service bridge spans are numbered from 1 to 350 starting from the west abutment.

MISSISSIPPI RIVER AND TRIBUTARIES PERIODIC INSPECTION BONNET CARRE SPILLWAY SETTLEMENT REFERENCE MARKS TABULATION OF ELEVATIONS

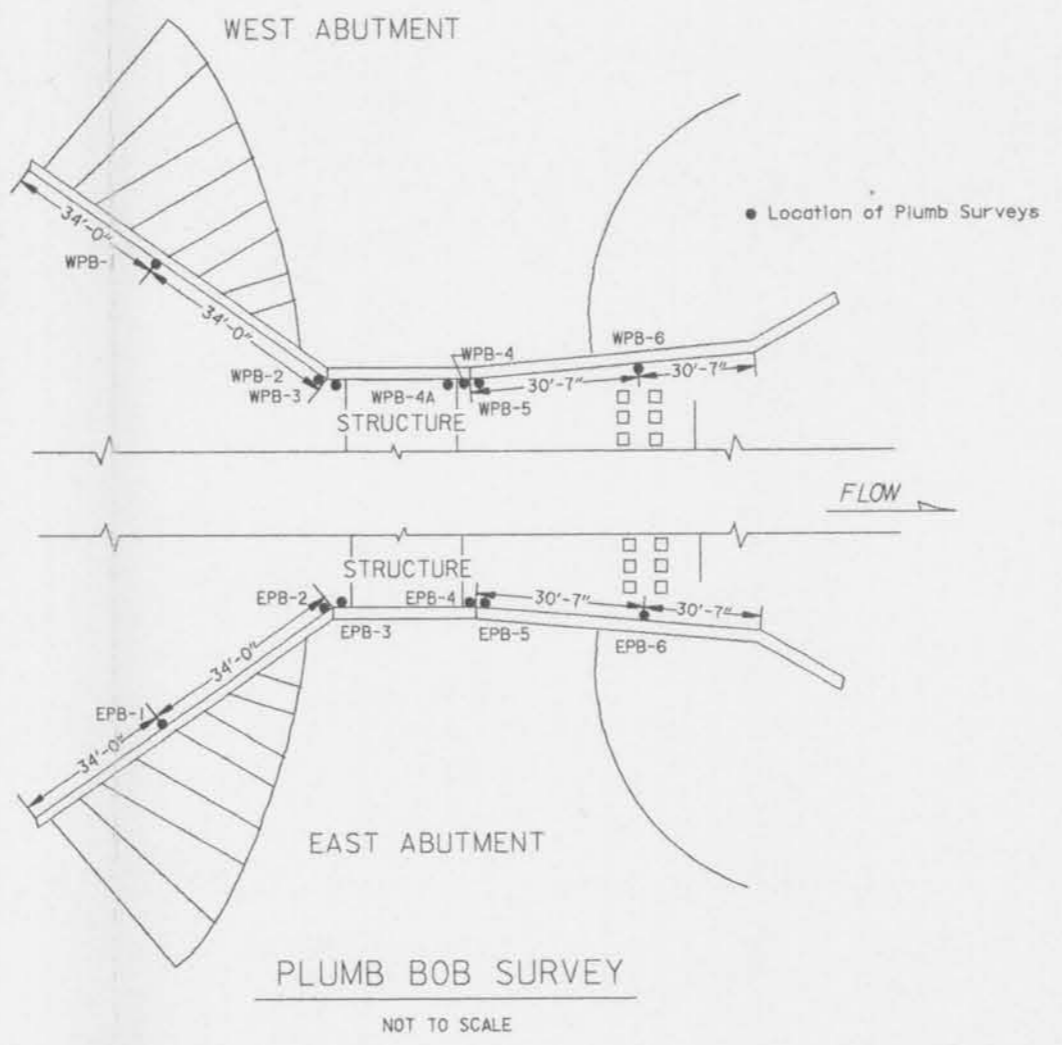


U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS CORPS OF ENGINEERS NEW ORLEANS, LOUISIANA

PLUMB BOB SURVEY - DISTANCE IN INCHES

NO. OF REFERENCE MARK	EPB-1	EPB-2	EPB-3	EPB-4	EPB-5	EPB-6	WPB-1	WPB-2	WPB-3	WPB-4	WPB-4A	WPB-5	WPB-6	RIVER GAGE	TEMP.
INITIAL DATE	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89	11-20-89		
INITIAL READING	+0.563	+1.500	+1.750	+2.625	+2.625	+1.125	-0.125	+0.125	+0.250	-0.813	+0.563	-0	+0.250		
DATE OF OBSERVATION	29 OCTOBER 1990	+0.500	+1.500	+1.563	+3.000	+2.875	+1.375	-0.125	-0.563	+0.375	-0.563	+0.500	+0.125	+0.250	
	05 DECEMBER 1991	**	**	**	**	**	**	**	**	**	**	**	**	**	
	08 DECEMBER 1992	**	**	**	**	**	**	**	**	**	**	**	**	**	
	20 NOVEMBER 1993	+1.31	+2.063	+2.375	+3.25	+2.938	+1.43	+0.625	+0.562	+0.437	-0.625	*	+0.125	+0.375	6.9 72°
	04 FEBRUARY 1998	**	**	**	**	**	**	**	**	**	**	**	**	**	14.7 55°

NOTE:
 (+) Top of wall moving out away from the structure.
 (-) Top of wall moving in toward the structure



Note:
 Original elevations adjusted +0.089 due to 1976-1977 EPOCH adjustment for PBM T-188.
 The service bridge spans are numbered from 1 to 350 starting from the west abutment.
 The number appear on the web of the inboard channel of the North Bridge.
 * Not Surveyed
 ** Not Surveyed- Plumb Bob base set up marks covered with water/silt.
 *** Appear to be a survey error.

MISSISSIPPI RIVER AND TRIBUTARIES
 PERIODIC INSPECTION
 BONNET CARRE SPILLWAY
 PLUMB BOB SURVEY

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
 CORPS OF ENGINEERS
 NEW ORLEANS, LOUISIANA

APPENDIX C

BONNET CARRÉ OPERATING STATISTICS

	<u>1937</u>	<u>1945</u>	<u>1950</u>	<u>1973</u>	<u>1975</u>
Date Opened	28 JAN	23 MAR	10 FEB	8 APR	14 APR
Stage* When Opened	14.2	18.5	19.98	18.3	17.83
Date Closed	16 MAR	18 MAY	19 MAR	21 JUN	26 APR
Stage* When Closed	18.1	19.0	18.4	15.3	16.1
# Bays Opened	285	350	350	350	225
Max. Discharge (cfs)	211,000	318,000	228,000	207,000	110,000
Avg. Discharge (cfs)	155,000	224,000	156,000	141,000	69,000
Max. Stage*	19.3 (28 Feb)	19.8 (1 May)	20.0 (10 Feb)		
Max. Lowering	1.7 ft	2.6 ft	2.0 ft		

	<u>1979</u>	<u>1983</u>	<u>1994</u>	<u>1997</u>
Date Opened	17 APR	20 MAY	16 MAY	17 MAR
Stage* When Opened	17.2	17.1		16.7
Date Closed	31 MAY	23 JUN	27 MAY	18 APR
Stage* When Closed	13.9	14.2		15.4
# Bays Opened	350	350	30	298
Max. Discharge (cfs)	228,000	268,000	11,300	243,000
Avg. Discharge (cfs)	134,000	196,000	9,650	154,000
Max. Stage				
Max. Lowering				

* at Carrollton Gage

Deposition In Floodway

<u>YEAR</u>	<u>Weir to Airline Hwy</u>	<u>Airline Hwy to ICRR</u>
1937	7,200,000 cy	3,000,000 cy
1945	5,000,000 cy	7,500,000 cy
1950	2,800,000 cy	2,200,000 cy
1973		
1975	1,200,000 cy	
1979		
1983		
1994		

APPENDIX D

HISTORICAL PROBLEMS & DEFICIENCIES

<u>DATE</u>	<u>DESCRIPTION</u>
APRIL 1938	The report " Bonnet Carré Spillway - Constructed by Corps of Engineers" documents the 1937 operation of the structure. Over 5 million cy of material (rough estimate) was deposited between the structure and Airline Highway. Excessive settlement and subsidence was noted on the guide levees.
OCT 1954	The report "Bonnet Carré Spillway - Maintenance of Design Capacity" documents the inefficiencies of the floodway which prevent the achievement of design discharge. The major problem was determined to be sediment control and removal. Flooding of the forebay area during high water periods cause significant deposition of material. Dredging of the forebay during operation was not a solution since more sediments would enter the floodway (happened in 1950). Economical solution was to constructed a levee to a grade just above project flow line in the forebay. The upstream end tied into the existing spur levee while the downstream end terminated above the connecting channel. The connecting channel provided access for a floating plant and a pathway for initial flooding and then draining of the forebay area. The floodway has extensive silting between the structure and Airline Highway. Remedial action is required after the next spillway opening.
16 MAY 1968	The following was noted during Periodic Inspection No. 1: (1) No instrumentation devices are on the structure, (2) Steel hardware rusting, (3) needle retainer crossbar at bay 193 was loose, (4) siltation of forebay, (5) two concrete panels missing from service bridge, (6) one panel broken and (7) bushes growing on structure.
1 NOV 1973	The following was noted during Periodic Inspection No. 2: (1) Elongated vertical spalled area at expansion joint in west abutment between the structure and the lakeside wingwall, (2) Spalling and cracking of the edge of vertical construction joints in weir openings for the even numbered bays (compression movements). Corresponding tension

cracks were noted in the odd numbered bays, (3) 1/8-inch crack extending from across the top of the pier at the needle girder support pad down both sides of the pier to stop at the pier-weir intersection [piers 88-89, 92-93, 106-107, and 154-155], (4) Rusted needle girder support pads and deteriorated anchor bolts [piers 154-155, 165-166, 177-178, 183-184, 206-207, 216-217, 266-267, 320-329, 330-331 and 348-349], (5) Separated expansion joint between west abutment and riverside wingwall - had existed for long period of time, (6) Cracks in stilling basin along the lakeward most line of baffle blocks that ranged in size from hairline to 1/8-inch, (7) Siltation of forebay and (8) Deterioration of cranes - spare parts no longer available.

12 DEC 1978

The following was noted during Periodic Inspection No. 3: (1) Items 1 thru 5 from PI No. 2 were again observed with no apparent worsening of the structure, (2) Concrete pad missing on lakeside walkway between bays 186 & 187, (3) Piers 286-287 & 303-304 have a small spalled area at the top of the weir with exposed reinforcement, (4) Anchor bolt missing for needle girder support pad at pier 348-349 and (8) tilted staff gages in the forebay.

MAY-JUN 1983

During the operation of the spillway, minor seepage was noted along: (1) the Upper Guide Levee near station 135+00, between stations 277+00 and 308+00 and the levee that parallels ICRR near the lake and (2) the Lower Guide Levee between stations 229+00 and 267+00. Also, three small sand boils were observed around the base of a tree near station 267+00.

2 AUG 1984

The following was noted during Periodic Inspection No. 4: (1) Numerous walkway panels have cracks, corners missing & exposed reinforcement - see enclosed summary chart, (2) Minor damage to the edges of some baffle blocks between bays 152 & 223, (3) Cracks in top of piers 40-41 & 29-30, (4) Large spalls at construction joint in weir located at bays 24 & 26, (5) Small spalls & cracks in weir at bays 10, 30, 50, 60, 156, 158, 162, 204, 342 & 350, (6) One-inch inward movement (visual observation) of riverside wingwall on west abutment, (7) West abutment -- 1/2 to one-inch inward movement (visual observation) of the lakeside wingwall on west abutment -- continued monitoring of triangular-shaped spalling area on the lakeside end of abutment -- additional triangular crack on lakeside wingwall 30 feet

from abutment -- see enclosed table of cracks, (8) East abutment -- one-inch settlement from data & visual deflection of tracks over bay 350 and abutment was noted, (9) Corrosion observed on the bearing pads under most of the needle support girder hinges and on the top portion of the rails, (10) Cranes showed significant deterioration and weathering, (11) Staff gages were in need of resetting & cleaning and (12) Numerous piers had spalling of the construction joint located at the weir elevation.

30 AUG 1989

The following was noted during Periodic Inspection No. 5: (1) Extensive cracks at the construction joint of the weir at bays 22, 34, 38, 40, 45, 48, 56, 70, 78, 84, 226, 230, 236, 238, 248, 252, 260, 262, 280 & 347, (2) Spalling of concrete has exposed the copper waterstop in the construction joint of the weir at bays 10, 16, 20, 22, 24, 26, 32, 34, 36, 50, 56, 60, 68, 92, 156, 158, 176, 254, 334, & 342, (3) Continued monitoring of cracks originating in top of piers 40-41 & 29-30, (4) Deep crack on west abutment beginning on north side of the riverside bridge and terminating at the south wingwall-abutment joint 10 feet from abutment top, (5) Continued monitoring of cracks in wingwalls, (6) Continued monitoring of triangular-shaped spalling area on the lakeside end of west abutment, (7) West abutment -- it's tilted $\frac{1}{4}$ to $\frac{1}{2}$ inch westward (plumb bob) & settling toward the lake -- riverside wingwall tilted $\frac{1}{4}$ inch eastward (plumb bob), (8) East abutment -- settling toward the river - wingwalls & abutment are plumb, (9) Numerous walkway panels have cracks and spalls - similar quantity to previous inspection, (10) Bridge stringers & diaphragms between them -- pitting and scaling where paint is missing -- corrosion under paint bubbles, (11) Siltation of forebay -- ground elevation varies between weir high and 3 feet below weir height, (12) Tops of numerous needles have rotted due to a lack of capping material, (13) Cranes -- some rail clamps were missing -- diamond tread plates on trolleys were loose or missing -- gaps > 2" between rails -- operator could not observe needle latching and unlatching operation, (14) Staff gages need resetting and painting and (15) Small trees and brushes upstream of weirs and adjacent to end sill.

30 AUG 1994

The following was noted during Periodic Inspection No. 6: (1) Shallow/wide cracks & spalling at the construction joint on the riverside of the weir at bays 10, 26, 36, 38, 156, 226,

230, 232, 236, 238, 246, 252, 322 & 328, (2) Recently repaired cracks -- some patches showed signs of excess mixing water -- several were laminated -- patches placed at construction joint in even numbered bays (expansion joints - copper waterstop) were placed improperly, not gap for expansion, (3) Cracks & spalling at the construction joint on the lakeside of the weir at bays 3, 6, 12, 16, 24, 33, 34, 36, 38, 40, 50, 85, 92, 93, 116, 202, 231, 244, 254, 265, 266, 280, 282, 284, 285, 288, 289, 294, 304, 307, 308 & 316, (4) Vertical cracks between the bridges that extend downward toward the top of the weir & originated at top of piers 14-15, 20-21, 24-25, 28-29, 30-31, 31-32, 40-41, 41-42, 44-45, 55-56, 66-67, 149-150, 155-156, 156-157, 237-238, 262-263 & 268-269, (5) Cracks originating on the riverside edge 3 feet above the ground and extending on a declining angle of 45° at piers 24-25, 28-29 and 44-45, (6) Continued monitoring of triangular-shaped spalling area on the lakeside end of west abutment - concern about material falling, (7) Continued monitoring of arched crack under riverside bridge on west abutment, (8) Active tilting movement of abutments -- open joint between riverside wingwall and west abutment, (9) Pier 303-304 has a small spalled area at the top of the weir with exposed reinforcement, (10) Bridge stringers, diaphragms between stringers, needle support girders & channel stringers -- pitting and scaling where paint is missing -- corrosion under paint bubbles, (11) Cranes -- some rail clamps were - - gaps > 2" on rails between bays 245 & 246 and 246 & 247, (12) Observation tower in deteriorated condition, (13) Walkway panels R30b, L40d, L50e, L92d, L166b, L258b, L259e & L315c are safety hazard, (14) Tops of numerous needles have rotted due to a lack of capping material, (15) Continued settlement of east side of the structure, (16) Leaching rust spots on pier 194-195 and (17) Several staff gages were missing while others needed to be cleaned and repaired.

APPENDIX E

HISTORICAL REPAIRS/CONSTRUCTION WORK

<u>DATE</u>	<u>DESCRIPTION</u>
CY 1937-38	Several factors performed for maintenance and improvement of flow conditions: (1) Floodway area riverside of Airline Highway was grubbed and converted to pasture land, (2) Floodway area lakeside of Airline Highway had a mile wide strip "French" cleared, (3) Raised guide levees - had excessive settlement and subsidence, inadequate freeboard & thru levee seepage and (4) Placement of 2,650 foot spoil bank & excavation of diagonal diversion canal from borrow pit to lake - scour of upper guide levee between Illinois Central railroad and the lakeshore.
APR 1940	Construction of a 6,000 foot long levee with a crown at El. 24 MSL across the forebay to prevent overflow and reduce forebay silting.
CY 1945	Degraded the forebay levee prior to 1945 high water.
FEB-MAR 1950	Dredging of the forebay to EL. 2 MSL during spillway operation to increase flow capacity. Falling river stages required termination of dredging activities with only 1.5 million cy excavated (<50%).
CY 1951	Dredging of the forebay was completed during the high water period of 1951. Approximately 2 million cy of material were removed.
CY 1951-54	The following was performed: (1) Degrading of a 5,000 foot section of the old Lakeshore-Hammond Highway embankment and (2) Complete clearing of a 1/2 mile center strip of the 1 mile strip that was "French" cleared in 1938.
Late 1950's	Construction of levee in forebay.
1960's	Removal of sediment deposits in floodway is being accomplished by permitting contractors to haul off the material at no cost.

FY 1971	Restored sedimentation levee in forebay, dredging not done due to low river stages.
JUL 1971	Settlement and alinement markers were installed on the structure.
Early 1970's (Prior PI #2)	The following was performed: (1) Replaced concrete panels, (2) Cleaned & repainted steel hardware, (3) Repaired crossbar at bay 193 and (4) Removed bushes growing on structure.
Early 1973	Removal of the siltation levee (Elevation not specified) and a large portion of silt deposits in the forebay prior to the 1973 spillway opening.
JAN-MAR 1974	Dredging of the forebay to elevations varying between 5 & 7 feet N.G.V.D. was accomplished by three contract cutterhead dredges. Approximately 1.6 million cy was removed from the forebay.
CY 1974	Contract DACW29-75-C-0011 - purchase of two new model HC-48A cranes with a custom design gantry.
MAR-MAY 1975	Dredging of forebay was accomplished by two contract cutterhead dredges. Dredging was suspended from 13 April to 30 April due to spillway opening. Approximately ¾ million cy was removed from the forebay.
Mid 1970's (Prior PI #3)	Repaired needle girder support pads & anchor bolts.
Prior 1975	Approximately 1,400 needles had been replaced with new needles that are much lighter in weight than the original needles. These new needles tended to float when placed in flowing water during the closure operation in April 1975.
JUN 1975	Commercial sand haulers received permits to remove sediment deposits in the forebay. Sedimentation levee was not rebuilt to grade.
CY 1979	Swiss Craft Professional Painters cleaned and repainted the entire steel portions of the weir structure.
CY 1980	Target Industrial, Inc. repaired piers 153-154, 154-155, 155-156, 156-157 & 160-161, constructed four new service

	bridge sections, installed six service bridge sections & painted 18 service bridge spans.
Early 1980's PI #4)	The following was performed: (1) Replaced missing (Prior concrete panel, (2) Repaired spalled areas on piers 286-287 & 303-304 with epoxy cement and (3) Reset & recalibrate the tilted gages in the forebay.
CY 1985	Spalls at construction joint of weir in bays 24 & 26 were patched.
Mid to Late 1980's (Prior PI #5)	The following was performed: (1) Replaced walkway panels 30b, 40d, 50e, 166b & 315c, (2) Both cranes cleaned & repainted, (3) Repainted top portion of crane rails, (4) Staff gages cleaned, repainted & reset and (5) Concrete patch work at the construction joint on the riverside of the weir at bays 10, 16, 20, 22, 24, 26, 30, 32, 34, 36, 38, 40, 42, 45, 50, 54, 56, 60, 68, 70, 72, 78, 80, 81, 84, 86, 92, 118, 120, 124, 130, 136, 138, 149, 150, 151, 154, 194, 204, 334, 340, 342, 348 & 350.
NOV 1989	Plumb bob apparatus installed. ???
Early 1990's (Prior PI #6)	The following was performed: (1) Gantry crane clamps replaced, (2) Diamond tread plates on crane trolley repaired, (3) Bought 80 Bongossi wood needles – only installed 20 for evaluation - existing good needles replaced some rotten needles throughout the structure, (4) Staff gages painted and stabilized, (5) New mirror installed on gantry crane and (6) Trees and bushes removed.
CY 1997	Installed new needle keeper beams.

APPENDIX F

MARINE ACCIDENTS/INCIDENTS

<u>DATE</u>	<u>DESCRIPTION</u>
24 APR 1979	M/V BIG JOE (owner Paul W. Towing Co.) was headed upstream with four loaded barges. The tow broke up and two barges tied abreast struck the structure at pier 160-161. On 6 Mat 1979 while the owners were attempting to complete the removal of the last barge, it got out of control further damaging the structure.
10 JUN 1983	Towboat "Christie Badeaux" was pushing three barges and developed fuel flow problems while off the entrance to the spillway. The "Bienville" and another towboat combined efforts and pushed the "Christie Badeaux" with tow to shore upstream of the spillway thus averting costly damage to the structure.
13 JUN 1983	Fishing boat in Mississippi River capsized immediately upstream of the spillway. The boat was grounded off a peninsula of land extending from the riverbank and the two boaters were on the shore. Coast Guard helicopter and rescue boat were sent to the site. The structure's railcar with crew was dispatched to the upstream end of the structure with rope and safety gear. Only several pieces of boating gear passed through the structure.

APPENDIX G

PEDSTRIAN/CRANE BRIDGE INSPECTION REPORT

CEMVD-ET-ES (CEMVN-ED-GE/10 Dec 99) (1105-2-10c) 1st End
Mr. Johnson/cr/601-634-5935
SUBJECT: Bonnet Carre' Spillway Structure Pedestrian/Crane
Bridge Report

CDR, Mississippi Valley Division, Vicksburg, MS 39181-0080
18 January 2000

FOR Commander, New Orleans District, ATTN: CEMVN-ED-GE

1. Reference ER 1110-2-111, Periodic Safety Inspection and Continuing Evaluation of USACE Bridges, 30 April 1997.
2. The inspection report for the subject bridge is approved.
3. Based on the findings in the inspection report, and in accordance, with paragraph 7 of the referenced ER, your request in paragraph 3 of the basic memorandum for authority to increase the inspection interval for the subject bridge to five years, is granted.
4. The Statement of Inspection Review and Approval has been certified, and has been inserted as the first page in a copy of the report as required by paragraph b of Appendix E to the referenced ER, and is returned for your records.
5. It is noted in paragraph 2 of the basic memorandum that technical review was separated out of the bridge report as enclosures 2 and 3. In the future, technical review should be included as part of the bridge report and not submitted as separate enclosures. Additionally, four copies of the bridge report should be furnished to this office for approval and the basic memorandum should indicate to this effect.

FOR THE COMMANDER:

3 Encls
wd 3 cys of encls 1-3


JOSEPH R. MCCORMICK, JR., P.E.
Acting Chief, Engineering Division

CF (w/encls 1-3):
CECW-ET Mr. Paul Tan



DEPARTMENT OF THE ARMY

NEW ORLEANS DISTRICT CORPS OF ENGINEERS

P.O. BOX 60267

NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF:

CEMVN-ED-GE

10 December 1999

MEMORANDUM FOR Commander, Mississippi Valley Division,
ATTN: CEMVD-ET-ES

SUBJECT: Bonnet Carre' Spillway Structure Pedestrian/Crane Bridge Report.

1. Subject report is submitted for you information and concurrence (Encl. 1).
2. The Technical Review was conducted as outlined in Enclosures 2 and 3.
3. In compliance with ER-1110-2-111, dated 30 April 1997, paragraph 5c of the ER, we are requesting authority for an increase inspection interval to five years. The pedestrian/crane bridges are in good condition, structurally sound, and safe for use.

FOR THE COMMANDER:

- 3 Encl. (3/1/99)
1. Bridge Inspection Report
 2. Quality Control Plan
 3. Design/Review Activities

Robert J. Fairless, P.E.
for GERARD S. SATTERLEE, JR., P.E.
Chief, Engineering Division

STATEMENT OF INSPECTION REVIEW AND APPROVAL

PART 1: TO BE COMPLETED BY THE DISTRICT OR OPERATING MSC

COMPLETION OF INSPECTION AND EVALUATION

The inspection and evaluation of the **Bonnet Carre' Spillway Structure Pedestrian/ Crane Bridges** have been completed by a qualified inspection team according to the NBIS. The inspection report received an independent technical review by a qualified bridge engineer and all substantive issues arising during the review have been resolved to meet the provisions of PL 100-17 and existing USACE policy.

Paul J. Salassi
Pedestrian/Crane Bridge Inspection Team Leader

9/21/99
Date

Walter Barry Jr
Technical Review Team Leader

12-11-99
Date

Robert J Furlen
for Chief, Engineering Division

12/11/99
Date

PART 2: TO BE COMPLETED BY MSC

CERTIFICATION OF QUALITY ASSURANCE AND APPROVAL

The inspection, evaluation and review of the **Bonnet Carre' Spillway Structure Pedestrian/Crane Bridges** have been completed in accordance with the approved Quality Control Plan, and this report is approved as sufficient in accordance with ER 1110-2-111 for updating the data in the CEBIS, and for proceeding to budget, schedule and design all maintenance rehabilitation work necessary to correct deficiencies which jeopardize the structural safety and integrity of the **Bonnet Carre, Spillway Structure Pedestrian/ Crane Bridges**.

Jessie S. Paul
for Chief, Engineering Division
CEMVD-ED-E

1/21/00
Date

SIMPLIFIED PEDESTRIAN/CRANE BRIDGE INSPECTION REPORT
FOR

BONNET CARRE' SPILLWAY STRUCTURE

MISSISSIPPI RIVER AND TRIBUTARIES
9 SEPTEMBER 1999

U.S. ARMY ENGINEER DISTRICT

CORPS OF ENGINEERS

NEW ORLEANS, LOUISIANA

BONNET CARRE' SPILLWAY STRUCTURE

PEDESTRIAN/CRANE BRIDGES

EXECUTIVE SUMMARY

Mr. Paul Salassi (CEMVN-ED-GE) conducted a routine inspection of Bonnet Carre' Spillway Structure on September 9, 1999. It was a simple visual examination of all bridge components. Only two concrete walkway panels out of 3,496 require replacement at this time. Future inspections should monitor the concrete walkway panels noted in paragraph 4a and both abutment walls. The paint system for the bridge steel components is starting to show signs of deteriorating and repainting should be scheduled within the next 5 years. Steel channels beams, support stringers, lateral bracing and connections are structurally sound. Bearing seats are satisfactory and anchorage sufficient at all locations. The pedestrian/crane bridges are in good condition, and none of the deficiencies found compromise the integrity of the bridges.

BONNET CARRE' SPILLWAY STRUCTUE
PEDESTRIAN/CRANE BRIDGE

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BONNET CARRE' SPILLWAY STRUCTUE
PEDESTRIAN/CRANE BRIDGE

1. INTRODUCTION

a. Structure:

Bonnet Carre' Spillway Structure Pedestrian/Crane Bridges (CEWMVNLA-PED015A and CEWMVNLA-PED015B) are located 128 miles Above Head of Passes (AHP) on the left descending bank of the Mississippi River in St. Charles Parish, Louisiana. This is approximately 33 miles upstream of Canal Street in New Orleans. See plate no. 1 for location map.

b. Loads Carried:

The bridges serve as a walkway for project personnel as well as a craneway for the traveling cranes, and rail car used to transport personnel and equipment.

c. Weather:

The bridge was inspected in the morning of Thursday, September 9, 1999. The day was clear with temperatures around 90° F.

d. Inspection Team:

Mr. Paul Salassi from the New Orleans District (CEMVN-ED-GE) inspected the pedestrian/crane bridges. The inspector has completed the "Comprehensive Bridge Inspection Training" course taught by FHWA. See page V-1 of the report for the other periodic inspection team members.

2. DESCRIPTION AND HISTORY

There are 350 main bridge spans (distance between the supports of the channel beams), each measuring 22-feet long and a 20 feet clear span width (distance between support piers). The piers are 2-foot thick reinforced concrete, that carry the loading for two-channel beam and concrete operating bridges and furnish support for the upper end of the needle escape bars. The bridges serve as a craneway for the traveling cranes as well as a walkway for project personnel. In addition to the cranes, there is also an engine driven rail car used to transport personnel and equipment along the structure (see photo no. 1). The spillway structure and pedestrian/crane bridges were completed in 1931.

3. INSPECTION PROCEDURES

The inspector conducted a routine inspection of both bridges. The bridges were visually examined from the deck, abutments, and from beneath the bridge with the aid of binoculars to visually check the underside of the steel channels and concrete walkway panels. The lakeside apron had several inches of water due to recent rains and the underside of the lakeside bridge could only be observed from the end sill of the fore apron with the aid of binoculars. Any observed distresses were noted and photographed.

4. INSPECTION RESULTS

a. Deck: In general, the majority of concrete walkway panels were observed to have minor hairline cracks and were covered with mold and mildew; however, they are structurally in good condition (see photo no. 6). Several new panels were in place. Exposed rebars were noted on the underside of several riverside concrete walkway panels (see typical photo no. 2). Due to the standing water in the fore apron, the underside of the lakeside bridge could not be observed up close and exposed rebars probably exist also (see photo no. 3). The concrete walkway panels are identified with letters "L" and "R" stand for the lakeside and riverside walkways, respectfully. Also, the numeric portion identifies the gate bay the walkway panel is adjacent to while the small letters identify one of the five panels for the gate bay going from west to east. The large concrete panels are represented by "a" thru "d" while "e" represents the small concrete panel adjacent to the next higher numbered gate bay. Panel L171e had a medium size crack from one end to the other and had a solid sound (see photo no. 4). Panel L159e had a shoe size spall on each corner of one end and only about half of its bearing surface remaining (see photo no. 5). Panels L322d, L226c, L92d, R38b, R174b, R332a, R333a, and R338d have small areas of missing and/or cracked areas. Panel L40d is a new panel and rocks when walked on.

b. Superstructure: Over the superstructure is in good condition.

1) Channel Beams. Steel channels beams supporting the walkway concrete decks are simple spans and are, therefore, fracture critical. Each bridge has two channel beams which bear directly on ends of the structure piers. The channel beams are in good condition; however, the top portion of the channel beam (which the crane and engine

driven rail car ride) are beginning to show signs of rust (see photo no. 6). No damage or loss of material thickness attributed to the rust was noted.

2) Base Plate and Anchor Bolts. Anchor bolts fitted through slotted holes in the channel

beams prevent lateral movement. Base plates and anchor bolts are in good condition.

3) Channel Stringers, Channel Lateral Bracing and Connection Angles. The channels and connection angles appeared to be in good condition (see photo no. 7). However, on the underside of the riverside bridge areas of corrosion and peeling paint were noted on the stringers and lateral bracing as well as the connection angles between the two. Again, due to the standing water in the fore apron, the underside of the lakeside bridge could not be observed up close and these conditions probably exist also. Some stringers had small paint bubbles appearing on the top flanges and corrosion was present under the bubbles. No damage or loss of material thickness attributed to the corrosion was noted.

c. Substructure:

1) Concrete Piers. The concrete piers appear to be in good condition. Some fine and isolated cracking with efflorescence was visible running through the piers beginning approximately 3 feet above the ground line. Minor transverse cracks across the top of the piers 40, 41, and 42, noted during the last periodic inspection have been sealed with a silicon caulking compound. A medium size spall was noted on the riverside bridge bent of pier 319. The spall appeared to be old and no action is required at this time (see photo no. 8)

2) Abutments. Security fences and alarms have been installed on the west and east abutments.

a) West Abutment. The large spall, triangular in shape and approximately (1'x 1x 1'), that extends down from the top 10 feet that was noted during previous periodic inspections appeared to be the same. This spall is about 3 feet downstream of the lakeside bridge where span no. 1 channel beams rest on the abutment wall and should not affect the bridge (see photo no. 9). The joint between the riverside wingwall and the abutment has not been sealed. The deep and fine arched crack under the riverside bridge has not changed since the last periodic inspection (see photo no. 10).

b) East Abutment. The east abutment wall appears to be in good condition. However, approximately 1.5 inches of settlement has occurred between bays 280 and 350 during the past five years (1993 to 1998).

d. Instrumentation Devices: Reference markers have been installed on the structure for the purpose of checking differential settlement and possible tilt of the structure during high water periods. The reference markers are located along the top of the piers between the first two and last two bays, and every 10th monolith along the remainder of the structure. Plumb bob surveys monitor the horizontal movements of the abutments and wingwalls on both ends of the structure. Instrumentation devices on the bridges are in good condition.

5. CONCLUSIONS

The inspector did not see any deficiencies that compromise the integrity of the bridges. Most of the deficiencies observed are consistent with weathering and age. Overall, the riverside and lakeside bridges are structurally sound and safe for use.

6. RECOMMENDATIONS To insure continuation of safety, stability and operational capability of the pedestrian/crane bridges, the following remedial actions will be performed by Bonnet Carre' structure personnel:

- a. Concrete walkway panels L171e and L159e will be replaced as soon as possible.
- b. Concrete walkway panels L322d, L226c, L92d, R38b, R174b, R332a, R333a, and R338d that have small areas of missing and/or cracked areas will be monitored.
- c. The newly replaced concrete walkway panel L40d that rocks when walked on will be shimmed up.
- d. The paint system for the bridge steel components is starting to show signs of deteriorating and repainting should be scheduled within the next 5 years.
- e. Both abutments will continue to be monitored. The large spall on the west abutment wall does not affect the stability of the lakeside bridge. However, repairs will be made to west abutment wall by reducing the load behind the abutment and wingwalls, and repairing the concrete (see proposed remedial actions in section VI of periodic inspection report for repair details).

APPENDIX I

Photographs 1 thru 10



PHOTO 1 – Spillway looking west.

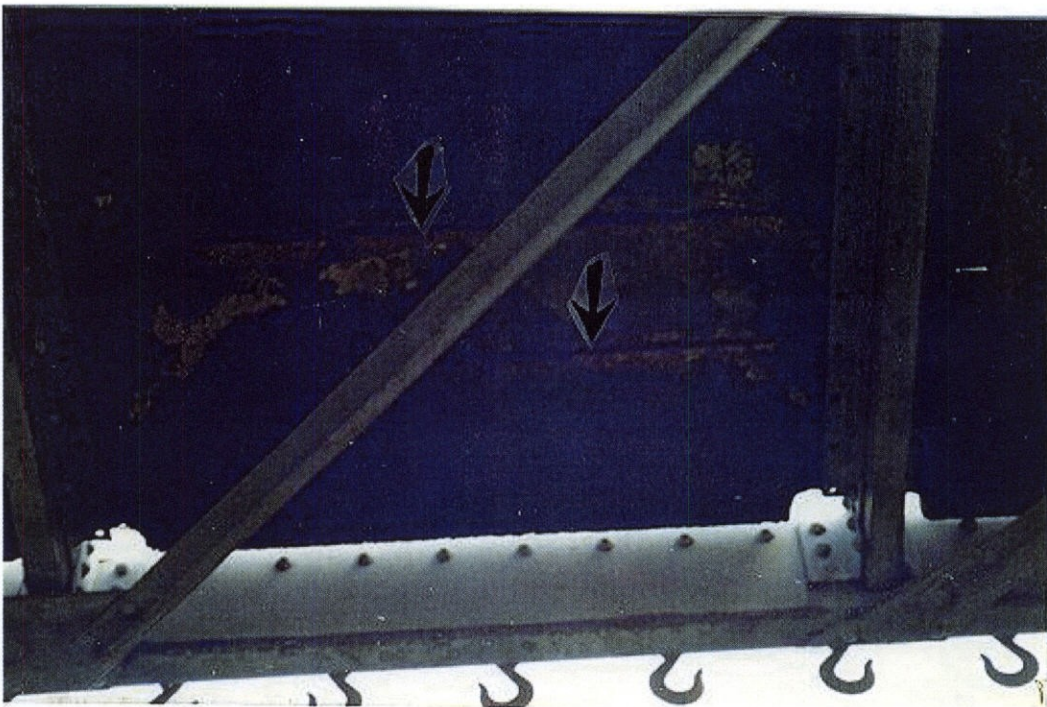


PHOTO 2 – Typical close up of underside of river end concrete walkway panels (note exposed rebars).



PHOTO 3 – Downstream side of spillway at edge of end sill and fore apron – looking west.

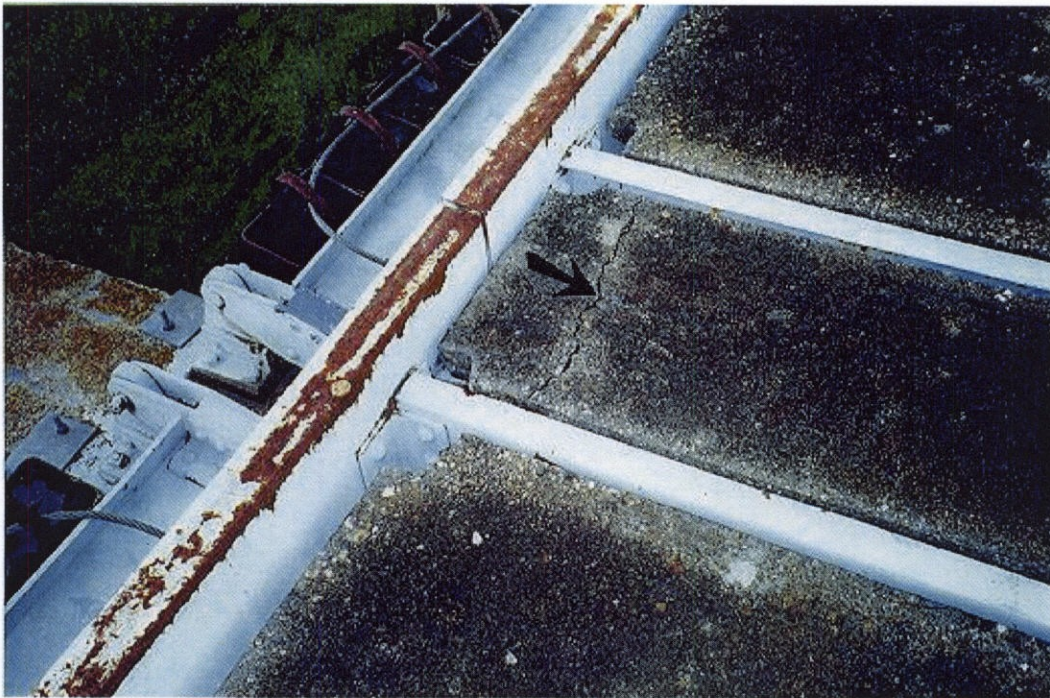


PHOTO 4 - Panel L171e (note medium size crack from one end to the other of panel).

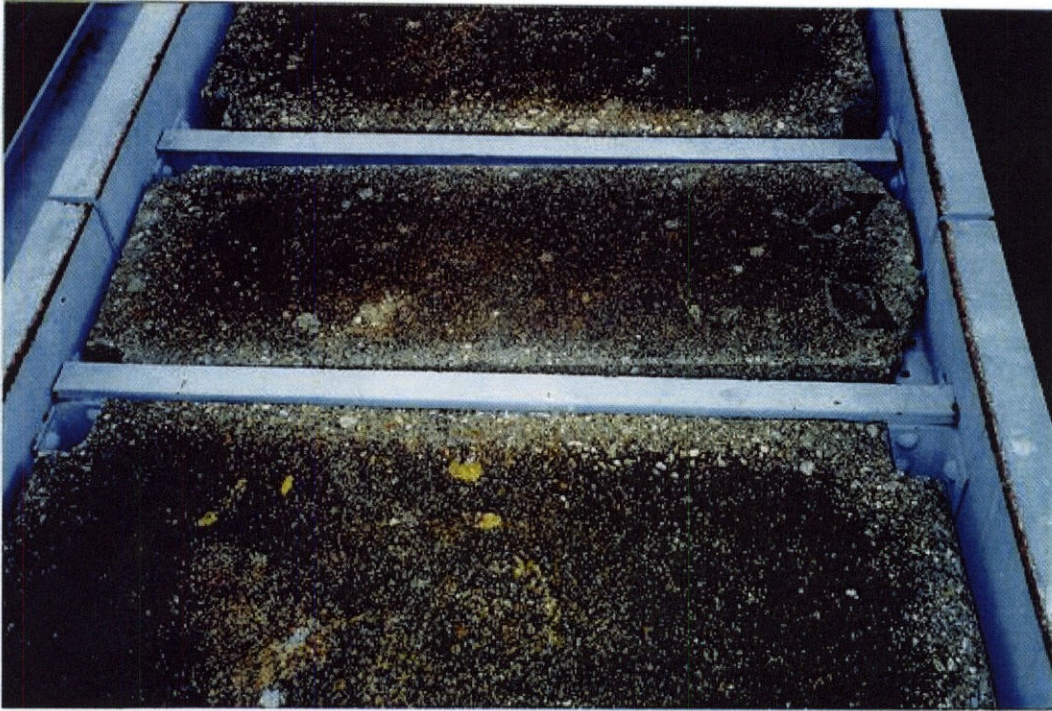


PHOTO 5 - Panel L159e (note shoe size spall on each corner with only about half of its bearing surface remaining).



PHOTO 6 - Typical close up of concrete walkway panels, note top portion of the Channel beam (which the crane and engine driven rail car ride) are beginning to show signs of rust.

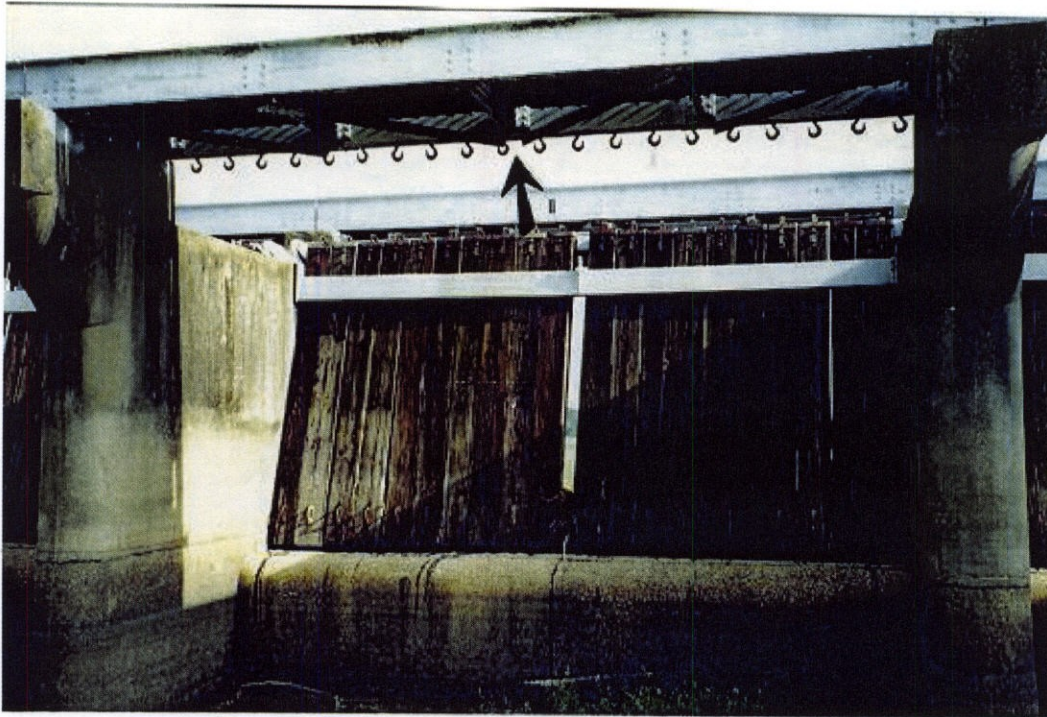


PHOTO 7 - Underside of the riverside bridge (areas of corrosion and peeling paint were noted on the stringers and lateral bracing as well as the connection angles between the two).



PHOTO 8 - Medium size spall on the riverside bridge bent of pier 319. The spall appeared to be old and no action is required at this time.



PHOTO 9 - Large spall on west abutment wall, noted during previous periodic inspections appeared to be the same. This spall is about 3 feet down-stream of the lakeside bridge where bridge span no. 1 channel beams rest on the abutment wall and should not affect the bridge.



PHOTO 10 - The deep and fine arched crack under the riverside bridge, noted during previous periodic inspections has not changed.

APPENDIX II

CEBIS Structure Inventory & Appraisal Sheet

COE Pedestrian Bridge Structural Inventory Sheet Date: 12/18/1999

***** IDENTIFICATION *****

1 State - Louisiana 226
 202 COE Bridge Number :CEWMVNLA-PE015A
 200 COE Division :CEMVD
 201 COE District :CEMVN

***** CONDITIONS *****

58 Deck : 5
 59 Superstructure : 7
 60 Substructure : 7
 61 Channel Protection : N

3 County Code :000
 4 Place Code :0000
 8 Structure Number :0000000000000000
 6 Features Intrstct: BONNET CARRE - RIVER SIDE
 7 Facility Carried: PEDESTRIAN/CRANE
 9 Location : 33 MILES U/S OF N.O., LA.
 21 Maintenance Responsibility:00
 22 Owner :00

***** LOAD RATING & POSTING *****

41 Stru Open/Posted/Closed : D
 220 Psdestrian (kilopascal) : 0.00
 221 Vehicle (Metric tons) : 0

***** APPRAISAL *****

71 Waterway Adequacy : N
 72 Approach Roadway Alignmen : 8
 36 Traffic Safty Features :NNNN
 113 Scour Critical Bridges : N

***** STRUCTURE TYPE & MATERIAL *****

43 Stru Main Material- Steel continuous
 Type- Channel beam:422 *****
 44 Stru App Material- Steel continuous
 45 # of Main Spans:350
 46 # of App Spans :0000
 107 Deck Stru Type -Conc precast :2
 108 Wearing Surface Protection
 A Deck -None
 B Membrane -None
 C Protection -None

PROPOSED IMPROVEMENTS *****

75 Type of Work :
 94 Bridge Improvement Cost: 0
 96 Total Project Cost (K) : 0
 97 Year of Imprvmnt Cost Est.:

***** AGE & SERVICE *****

27 Year Built : 1931
 106 Year Reconstructed : 0000
 42 Type of Service on -Pedestrian
 under- Relief for Waterway : 39

***** INSPECTION *****

90 Insp Date: 09/99
 91 Freq: 60 month
 92 Critical Feature Insp 93 Date
 A Frac. Crit Detail :Y 60 /
 B Underwater Insp :N /
 C Other Special Insp:N /
 203 Insp Officer :ED-GE
 204 Inspector :PAUL SALASSI
 205 Inspection Cost :800

***** GEOMETRIC DATA *****

48 Length of Max Span : 6.7 M
 49 Structure Length :2224.4 M
 51 Bridge Width, Curb-to-Curb : 1.4 M
 52 Deck Width, out-to-out : 1.4 M
 34 Skew : 0 deg
 35 Stru Flared : 0

Bridge record updated on : 11/02/1999

COE Pedestrian Bridge Structural Inventory Sheet Date: 12/18/1999

***** IDENTIFICATION *****

1 State - Louisiana 226
 202 COE Bridge Number :CEWMVNLA-PED15B
 200 COE Division :CEMVD
 201 COE District :CEMVN

***** CONDITIONS *****

58 Deck : 5
 59 Superstructure : 7
 60 Substructure : 7
 61 Channel Protection : N

3 County Code :
 4 Place Code :
 8 Structure Number :
 6 Features Intrsct: BONNET CARRE - LAKE SIDE
 7 Facility Carried: PEDESTRIAN/CRANE
 9 Location : 33 MILES U/S OF N.O., LA.
 21 Maintenance Responsibility: 00
 22 Owner : 00

***** LOAD RATING & POSTING *****

41 Stru Open/Posted/Closed : B
 220 Psdestrian (kilopascal) : 0.00
 221 Vehicle (Metric tons) : 0

***** APPRAISAL *****

71 Waterway Adequacy : N
 72 Approach Roadway Alignmen : 8
 36 Traffic Safty Features : NNN
 113 Scour Critical Bridges : N

***** STRUCTURE TYPE & MATERIAL *****

43 Stru Main Material- Steel continuous
 Type- Channel beam: 422 *****
 44 Stru App Material- Steel continuous
 45 # of Main Spans: 350
 46 # of App Spans : 0000
 107 Deck Stru Type -Conc precast : 2
 108 Wearing Surface Protection
 A Deck -Not Applicable
 B Membrane -Not Applicable
 C Protection -Not Applicable

***** PROPOSED IMPROVEMENTS *****

75 Type of Work :
 94 Bridge Improvement Cost: 0
 96 Total Project Cost (K) : 0
 97 Year of Imprvmnt Cost Est.:

***** AGE & SERVICE *****

27 Year Built : 1931
 106 Year Reconstructed : 0000
 42 Type of Service on -Pedestrian
 under- Relief for Waterway : 39

***** INSPECTION *****

90 Insp Date: 09/99
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48 Length of Max Span : 6.7 M
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Bridge record updated on : 11/02/1999

APPENDIX III

Quality Control Plan and Design/Review Activities

U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT

QUALITY CONTROL PLAN

Project Title: Simplified Pedestrian/Crane Bridge Inspection Report for Bonnet Carre' Spillway Structure.

Authority: Authority to inspect the subject bridge is provided by ER 1110-2-111, subject "Periodic Inspection and Continuing Evaluation of USACE Bridges", dated 30 April 1997. The Periodic Inspection was performed in accordance with the subject regulation.

Quality Control Plan: The Quality Control is the function whereby policies, standards, procedures, and format are used to control the quality of the work produced.

Periodic inspection Report. The Periodic Inspection Report presents the results and conclusions of the engineering inspection and data evaluation to evaluate the structural integrity and operational adequacy of the pedestrian/crane bridges. The report also presents recommended remedial actions to correct any noted deficiencies. The inspection and report were accomplished in accordance with the subject ER.

In-House Technical Review. The New Orleans District (NOD) performed an in-house review to achieve the desired quality control on various project tasks and to check for format, adequacy and accuracy of the report. A copy of the quality control plan is filed in Gen & Env Des Section. These reviews were conducted in-house because the necessary expertise was located within NOD. These reviews ensure the accuracy of the report and ensure the inspection and reporting were conducted in accordance with ER 1110-2-111. A copy of NOD's quality control plan with all endorsements to the report will be included with the file copy of the Periodic Inspection Report.

Simplified Pedestrian/Crane Bridge Inspection Team

<u>Name</u>	<u>Function</u>
Paul Salassi	Bridge Technical Specialist

U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT

QUALITY CONTROL PLAN

(Continued)

Technical Review Team

<u>Name</u>	<u>Function</u>	<u>Office</u>	<u>Ext</u>	<u>Registered</u>
Walter Baomy	Acting C/Gen Engr Br	ED-GE	2656	Yes/Civil
Joseph Chryssoverges	Tech Reviewer/Stru Engr	ED-GE	1009	---
Glenn Felger	Review Team Manager	ED-E	2601	---

U.S. ARMY CORPS OF ENGINEERS
NEW ORLEANS DISTRICT

DESIGN/REVIEW ACTIVITIES

<u>TASK</u>	<u>DATE COMPLETED</u>
Preinspection meeting and finalize schedule for inspection	01 Sep 99
Perform periodic inspection	09 Sep 99
Assemble draft report	21 Sep 99
Perform in-house review, and resolve comments	30 Sep 99

Paul J. Salassi
Paul J. Salassi,
Bridge Technical Specialist

9/21/99
Date

Glenn Felger
Glenn Felger,
Technical Review Manager

3/6/99
Date