DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS
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DEC 15 2006

MEMORANDUM FOR SEE DISTRIBUTION

SUBJECT: Guidance Memorandum for Critical Gage Instrumentation

1. PURPOSE: The purpose of this memorandum is to provide guidance that will define the responsibilities, requirements, and procedures for verification of critical gage readings to include pool level and other critical project operations.

2. APPLICABILITY: This Guidance Memorandum is applicable to all U.S. Army Corps of Engineers projects with water level gages owned and operated by the Corps.

3. REFERENCES:

a. ER 1110-2-240 - Water Control Management

b. ER 1110-2-249 - Management of Water Control Data Systems

c. ER 1110-2-1400 - Reservoir/Water Control Centers

d. ER 1110-2-8156 - Hydrometeorological Data Management and Archiving

e. ER 1130-2-530 - Flood Control Operations and Maintenance Policies

f. USACE, South Atlantic Division, CESAD-PDS-O/RBT, SOP 1130-2-6, 21 July 2006.

4. GENERAL: The Corps operates numerous multi-purpose water resource projects. Regulations require adequate provisions for data collection, analysis, and dissemination of basic data, monitoring project operations, and keeping the public informed regarding water control matters. This Guidance Memorandum provides guidance and procedures for providing appropriate redundancy and assurance of accuracy of critical instrumentation reporting equipment that is essential to making water management operational decisions. This guidance applies to rivers, reservoirs and lakes important to water supply, hydropower, flood control, or navigation, or which contribute to the overall system composed of a series of projects, all or part of which support these purposes. Critical instrumentation reporting equipment could include:

i. River gages including
   1. downstream control points
   2. navigation project upper and lower pool gages
   3. high priority needs such as flood damage reduction computations or unsteady flow model boundary or initial conditions
   4. NWS forecast points

ii. Reservoir gages including
   1. pool and tailwater gages
   2. controlling side water gages
   3. control points
   4. critical inflow gages
   5. gages used to determine lake-wide or system averages
   6. gages located at the lake outlets and connecting channel control points
   7. other gages important to meeting the water management mission

iii. Any other gage on which critical operations, decisions, public safety or liability depends, whether routinely or periodically

a. Background: We cannot assume our primary source of critical instrumentation, whether a mechanical, hydraulic or electronic water level indication system functions properly 100 percent of the time. It is imperative we periodically check these devices against a redundant system of fixed datum, such as staff, slope, wire weight, tape, or tile gages. It is equally important that water level indication systems be verified after maintenance, replacement or new installation.

5. RESPONSIBILITIES:

a. The Senior Water Management person located at the division level will ensure that programs are in place at the project and district levels that follow this guidance memorandum. The evaluation of executing this guidance memorandum at the division level will occur during the Command Assistance Visits. The Senior Water Management person will brief the team on the division's compliance status with this guidance memorandum.

b. The responsibility for operating and maintaining Corps owned gages varies significantly across the Corps. In many locations these services are performed by United States Geological Services (USGS) on a cost reimbursable basis, while in other locations the services may be performed by hydrologic or electronic technicians or contractors that provide services under water management and/or operations supervision. Any personnel that are tasked with the responsibility to operate and maintain critical gaging instrumentation must be qualified to perform the services.

c. District Water Management personnel are responsible for collection, analysis, dissemination, and quality assurance of hydrometeorological data (ER 1110-2-249), and

monitoring project operations. These personnel are also responsible for determining the appropriate level of redundancy and critical nature of gaging systems.

6. PROCEDURES:

a. Districts will ensure that all projects have appropriate redundancy in the gaging system to assure availability and accuracy of data. The redundant system does not need to be elaborate. In many instances a staff gage will be sufficient. In the case of Corps owned pools, the redundant system will provide the capability to determine the pool elevation and a process to compare the elevation determined from the redundant gage with the primary gage. To the greatest extent possible redundant gages should be located so that they can be read by the security cameras operated by the shift operators or easily from the structure.

(1.) If practical all critical gaging systems should be tagged with a notice that states any action taken on the equipment requires adherence to this guidance memorandum. The tag may also include other pertinent information such as reporting requirements and verification procedures as deemed appropriate for that critical gage.

b. For Corps-owned gages located at Corps projects, Corps Project Operations Managers are responsible to ensure the accuracy of the primary gage on a periodic basis as determined by the critical need for accurate readings. In the case of Corps-owned pools, responsible personnel will compare the pool elevation recorded on the primary gage or recorded by System Control and Data Acquisition (SCADA) system with the elevation on the redundant gage.

(1.) If there is an inquiry from the public with regards to abnormal pool level conditions or a concern raised by an interested party, responsible personnel will compare both the primary automatic gage and the redundant gage if the validity of the reading is in question and document the results.

(2.) The shift operator, dam tender, lock tender, or other responsible personnel will log into the Official Station Logbook when maintenance/replacement actions are performed on critical instrumentation. If there are any significant deviations (greater than 0.3 feet or whatever level the Division determines to constitute a significant deviation) between pool level readings, a trouble report will be written and the Operations Project Manager notified. The Chief, Operations Division at each district will designate a POC to receive the weekly verification and related trouble reports. Immediate telephonic notification of the POC is required if there are significant discrepancies in readings. The POC will immediately notify the Chief, Operations Division and the Chief, Water Management Section (or other related office) of any significant discrepancies in readings or other problems that may adversely affect water management decision-making.

(3.) Each project will maintain an Official Station Logbook documenting the periodic checks between the primary gage and the redundant gage. Information to be recorded will include

date, time of entry, pool elevation reading from the primary gage, pool elevation reading from the redundant gage, name of person making the reading, and remarks.

c. For Corps-owned critical gages not located at a project, the District Water Management will be required to develop a documented verification process and provide a copy to Division for review and approval.

d. For critical gages not owned by the Corps, the Corps should consider serving in a quality assurance role and verify the gaging partner has a quality assurance plan.

e. Replacement of water level indicators or major maintenance to existing equipment.

(1.) Prior to any equipment replacement to include primary and secondary (redundant) recording systems, the vertical team for the project shall be notified of the impending action. The team should include all personnel who have a stake in the accuracy of the readings. Normally this would include project personnel on the maintenance and the operations side, Water Management personnel, and other district personnel that are involved in monitoring water surface elevations.

(2.) Immediately following installation, replacement, or any maintenance activity on a critical gage, efforts shall be taken to verify that the reading is accurate using best practices appropriate to the type of gage. Dependent upon the ability to validate the maintenance activity, the verification of instrumentation reading may entail daily readings until a major change in lake levels or may be able to be verified that day. This will all depend on the nature of the instrumentation and the ability to accurately verify readings.

(3.) Gage readings will be verified periodically with the frequency to be defined in the District's gage verification program; a periodic verification is to occur during significant flood events.

7. CONCLUSION:

a. Divisions should take time to evaluate all instrumentation to determine if the instrumentation at project sites is of a critical nature. It is up to the division to determine the criticality of instrumentation and what constitutes a significant deviation in the gage readings.

b. Through the inclusion and routine reading of redundant gages at all of our civil works projects, we are improving reliability and accuracy of water level information used for water management decision making.

c. The verification that appropriate redundancy and accuracy of critical gage information is readily available for making water management and/or dam safety decisions will be included in

the Dam Safety Program inspections. During the inspection, critical instrumentation will be identified and reviewed as an inspection item and discrepancies will be documented in the inspection report.

8. Any questions on this matter should be directed to Mr. Jerry Webb, Principal Hydrologic and Hydraulic Engineer, USACE Headquarters at 202-761-5543, email: Jerry.W.Webb@usace.army.mil

FOR THE COMMANDER:

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