

Bolivar Interim Risk Reduction Measures (IRRM) were developed and evaluated between February 2007 through August 2007. An Independent Technical Review of the plan and associated revisions were completed March 2008. The plan is currently under review by Division and Headquarters USACE for approval and concurrence. Although there are many IRRM, a few of the select ones include:

**Development of an Interim Operating Elevation (IOE):** The project IOE or IOP (Interim Operating Pool) is a target pool elevation used during management of high water events. Depending on the circumstances, as the pool elevation approaches the IOE, the discharge (or outflow) is increased incrementally in an effort to prevent the IOE from being surpassed. As the pool equals the IOE, the Huntington District will attempt to equalize the discharge to the inflow into the pool in order to maintain the IOE and prevent further increases in pool elevation. Bolivar dam has seepage problems and through previous analysis was thought to be safe through pool elevations up to and including 949 feet, or 54 feet on the Bolivar dam gage, however due to several unexpected artesian-type boils that occurred at pool elevations of 935-936 feet during the March 2008 event, future safe operating elevations may be somewhat less. Pools above these elevations do not necessarily mean imminent dam failure, rather concerns regarding the possibility of a dam failure increase as pool elevations rise above these thresholds. This IOE serves as a guide. The Huntington District may operate to higher or lower elevations based on the most up to date analysis, hydrologic conditions or other factors at the time. Additionally, as new conditions for the dam are discovered, the District may adjust the IOE.

**Tree Removal:** Removal of trees will be evaluated in areas of observed boils as documented during the 2005 and 2008 storm events including areas on the downstream terrace and within selected areas downstream of the existing sand and gravel seepage blanket. Tree clearing would also be required for an area along the old stream channel that is within 250 ft. of the toe of the dam. The extent of the tree removal will be initially determined by engineering requirements to reduce the risk for progressive failure modes. By removing the trees, a more thorough inspection for seepage and other dam safety concerns located within areas downstream of existing granular blanket and along the terrace will be possible, thereby reducing the risk of undetected seepage or other potential failure-in-progress mechanisms. Removal of the trees from the terrace and downstream of the existing granular blanket will also allow construction of emergency repairs if conditions warrant or augmentation of the existing granular seepage blanket.

**Perform Emergency Exercise:** A Dam Safety Exercise (DSE) was conducted for the Bolivar and Dover Dams on December 18, 2006 that allowed the District to identify and raise awareness of Dover and Bolivar dam stability and downstream flood impacts. The exercise revealed many lessons learned,

allowing us to verify strengths in some areas, and showed others that need some improvement.

**Install Additional Seepage Blanket:** The existing granular seepage blanket will be augmented on areas of the downstream terrace and along the downstream slope of the terrace between stations 31+00 to 49+00. This additional seepage blanket will provide a reduction in the probability of unsatisfactory performance associated with uncontrolled under seepage and terrace seepage.

**Downstream Access Improvement:** Vehicle access along the downstream terrace and dam is proposed to be improved and relocated so that access is maintained as Dover Pool backs up along the downstream toe of Bolivar Dam. The new road will allow access to critical areas along the downstream toe and terrace of the dam, allowing access during high water events. This will allow transportation of repair materials and equipment if necessary during emergency conditions. Access for monitoring the performance of the dam will be improved, thus reducing the risk that potential seepage points remain undetected.