IMPLEMENTED INTERIM RISK REDUCTION MEASURES (IRRMP)

The Huntington District has implemented a number of Interim Risk Reduction Measures (IRRM) to help reduce the risk of the project while we continue to study to find a long-term risk management plan. The following is summary of the IRRMs completed to date.

2008 Communication Plan: A communication plan was created to layout effective communication for Huntington District to address day to day and emergency actions. The plan includes key points of contact for all internal and external project delivery personnel, Huntington District personnel, media, and local and elected officials.

This plan ensures that all stakeholders will continue to be informed at all stages of the project, reducing risk of not meeting their expectations, while maintaining public awareness. It also reduces the risk of losing valuable time or control of situations during an emergency condition due to poor or broken communication processes.

Zoar Levee

2008 Establish Evaluation and Surveillance Pools: Zoar Levee is subject to the interim maximum flood control pool (IMFCP) of Dover Dam, which is now set at elevation 909 ft. This is the elevation of the Dover Dam IMFCP set after completion of installation of anchors in 2008 allowing the dam to be safely loaded to elevation 909 ft. The IMFCP will not be exceeded except by special directive from the Huntington District office or events that exceed our ability to discharge water. Zoar Levee's IRRMs discussed below are designed to facilitate loading to this same pool elevation, however, these measures do not ensure tolerable performance to that elevation, as defined by ER 1110-2-1156.

As such, Huntington District has established a three tier surveillance plan for Zoar Levee.

The IMFCP and Surveillance Plans formalize District responses to increases in Dover Dam's pool elevation and makes operations staff available to do other flood duties if necessary. Continuous surveillance by geotechnical and dam safety specialists also increases the success of detecting performance issues early and thus increases the likelihood that remedial measures can be implemented in a timely and effective manner. These plans also increase the likelihood of successful evacuation if necessary. This is imperative, given the proximity of the levee to many residences, hotels, and other commercial enterprises.

2008 Crest Profile: A crest profile survey of the levee was completed in 2008 which showed no apparent locations of settlement.

2008 Store Sandbags on Site: Three thousand sandbags for emergency use have been stored in the Zoar Pump Station so they can be filled with sand and utilized to help stabilize under seepage exit boils when necessary.

Sand bagging boils can assist in slowing the continued progression of boils and can allow for additional time for evacuation if necessary.

2008 Installation of Emergency Granular Seepage Blanket: In response to an emergency situation in March of 2008, a granular seepage blanket was placed on the interior toe of the Rock Knoll reach to prevent catastrophic failure.

The placement of the 2008 emergency blanket prevented Zoar Levee from catastrophically failing and damaging Zoar Village, by managing the seepage and reducing the piping of foundation material.

2008-2009 Seepage and Drainage Collection System: A seepage collection system on the interior toe of the Ball Field reach has been constructed along with a larger storm drainage culvert under State Route 212. The seepage collection system consists of a perforated pipe within a granular trench that provides for relief of seepage pressure at the toe of the levee and collects flow from the relief wells.

This drain intercepts and collects under seepage that will reduce pressure at the toe of the levee, increasing its stability. Further the collection and discharge of this seepage to the Zoar Pump Station should enhance surveillance activities by reducing standing water on the interior of Zoar Levee.

2009 Stockpile/Access Granular Materials: Different gradations of aggregate materials suitable for use in the construction of an emergency granular seepage blanket have been stockpiled near the Rock Knoll reach on Zoar Levee. In addition, a list of suppliers of suitable material that can respond 24 hours a day and seven days a week have been developed. This list includes the location and normal and emergency contact information.

Having suitable material on-site for emergency repairs will assist in slowing seepage and piping to provide additional time for evacuation.

2009 Assessment and Rehabilitation of Existing Relief Wells: The construction of the seepage and drainage collection system enabled the well outlet elevations to be lowered an average of 3 ft. Two new relief wells were installed as replacements to existing wells in the spring of 2009. The existing wells were not producing as much flow as nearby wells. Five existing wells were plugged and abandoned, four of which were underneath the expanded levee footprint and posed potential seepage/piping hazards. All remaining wells were mechanically and chemically rehabilitated to improve efficiency.

This rehabilitation will allow Huntington District to characterize and quantify pre- and post- well condition and pumping efficiency, giving a level of confidence that under seepage pressures are being properly relieved, thereby reducing the potential for piping due to under seepage.

Zoar Pump Station

2011 Upgraded Pump Station with 3rd Pump: A third pump has been added to the pump station reducing the need to retain water in the Diversion Dam. Electric service to the station was also upgraded to accommodate the additional pump. Total pumping capacity has been increased from 30,000 gpm to 45,000 gpm.

The addition of a third pump reduces the risk of interior flooding, providing additional pumping capacity, and assists in pumping the additional discharge from the relief wells out of the interior of the levee. This will help relieve interior pressures on the toe of the levee and may also help increase the success of detecting failures. The third pump will also reduce the frequency on which Zoar Diversion Dam would be required to reduce inflow into the ponding area.

2011 Upgraded Pump Station with New Emergency Generator: A replacement generator has been added to better ensure continuous operation of the pumps. The new generator has the capacity to power all three pumps simultaneously, whereas the previous generator could only power one pump.

In the event of power failure, the generator must be used for operation of the pump station. The previous generator could only run one pump at a time, which was insufficient to handle the inflow into the ponding area.

2011 Automated the Pump Station: The pumps have been equipped to turn on and off automatically, in a stepped progression based on triggering ponding elevations. Previously a person was required to be dedicated to operate the pumps during a flood event. This action should free up personnel for surveillance, monitoring, reading instrumentation, or flood fighting.

2011 Zoar Pump Station Phone Gage: A water level sensing instrument was installed at the intake well at the Zoar Pump Station. This devise will alert Huntington District staff if the pumps do not activate when required and reduce the potential that water will pond uncontrollably behind the pump station and potentially flood structures inside the levee.

2012 Ditch and Weir Along Seepage Berm: A ditch has been constructed along the outer edge of the 2008 emergency seepage berm. This ditch will collect seepage and convey it to a v-notch weir that will allow measurement of seepage flow.

This tool will aid in the monitoring of seepage conditions no longer observable due to the placement of the 2008 blanket to provide earlier warning of distress.

Zoar Diversion Dam

2008 Establish Evaluation and Surveillance Pools: Zoar Diversion Dam has an IMFCP set at El. 906.0 ft. The IMFCP will not be exceeded except by special directive from the Huntington District office or events beyond our ability to discharge water.

As performance to this elevation is not tolerable, as defined by ER 1110-2-1156, the Huntington District has established a three tier surveillance plan for Zoar Diversion Dam.

The IMFCP and Surveillance Plans formalize Huntington District responses to pools at the Diversion Dam and free operations staff to do other flood duties if necessary. Continuous surveillance by geotechnical and dam safety specialists also increases the success of detecting performance issues early and thus increases the likelihood that remedial measures can be implemented in a timely and effective manner. These plans also increase the likelihood of successful evacuation if necessary.

2009 Crest Profile: A crest profile survey of the Diversion Dam was completed in 2009 which showed no apparent locations of settlement in the height of the dam.

2012 Install Pool Gage with Alerting Capability: A gage has been installed to record the reservoir level at the diversion dam and automatically alert Huntington District staff to levels exceeding an established elevation. This gage will transmit a signal through a Geostational Orbiting Environmental Satellite (GOES) to Huntington District water management web pages and

operations staff office and mobile phones. Along with this device, the control gate at the diversion dam is now powered by commercial power. However, an outlet for a portable diesel generator will be maintained in case of a loss of commercial power.

These upgrades were considered essential. In 2011, the diversion dam impounded water at least three times due to intense, isolated rain events that showed no measurable differences at nearby stream gages on the Tuscarawas River. These inadvertent impoundments occurred with the control gate open and in at least one instance caused approximately 9 feet of water to be impounded upstream of the diversion dam.

In each instance, Huntington District personnel were alerted of the impoundments by local residents which reduced the ability to monitor the diversion dam's performance. The pool gage and alerting system will provide Huntington District personnel with the ability to reach the site in time to monitor the project performance and increase warning time for emergency action and evacuation, if necessary.

For more information or to provide comments, please contact:
Attention: Zoar Levee
U.S. Army Corps of Engineers, Huntington District
502 Eighth Street
Huntington, West Virginia 25701
Voice: 304-399-5720
Email: zoarlevee@usace.army.mil