Howard Hanson Dam Reduced Storage Capacity
FREQUENTLY ASKED QUESTIONS

U.S. ARMY CORPS OF ENGINEERS BUILDING STRONG®

Q: What is the problem with Howard Hanson Dam?
A: Following a record high level of water behind Howard Hanson Dam in January 2009, the Corps of Engineers became concerned after discovery of two depressions on the right abutment, increased water levels in groundwater monitoring wells, and the appearance of sediment-laden water entering the abutment drainage tunnel. To date, engineers have excavated the depressions, have installed additional monitoring equipment and conducted tests while water was held at the traditional summer conservation pool elevation. What they have found indicates that they have isolated the reasons the two depressions formed, but they still need to evaluate the extent and effects of the seepage within the abutment, particularly in areas not protected by an existing grout curtain. What the Corps has found so far hasn't yet increased our confidence in using the full flood storage capacity of the dam. Therefore the Corps has placed restrictions on the pool elevation until engineers' concerns have been addressed. While the dam is not in immediate danger of failing, there is an increased risk to the downstream communities for higher flood levels. The Corps has been working closely with King County and the downstream cities of Auburn, Kent, Renton and Tukwila to prepare for flood season, should higher-than-standard flows be necessary from the dam. The Corps of Engineers will continuously reassess the pool restrictions as conditions change and may change the restrictions on pool elevation after careful deliberation.

Q: What does the problem mean to communities along the Green River?
A: The restricted flood storage capacity means increased flood risk to the Green River Valley below the dam. Should a major flood event occur with the temporary restrictions on pool elevation, it is possible that levees in the lower valley could be overtopped.

Q: What areas are at risk in what conditions?
A: The Corps of Engineers has provided to King County and the local communities a variety of possible mapped flood scenarios, and local emergency management officials are using that information in developing response plans. The scenarios that the Corps has provided represent only a few of the virtually limitless possibilities for what may occur in a storm event or events, and all residents in the valley are urged to plan and prepare for flooding as a prudent precaution.

Q: Will I be flooded every time it rains?
A: No. Before the depressions were discovered, the Corps operated the dam to reduce the risk of exceeding flood stage on the Green River at Auburn. The Corps will continue to operate this way. The dam is kept empty during the flood season except during flood events that would otherwise cause the Green River to exceed flood stage. In these cases, water is stored behind the dam. Even with the current restrictions on pool capacity, there is still room to store flood water behind the dam, especially for small to moderate rain events. It is during the less frequent, large rain events that there would be a higher risk for dam releases that may exceed the channel capacity downstream.

Public safety remains our number one priority. We encourage local residents and businesses to contact local emergency managers and work with them to determine the best path for being prepared for any contingency.

Q: Why am I just hearing now that I'm at risk for flooding?
A: Since 1961, Howard Hanson Dam has been providing flood risk reduction on the Green River. Before the construction of the dam, the floodwaters of the Green River would spread out almost unimpeded across the valley. With major flooding reduced, the Green River Valley has attracted residential and industrial growth, raising its economic worth substantially. During the January 2009 flood event, prevented damages were approximated at $4 billion. However, the area remains an active flood plain and will always be at some risk of flooding even with the dam and levees in place and fully functioning.

Q: If there is a problem, why hold water behind the dam?
A: During flood season the Corps doesn't hold any water behind the dam unless flooding is imminent. The Corps always takes the water level behind the dam down to basically no pool (elevation 1,075 feet) and run of the river operation by the beginning of flood season each year.

The dam's authorized maximum flood storage pool is elevation 1,206 feet above sea level. In January 2009 the pool reached a record pool of 1,189 feet in a matter of days, because inflows to the dam were as high as 30,500 cubic feet per second and outflows were cut to zero to limit flooding in the Green River Valley, which was experiencing high tributary inflows to the river downstream of the dam. This fall, because of ongoing concerns with the right abutment, the Corps doesn't plan to hold water to the authorized maximum level and may release outflows that could exceed the capacity of the levees and channel downstream in an effort to ensure safety of the dam.

Q: How long will it take to fix the problem?
A: The Army Corps of Engineers is in the process of evaluating the risks associated with the damage at Howard Hanson Dam incurred following the January 2009 flood event. The Corps is also constructing short term repairs to address immediate concerns. Preparations for the upcoming flood season include constructing an interim seepage barrier wall and improving the drainage of the right abutment to control seepage through the most critical part of the right abutment. This work is scheduled to be substantially complete prior to Nov. 1. Unfortunately there is not a definitive time frame for the investigation or longer term repairs to be complete. Until all assessments can be completed, the Corps of Engineers determined it would be prudent to place restrictions on the pool level for flood storage. This does increase the risk of flooding along the Green River. The Corps is in constant communication with county and city officials and emergency managers. The Corps urges Green River Valley residents to be in contact with those agencies to ensure preparedness for any contingency. We will continue to provide information to the county and cities as it is available. Additionally, updates to the situation will be posted on our District's Web site and communicated through the cities affected.

Q: Why are we just now hearing about seepage concerns at the dam?
A: The right abutment has seeped since its construction. Every earthen dam has seepage. Howard Hanson Dam's seepage has always been highly monitored and mitigated, allowing for safe operations for nearly 50 years, which in turn allowed the development of the Green River Valley. The record high flood storage pool in January resulted in several internal and external changes to the right abutment never before observed that may be symptoms of internal erosion within the right abutment. The sediment-laden water in the drainage tunnel, high water levels within the right abutment and the depressions that were discovered after the January pool of record alerted the Corps to a new situation that engineers haven't yet been able to fully investigate. Until engineers are able to fully investigate the situation and determine what may have caused the observed conditions, the Corps is restricting the pool elevation. This reduced storage capacity and increased risk of higher flows downstream is the new situation the Corps and local communities feel it is of importance for local residents and businesses to be aware of.

Q: How do I know I'm safe?
A: Howard Hanson Dam presents no immediate danger to people and property below the dam. However, the restricted flood pool capacity behind Howard Hanson Dam does increase the risk

of river flows above levee protection levels in the Green River Valley. The Corps urges citizens to contact their local emergency managers and work with them to determine the best path for being prepared for any contingency. Public safety is our number one priority. The safety of our employees, visitors, and everyone in or around Howard Hanson Dam is of paramount importance to us.

Q: What are the chances the dam could break?
A: Howard Hanson Dam presents no immediate danger to people and property below the dam. The dam structure itself is not experiencing any symptoms what would indicate potential failure. The abutment is the concern. However, the Corps urges citizens to contact their local emergency managers and work with them to determine the best path for being prepared for any contingency. Public safety is our number one priority. The safety of our employees, visitors, and everyone in or around Howard Hanson Dam is of paramount importance to us.

Q: If there is a huge flood, how much time will I have to evacuate?
A: The Corps is in frequent communication with county and city officials and emergency managers. The Corps urges Green River Valley residents to be in contact with those agencies to ensure preparedness for any contingency. Any emergency messages regarding evacuation will come from those entities. For preparedness information for your community, you may want to begin with King County's portal to local emergency management organizations:
http://www.kingcounty.gov/safety/prepare/Links/Emergency%20Management%20Agencies.aspx
Or their Preparedness website:
http://www.kingcounty.gov/safety/prepare/residents-business.aspx

Q: Do you have the money to fix the problem?
A: This situation is a high priority for the Corps and the Washington state congressional delegation, and we are working together to make sure we will have the funding we need to continue forward with evaluation and potential solutions.

Q: What have you done since January?
A: The Corps has excavated the small and large depressions, has installed additional monitoring equipment, and continues to conduct tests and analysis. Currently the Corps has contractors installing a subsurface cement based grout seepage barrier and additional drains from with the drainage tunnel as interim measures to reduce and further control the seepage. Simultaneously, the team has initiated test borings, geotechnical modeling and analysis to initiate design of a long term repair project to more fully address the seepage issues.

Q: What do you think is the problem?
A: Corps engineers and scientists continue to learn more about the situation every day as more borings, tests and monitoring data are analyzed. What they have found so far indicates that they have isolated the reasons the two depressions formed. The small depression appears to have formed due to weathering of surface rock shell material, and the subsurface disturbance was limited entirely to the rock shell material. During excavation of the large depression, strong evidence was found for the presence of an exploration tunnel excavated in the mid 1950s as part of the foundation investigation for dam construction, and we believe collapse of the tunnel may have caused the large depression. However, more needs to be done to evaluate the extent and effects of the seepage issues within the abutment, particularly in areas not protected by the existing grout curtain. What has been found so far hasn't restored confidence in using the full flood storage capacity of the dam.

Q: Has the Corps decided to limit the flood pool elevation to a specific point for the upcoming flood season
A: In preparation for the upcoming flood season, various operational plans for the dam have been evaluated by the Corps. However, the condition of the right abutment, as well as interim repairs underway to install a grout curtain, remain too uncertain at this time for the Corps to

announce a specific operating plan at the dam in the event of a flood. The U.S. Army Corps of Engineers is continuing to evaluate the condition of the earthen right abutment of the dam. In addition the Corps will be testing the performance of the grout curtain during construction and after it is completed. The Corps will re-evaluate restrictions on pool elevation as more is learned prior to flood season.

Q: How often would natural flows at Auburn exceed current levee capacity of 12,000 cubic feet per second if the dam did not exist?

A: The Corps estimates that there would have been approximately 29 flood events with natural flows that would have exceeded 12,000 cfs since the dam was completed (a 47-year period).