6 LEVEE OVERFLOW SECTION

A small section of the OHB ring dike will be constructed with a crest elevation lower than the design elevation of 926.5 feet. During a flood event large enough to potentially overtop the proposed levee this overflow section will allow flood water to enter the protected area in a controlled manner, which could potentially prevent an uncontrollable breach of the levee elsewhere along the alignment.

6.1 Design Calculations

The intent of the design of the overflow section is to allow the water surface within the protected area to reach the top of levee elevation (926.5 feet) prior to the exterior water surface reaching the top of the levee. To achieve this goal the total volume of water flowing into the protected area was calculated and compared to the volume of the protected area below elevation 926.5 to determine the rate of rise of the interior water surface versus the exterior water surface.

Flow into the interior area was calculated using the weir equation:

$$Q_{weir} = CLH^{\frac{1}{2}}$$

Where:

Q_{weir}= discharge over weir (cubic feet per second)
C = broad-crested weir coefficient
L = broad-crested weir length perpendicular to flow (feet)
H = head above weir crest (feet)

The broad-crested weir coefficient was varied as the head above the weir crest increased, as outlined in the Handbook of Hydraulics (Brater and King, 1976). For a weir crest breadth of 10 feet, C varies from 2.49 to 2.68.

Modeling indicates that a rate of rise of 0.5 feet per day (0.02 feet per hour) is a reasonable assumption for the flood waters outside of the OHB levee. Head above the weir crest was calculated using this rate of rise and a time step of 0.25 hours. Initially a weir crest elevation of 926.0 feet (0.5 feet below the levee crest elevation) was assumed, but this elevation required a much larger weir length than originally anticipated and was subsequently lowered to 925.5 feet (one foot lower than the levee crest elevation). The weir length was varied to achieve the design goal. Weir discharge for each 0.25 hour time step was determined and was then converted to cumulative inflow volume (with units of acre-feet).

Using ArcGIS and available elevation data for the Oxbow-Hickson-Bakke area, available volume within the protected area below 926.5 feet was determined. This information was used to determine the interior water surface elevation associated with each of the previously calculated cumulative inflow volume values.

6.2 Design Conclusions

Using a rate of rise of the exterior flood water of 0.5 feet per day, the exterior water surface will rise from the overflow section crest elevation (925.5) to the levee crest elevation (926.5) in 48 hours. An

overflow section weir length of 2,300 feet results in an interior water surface of 926.5 feet in approximately 47 hours, one hour before the exterior water surface reaches the top of the levee.

The recommended location for the OHB levee overflow section is on the west side of the ring levee just south of the Bakke subdivision. This portion of the levee is subject to less intense wind/wave action, and this location, along the west edge of the proposed West Pond, will ensure that the overflow section will not be directly adjacent to any future housing development. See Figure 47 for the proposed general location of the levee overflow section. The exact location will be determined as the design is finalized.

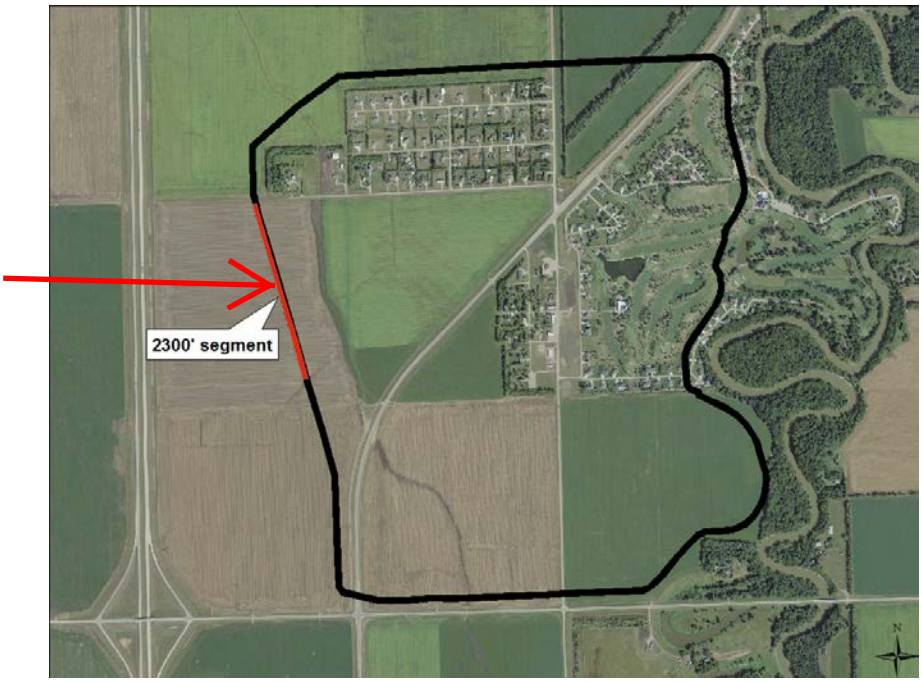

Figure 47 – Proposed Overflow Section Location

7 FINAL RECOMMENDATIONS

- Top of Oxbow/Hickson/Bakke Ring Levee Elevation should be set 4 feet above pool elevation of 922.5. This elevation does not include required overbuild.
- Include an overflow section that would have controlled overtopping during a Probable Maximum Flood event. The height should be 3 feet above pool elevation of 922.5, or one foot lower than the Top of Levee elevation. The length of the section will be 2,300 feet. The exact location of the overflow section will be determined during final design.
- Erosion Protection: Topsoil and seed only with the intent of establishing and maintaining vegetation on the clay levee.
- Exterior Side Slopes of 1V:4H are acceptable with exception of the NE corner where wave heights would be greatest and the exterior slope should be flattened to 1V:5H.
- Interior Side Slopes of 1V:5H will be used per Local Sponsor request (1V:4H is acceptable from a COE perspective).

- Vegetation Free Zone (VFZ): Extends minimum of 15’ from the toe of the levee. Local drainage ditches will be placed outside of the VFZ.
- Use EM 1110-2-1913, “Design and Construction of Levees”.