

MEMORANDUM FOR RECORD – DRAFT 1/2/14

SUBJECT: Fargo-Moorhead Metro Flood Risk Management (FMMFRM) Project – MFR 021-
Landscape Enhancements and Golf Course Layout along the Oxbow-Hickson-Bakke
Ring Levee

PURPOSE

1. This memorandum for record (MFR) defines the extent to which the City of Oxbow and the Oxbow Country Club will be allowed to construct landscaping and golf features adjacent to the Oxbow-Hickson-Bakke levee. Requirements for levees will be discussed, along with the impacts of the Vegetation-Free Zone requirements needed for the levees.

BACKGROUND

2. The design for the Fargo-Moorhead Metropolitan Flood Risk Management (FMMFRM) Project is ongoing. As part of the mitigation for impacts created through the staging of flood water upstream of the diversion project, a levee will be constructed around the Oxbow-Hickson-Bakke community. The construction of the levee will result in the removal of a number of homes in the City of Oxbow as well as disruption and segmentation of the Oxbow Country Club. These impacts are being mitigated through the construction of replacement residential lots and replacement holes for the Oxbow Country Club. The City of Oxbow and the Oxbow Country Club desire to incorporate the topography created by the construction of the levee into the golf facilities.
3. The project features will include:
 - A ring levee surrounding portions of the communities of Oxbow, Hickson, and Bakke.
 - Replacement residential lots to mitigate for the loss of residential lots due to the construction of the ring levee.
 - Replacement golf holes, clubhouse, and other golf features to mitigate for the loss of existing golf facilities.

LEVEE REQUIREMENTS

4. The levee will need to be designed, constructed, and maintained so that it is a reliable feature of the project. Many different factors must be considered when designing the levee; they are detailed below. The project delivery teams (PDTs) will complete the final design of the levee.

Levee Crest Elevation

5. The levee is an essential component of the flood risk management system for the communities of Oxbow, Hickson, and Bakke. The primary access into the communities of Oxbow, Hickson, and Bakke during large floods will be sections of Cass County Highways 81 and 18 and Interstate Highway 29. These access roads will be raised to an elevation that will allow access to be maintained up to a 0.2% chance flood. To provide adequate risk reduction up until the point at which access will be unavailable, the levee will be built to the 0.2% chance elevation plus overbuild to account for risk and uncertainty, wave run-up, and estimated settlement.

Levee Typical Cross Section

6. The typical cross section for the Oxbow-Hickson-Bakke levee is a compacted clay levee with a 10-foot top width and 1V:5H side slopes on the interior of the levee and 1V:4H side slopes on the exterior of the levee. The interior levee side slope could be as steep as 1V:3H, barring it satisfies slope stability requirements, but the Local Sponsor has determined that 1V:5H will be used to provide a less obtrusive visual appearance. Because of the impervious nature of the levee fill and the foundation, seepage has not been an issue on existing levees, nor has stability been an issue for levees constructed away from the river channel. These levees have performed well under flood conditions.

Levee Construction Requirements

7. The levee section will be constructed to the following requirements to ensure the integrity of the levee. These requirements are the minimum and may require further evaluation by the PDT during design.
 - a. Fill Material: Alluvium or Sherack materials shall be used as fill material. These formations will be located in the upper portion of the diversion channel excavation.
 - b. Stripping: All organic materials beneath the footprint of the levee shall be removed.
 - c. Inspection Trench: An inspection trench will be required. If any pervious layers are encountered during excavation, an analysis should be completed to determine if a cut-off trench will be needed.
 - d. Utilities and Drain Tile: If utilities and drain tile are encountered within the inspection trench or they are known to be beneath the footprint of the levee, at a minimum, the utilities and drain tile shall be removed from beneath the footprint of the levee and extending out 15 feet from the both toes of the levee. The exception would be utilities relocated as part of this project in compliance with MVP MFR for Utility Relocations.

- e. Overbuild: The placement of the excavated material will cause the foundation to settle and consolidate. The levee section will be overbuilt to accommodate the estimated settlement.
- f. Placement: The material shall be placed in lifts of 9 inches or less.
- g. Compaction: The fill material will be required to be compacted to a minimum 95 percent of maximum dry density as determined by the standard proctor.
- h. Moisture Control: The moisture content of the fill material when compacted shall fall within the range of 2 percentage points below optimum moisture content and 3 percentage points above optimum moisture content as determined by the standard proctor.
- i. Testing: More testing will be required than for the embedded levee associated with the diversion channel project. Final quantity will be determined by PDTs.
- j. Topsoil and Seeding: A minimum of 4 inches of topsoil shall be placed and seeded on any exposed surface of the levee.

GOLF COURSE FEATURE REQUIREMENTS

- 8. Incorporation of golf course features adjacent to the levee section as desired by the Oxbow Country Club will be done in accordance with requirements for planting berms outlined in ETL 110-2-571 "Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures." Beyond the minimum levee section needed to satisfy stability requirements, additional fill (planting berm) may be added to the interior side slope of the levee to better accommodate differing types of public use and related landscape planting approaches. In these planting berm areas, the Vegetation Free Zone (VFZ) on the interior side shall extend a minimum of 15' from the landside crest of the levee or intersection between the levee slope and the additional fill, whichever is greater. Within the VFZ, the only acceptable vegetative ground cover is perennial grasses. In addition, a 3' root free zone runs along the interior side slope of the levee. Any landscape plantings outside of the VFZ must take into account this 3' root free zone.

Golf Course Feature Location

- 9. The placement of any additional earth fill for golf course features along the landside of the levee shall be done in accordance with guidance related to planting berms outlined in Section 4 of ETL 1110-2-571.
- 10. All proposed golf course features will be located a minimum of 15 feet from the landside edge of the crown of the levee or the intersection between the levee slope and the additional fill, whichever is greater, and the VFZ shall be kept clear of obstructions so that access is always provided. Planting plans shall consider the requirements of vegetation free zones, including the root free zone.

11. All geotechnical stability and seepage requirements for levee design shall be met in areas where additional fill is placed adjacent to the levee section.
12. Root free zones shall be based on the minimum required embedded interior side slope of the levee, based on geotechnical analysis, beneath the surface of the additional fill. This embedded side slope shall begin at the protected side crest of the levee or at the intersection of the protected side levee slope and the top of the additional fill.
13. Irrigation systems adjacent to the levee pose two potential threats to system reliability: pressurize waterlines may fail, resulting in damage to the engineered levee section; and irrigation water may impair visual inspection by obscuring wet areas that are actually due to seepage. To minimize threats to the levee, any irrigation system installed as part of the golf course infrastructures shall be located a minimum of 20 feet from the landside edge of the levee crown or intersection between the levee slope and the additional fill, whichever is greater. Irrigation systems installed as described shall spray towards the golf course and not in the VFZ.

Golf Course Feature Construction Requirements

14. The construction requirements for additional fill placed for golf course features can be less stringent than the levee. Some considerations for construction requirements are listed below.
 - a. Stripping: Adequate topsoil beneath the footprint of the additional fill for golf course features should be stripped to conserve enough topsoil to allow for long term viability of vegetation. Additional topsoil can be left in place.
 - b. Placement: The specified lift thickness should be based on how dense the additional fill for golf course features needs to be to accommodate the end use. The thicker the lifts, the less dense the additional fill will be, which could lead to more settlement and less bearing capacity.
 - c. Compaction: The material placed as additional fill for golf course features should be compacted to accommodate the end use. Moisture Control: There will be no moisture control requirements.
 - d. Testing: The testing requirements for the additional fill for golf course features will be similar to that required for the levees but at less frequent intervals and will depend on what density is required for the additional fill.
 - e. Topsoil and Seeding: Topsoil thickness will be determined based on the end-use of the additional fill for golf course features. At a minimum, 4 inches of topsoil shall be placed and seeded on any exposed surface of additional fill.

RIGHT OF WAY REQUIREMENTS

15. The minimum requirements for right of way for the Oxbow Hickson Bakke levee are outlined below. Typical right of way requirements are also shown in Figure 1.

- a. The real estate required for construction, operating and maintaining the levee will be purchased and owned by the Diversion Authority. This area will include all area under the levee and any adjacent parallel drainage ditches plus a minimum of 50 feet beyond the toe of the levee or daylight point of drainage ditches.
- b. For areas in which the City of Oxbow and the Oxbow Country Club desire to incorporate golf features including additional fill, the real estate required will be a minimum of 20 feet on the interior side of the point where the levee section intersects existing ground.
- c. The Diversion Authority will allow the City of Oxbow and the Oxbow Country Club, through an easement, to utilize the area between the interior edge of the levee crown and the landside limits of the Diversion Authority's right of way for the purpose of operating and maintaining a golf course. All golf course operation and maintenance within this area shall be subject to the requirements outlined in this document.

VEGETATION FREE ZONE AND VEGETATION MANAGEMENT ZONE

16. The requirements for vegetation-free zones and vegetation-management zones are outlined in the USACE Technical Letter ETL 1110-2-571, "Guidelines for Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures." The primary purpose of the vegetation-free zone (VFZ) is to provide reliable, unobstructed access to the dam or levee for surveillance, maintenance, and flood-fighting purposes. A secondary purpose of the VFZ is to provide distance between root systems and levees, which moderates the risk of potential piping and seepage due to root penetration and structural damage resulting from a wind-driven tree overturning. In addition to the VFZ, a vegetation-management zone (VMZ) can be specified in which vegetation is less stringently managed.
17. In the context of the FMMFRM project, the VFZ will require periodic maintenance and control of the vegetation within that zone. The control of the vegetation would require mowing or burning (if permitted) at least once each year for inspection. No woody vegetation or trees would be allowed within the VFZ.

O&M AND COE INSPECTION REQUIREMENTS

VFZ O&M and Inspection Requirements

18. Mowing or burning of the VFZ will be required at least every year for inspection. Additional mowing or burning may be necessary to ensure health and vigor of the species providing erosion protection, and in anticipation of flood conditions and flood fighting activities. All requirements outlined in ETL 1110-2-571 will be adhered to.

REVIEW

CONTACT

19. Any questions concerning this MFR should be directed to

SIGNATURES

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