IOWA DEPARTMENT OF TRANSPORTATION

TO OFFICE: District 5 **DATE:** October 29th, 2018

ATTENTION: James V. Armstrong **PROJECT:** Muscatine County

STPN-006-8(41)--2J-70

FROM: Anthony J. Klein PIN: 19-70-006-010

OFFICE: District 5 Design

SUBJECT: FY 2021 – Slide Repair Project Concept

PROJECT LOCATION MAP: Page 5 or Click Here

Muscatine County, US 6, MM 279.3 - Sta. 902+00

Observations/Notes:

The overall area of the foreslope instability has a longitudinal length of about 30 feet, starting near Station 901+70 and extending to about Station 902+00. It appears that the foreslope has a height of about 20 to 25 feet and a 1.5:1 slope. The scarp, at its highest point, is present about 6 feet away from the outside edge of the gravel shoulder. There is an existing 8' x 6' RCB culvert located east of the foreslope instability at Station 902+30. Severe erosion is present at the outlet of the RCB culvert.

It appears that drainage channel from the culvert, which is present at the toe of slope for approximately 60 feet, has meandered toward the roadway resulting in erosion of the embankment at the toe of slope. This loss of support has likely caused the foreslope instability.

Link to pictures: DSCN1424.JPG

Link to relevant as-built roadway plan sheets: as-built road plans, US 6, near Sta 902+00.pdf

Link to relevant as-built culvert plan sheets: <u>as-built culvert plans, US 6, Sta 902+30.pdf</u>

Recommendations:

Bench and rebuild the foreslope to the original slope or slightly flatter, if possible, starting near Station 901+50 and extending to the RCB culvert. Benching into the existing embankment shall begin at the top of the foreslope near the outside edge of the gravel shoulder. It is recommended that the backfill material consist of Erosion Stone underlain with Engineering Fabric. A small amount of Clearing and Grubbing will be necessary. Backfill the scour hole present at the outlet of the RCB culvert with Class B Revetment. Raise the channel bottom with Class B Revetment to match the outlet elevation of the culvert. At the point where the channel diverges away from the roadway, begin tapering the channel bottom back to existing conditions. Within the limits of foreslope repair, armor the rebuilt slope to a height of about 10 feet from the toe with Class B Revetment. Any exposed Erosion Stone on the rebuilt foreslope shall be capped with a 1-foot thick layer of Macadam Stone Base Material (Gradation No. 13, without choke stone course).

Additional ROW may be needed to complete this repair.

It is recommended that field survey is obtained for the preparation of plans.

Due to the estimate height and steepness of the foreslope, it is anticipated that cable guardrail will be necessary within the limits of repair.

The following quantities are estimated along with the associated costs with the foreslope repair. Please note that this estimate does not include any costs associated with ROW or the cable guardrail.

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Estimated Quantities and Costs:

MM 279.3

| <u>Item</u> | <u>Quantities</u> | <u>Cost</u> |
|--|-------------------|---------------|
| Excavation, CL 10, Waste | 350 CY | \$ 2,000.00 |
| Erosion Stone | 625 TONS | \$ 20,000.00 |
| Macadam Stone Slope Protection (Gradation No. 13, no choke stone course) | 218 SY | \$ 8,300.00 |
| Class B Revetment | 800 TONS | \$ 39,000.00 |
| Engineering Fabric | 900 SY | \$ 3,000.00 |
| Clearing & Grubbing | 0.5 ACRES | \$ 1,000.00 |
| Contingencies, Mobilization & TC (35%) | | \$ 36,800.00 |
| | | |
| Total Cost | | \$ 108,100.00 |

Muscatine County, US 6, MM 275.6 - Sta. 708+58

Observations/Notes:

The overall condition of the foreslope was difficult to determine due to the amount of vegetation present. It would seem beneficial to return to this site sometime during the winter months when the vegetation is dormant.

For estimating purposes, the following were assumed:

The foreslope in this area has a height of about 25 feet and a 1.5:1 slope.

Foreslope instability has a longitudinal length of about 100 feet, starting at approximate Station 708+58 and extending to Station 709+58.

Based on as-built road plans, there appears to be a pipe with unknown diameter within the assumed limits of foreslope instability at about Station 709+16. This drainage structure was not observed in the field at the time of our visit. Based on observations made by DOT Maintenance, we understand that there are several sections of separated pipe present at the toe of slope within this area. Broken concrete was placed by DOT Maintenance within the general limits of instability to temporarily maintain the integrity of the slope.

Link to pictures: **DSCN1593.JPG**

Link to relevant as-built road plan sheets: as-built road plans, US 6, MP 275.5 and MP 275.6.pdf

Recommendations:

Bench and rebuild the foreslope to the previously constructed slope, starting near Station 699+64 and extending to about Station 700+84. Slope repair activities shall not disturb any existing tree vegetation present on the foreslope adjacent to the instability. The repair shall start at the toe of the existing foreslope and then extend up-slope to the outside edge of the gravel shoulder. It is recommended that the backfill material consist of Erosion Stone underlain with Engineering Fabric.

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Backfilling shall occur immediately after cutting the benches and placing the Engineering Fabric. The Erosion Stone shall be capped with a 1-foot thick layer of Macadam Stone Base Material (Gradation No. 13, no choke stone course). Clearing and Grubbing will be necessary. Evaluate the existing culvert structure. Remove/replace or repair the existing concrete pipe culvert.

It appears that temporary or permanent ROW will be needed to complete this repair.

Due to the height and steepness of the existing foreslope, it may be necessary to install guardrail within the limits of the repair. Recommend obtaining field survey for the preparation of plans.

The following quantities are estimated along with associated costs for the foreslope repair. This estimate does not include costs associated with repairs to the existing pipe, necessary ROW, or guard rail.

Estimated Quantities and Costs:

MM 275.6

| <u>Item</u> | Quantities | <u>Cost</u> |
|--|------------|--------------|
| Excavation, CL 10, Waste | 522 CY | \$ 3,000.00 |
| Excavation, CL 13, Waste | 100 CY | \$ 1,000.00 |
| Erosion Stone | 749 TONS | \$ 24,500.00 |
| Macadam Stone Slope Protection (Gradation No. 13, no choke stone | | |
| course) | 600 SY | \$ 24,600.00 |
| Engineering Fabric | 747 SY | \$ 2,200.00 |
| Clearing & Grubbing | 0.2 ACRES | \$ 1,000.00 |
| Contingencies, Mobilization & TC (35%) | | \$ 28,300.00 |
| | | |
| Total Cost | | \$ 80,600.00 |

Muscatine County, US 6, MM 275.5 - Sta. 699+74

Observations/Notes:

The overall condition of the foreslope was difficult to determine due to the amount of vegetation present. It would seem beneficial to return to this site sometime during the winter months when the vegetation is dormant.

For estimating purposes, the following quantities were assumed:

The foreslope in this area has a height of about 25 feet and a 1.5:1 slope.

Foreslope instability has a longitudinal length of about 100 feet, starting at approximate Station 699+74 and extending to Station 700+74.

Based on as-built road plans, there appears to be a 12-inch diameter concrete pipe within the assumed limits of foreslope instability at about Station 700+23. There also appears to be an 18 inch intake and pipe located directly west of Station 699+74. These drainage structures were not observed in the field at the time of our visit.

Based on observations made by DOT Maintenance, we understand that there are several sections of separated pipe present at the toe of slope within this area.

Link to relevant as-built road plan sheets: <u>as-built road plans</u>, <u>US 6</u>, <u>MP 275.5</u> and <u>MP 275.6.pdf</u>

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Recommendations:

Bench and rebuild the foreslope to the previously constructed slope, starting near Station 699+64 and extending to about Station 700+84. Slope repair activities shall not disturb any existing tree vegetation present on the foreslope adjacent to the instability. The repair shall start at the toe of the existing foreslope and then extend up-slope to the outside edge of the gravel shoulder. It is recommended that the backfill material consist of Erosion Stone underlain with Engineering Fabric. Backfilling shall occur immediately after cutting the benches and placing the Engineering Fabric. The Erosion Stone shall be capped with a 1-foot thick layer of Macadam Stone Base Material (Gradation No. 13, no choke stone course). Clearing and Grubbing will be necessary. Evaluate the existing culvert structures. Remove/replace or repair the existing concrete pipe culvert.

It appears that temporary or permanent ROW will be needed to complete this repair.

Due to the assumed height and steepness of the existing foreslope, it may be necessary to install guardrail within the limits of the repair.

Recommend obtaining field survey for the preparation of plans.

The following quantities are estimated along with associated costs for the foreslope repair. This estimate does not include costs associated with repairs to the existing pipes, necessary ROW, or guard rail.

Estimated Quantities and Costs:

MM 275.5

| <u>Item</u> | Quantities | <u>Cost</u> |
|--|-------------------|--------------|
| Excavation, CL 10, Waste | 415 CY | \$ 2,300.00 |
| Erosion Stone | 490 TONS | \$ 16,100.00 |
| Macadam Stone Slope Protection (Gradation No. 13, no choke stone | | |
| course) | 400 SY | \$ 16,400.00 |
| Engineering Fabric | 463 SY | \$ 1,400.00 |
| Clearing & Grubbing | 0.2 ACRES | \$ 1,000.00 |
| Contingencies, Mobilization & TC (35%) | | \$ 18,700.00 |
| | | |
| Total Cost | | \$ 53,600.00 |

ESTIMATED COSTS:

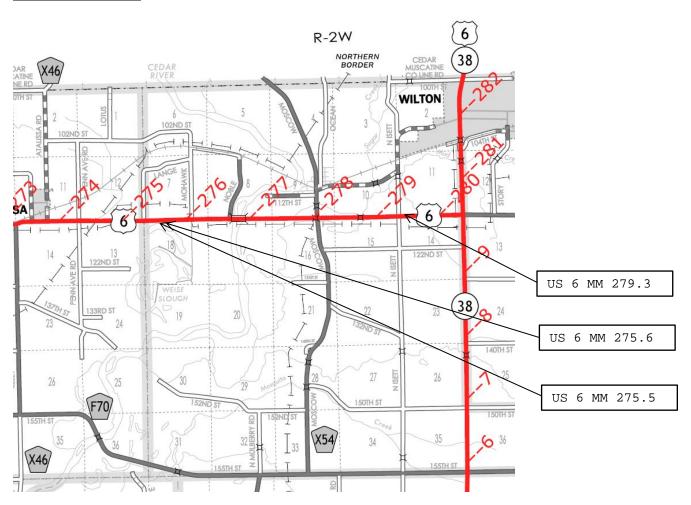
Location at MM 279.3 - \$110,000 Location at MM 275.6 - \$ 80,000 Location at MM 275.5 - \$ 55,000 **Total** - \$ **245,000**

FUNDS PROGRAMMED:

It has been identified by the District 5 office for construction in FY 2021. A schedule of events for plan development will be determined following approval of the Project Concept.

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LOCATION MAP:



cc:

| M. J. Kennerly | K. D. Nicholson |
|------------------|--|
| C. B. Brakke | S. J. Megivern |
| A. A. Welch | N. M. Miller |
| S. Anderson | G. A. Novey |
| M. J. Sankey | R. A. Younie |
| B. D. Hofer | K. Brink |
| B. E. Azeltine | D.R. Claman |
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| E. C. Wright | H. Torres-Cacho |
| A.J. Klein | J. R. Phillips |
| T. Quam | FHWA |
| J. Selmer | P.C. Keen |
| J. Woodcock | B. Walls |
| | C. B. Brakke A. A. Welch S. Anderson M. J. Sankey B. D. Hofer B. E. Azeltine S. J. Gent J.W. Laaser-Webb E. C. Wright A.J. Klein T. Quam J. Selmer |