



## REQUEST FOR CITY COUNCIL ACTION

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**MEETING DATE:** November 19, 2024

**AGENDA ITEM:** Pavement Rehabilitation Approach for the Friendly Hills Neighborhood Improvements

**ITEM TYPE:** New and Unfinished Business

**DEPARTMENT:** Engineering

**CONTACT:** Lucas Ritchie, Assistant City Engineer  
Ryan Ruzek, Public Works Director

**ACTION REQUEST:**

Provide staff with direction on the pavement rehabilitation approach within the Friendly Hills Neighborhood Improvements project

**BACKGROUND:**

The preparation of a feasibility report for the Friendly Hills Neighborhood Improvements, which is required to follow the Minnesota Statutes Chapter 429 process, was authorized by the Mendota Heights City Council by adopting Resolution 2024-28 at the City Council meeting held on June 4, 2024. The Statute 429 process is required because the city intends to assess a portion of the project.

The feasibility report for the Friendly Hills Neighborhood Improvements was accepted by the Mendota Heights City Council and called for a Public Hearing on September 17, 2024, by adopting Resolution 2024-45 at the August 7, 2024, City Council meeting. The recommendation of the feasibility report was to proceed with this project.

The proposed streets to be rehabilitated are Apache Court, Apache Lane, Apache Street, Aztec Lane, Cheyenne Lane, Creek Avenue, Decorah Lane, Fox Place, Havenview Court, Hazel Court, Hokah Avenue, Keokuk Lane, Mohican Court, Mohican Lane, Nashua Lane, Navajo Lane, Ocala Court, Ocala Lane, Pagel Road, Pontiac Place, Pueblo Drive, and Pueblo Lane. Streets proposed to be rehabilitated are broken out into multiple construction seasons with roadways identified north of, and including, Decorah Lane being proposed for rehabilitation in the 2025 construction season and roadways identified south of Decorah Lane being proposed for

rehabilitation in the 2026 construction season. Based on our observations, as well as our pavement management system, the condition of these streets has deteriorated to a point where it is no longer cost effective to patch the street and are to a point where rehabilitation is necessary.

During the public hearing, there was discussion between the residents and council as to the appropriate pavement rehabilitation approach; specifically, as to whether the roadways should receive a Full Depth Reclamation (FDR) or a Mill & Overlay (M&O) due to the proposed watermain replacement and existing material type in areas where watermain is not planned for replacement by Saint Paul Regional Water Services (SPRWS). Existing watermain within the project limits consists of both cast iron watermain and ductile iron watermain. SPRWS staff have indicated that the life expectancy of cast iron watermain has a typical life expectancy of 100 years and can be extended an additional 30 years, typically, with the addition of a sacrificial anode bag placement at strategic locations along the main. The cast iron watermain within the project area was constructed in the early 1980's. Preliminary discussions around the pavement rehabilitation approach during the public hearing were largely orchestrated around the pavement rehabilitation approach with consideration for future watermain improvements. However, based on the year of installation with the existing cast iron watermain and additional improvements included with the Friendly Hills Neighborhood Improvements, there is no guarantee that SPRWS would see the benefit or need to replace to existing watermain that is being left in place at the time of the next rehabilitation project, regardless of the pavement rehabilitation approach at this time or with a future rehabilitation project.

Staff had additional geotechnical evaluations performed by Braun Intertec throughout the project area to provide a recommendation toward the pavement rehabilitation approach. Braun's recommendation includes support for a M&O along certain roadways within the project area not receiving utility improvements, as identified within the attached geotechnical report and project maps, and note that the expected life expectancy for these roadways is 12-15 years. This would require an additional pavement rehabilitation project, likely an additional M&O, at that time. It is anticipated that the streets proposed for an FDR would receive an additional pavement rehabilitation in the 25 year range, likely a M&O, to prolong the pavement to the next FDR cycle in the 50 year range.

Providing a mixed pavement rehabilitation approach to the neighborhood would result in inconsistent pavement needs within the neighborhood over time, as well as inconsistent assessment amounts to residents within the same neighborhood receiving the same roadway benefit.

### **FISCAL AND RESOURCE IMPACT:**

Street improvement projects are proposed to be assessed to the benefiting property owners. Pursuant to the City's Street Rehabilitation and Reconstruction Policy, the benefiting properties should be assessed 50% of the street reconstruction and rehabilitation costs. The following tables show the estimated unit assessments based on the City policy. The following tables are further broken out based on the alternative pavement rehabilitation approaches, as

well as the applicable assessment amount. Including multiple pavement rehabilitation approaches within the same neighborhood would be inconsistent with the city's historical practices and staff are seeking direction as to how the assessment would be split, if at all, among the residents.

The following tables include total cost estimates for an FDR approach throughout the entire project area and include an equal assessment amount for all residents within the project area:

<b>Project Total</b>	<b>Total Estimated Costs (2025 and 2026)</b>
Street Improvements	\$ 4,251,095.50
10% Contingency	\$ 425,109.55
Indirect Costs for Street Improvements (20%)*	\$ 935,241.01
<b>Total Costs for Street Improvements</b>	<b>\$ 5,611,446.06</b>
Park Improvements	\$ 142,000.00
10% Contingency	\$ 14,200.00
Indirect Costs Park Improvements (20%)*	\$ 31,240.00
<b>Total Costs for Park Improvements</b>	<b>\$ 187,440.00</b>
Storm Sewer Improvements	\$ 638,275.00
Water Improvements	\$ 15,500.00
Sanitary Improvements	\$ 985,328.00
10% Contingency (All Utility Improvements)	\$ 163,910.30
<b>Total Cost for Utility Improvements</b>	<b>\$ 1,803,013.30</b>
Saint Paul Regional Water	\$

Service Watermain Replacement	1,399,640.00
10% Contingency	\$ 139,964.00
Indirect Costs for SPRWS (15%)*	\$ 230,940.61
<b>Total Cost for SPRWS Improvements</b>	<b>\$ 1,770,544.61</b>
Total Improvement Cost	\$ 7,431,838.50
Total Contingency Cost	\$ 743,183.85
Total Indirect Costs*	\$ 1,197,421.62
<b>Total Cost</b>	<b>\$ 9,372,443.97</b>
<b>Rounded Total Cost</b>	<b>\$ 9,372,445.00</b>

<b>Funding Source</b>	<b>Project Total</b>
Municipal Levy	\$ 2,505,723.03
City Assessment (Municipal Levy)	\$ 169,112.07
Park Fund (Municipal Levy)	\$ 187,440.00
<b>Total Municipal Levy</b>	<b>\$ 2,862,275.10</b>
Municipal State Aid Funds	\$ 300,000.00
Residential Assessments (50%)	\$ 2,636,610.96
Utility Fund - Storm Sewer	\$ 702,102.50
Utility Fund - Sanitary	\$



	1,083,860.80
Utility Fund - Water	\$ 17,050.00
Saint Paul Regional Water Services	\$ 1,770,544.61
<b>Total</b>	<b>\$ 9,372,443.97</b>

<b>Assessment Calculation</b>	<b>Total</b>
Total Project Cost	\$ 9,372,443.97
Assessable Amount	\$ 5,611,446.06
Assessment Amount (50% of Assessable Amount)	\$ 2,805,723.03
Total Units - Residential*	343
Assessment - Residential	\$ 2,636,610.96
Total Units - City of Mendota Heights*	22
City Assigned Assessment Amount	\$ 169,112.07
Total Units	365
Unit Assessment (Assessable amount/ XX Units)	\$ 7,686.91
<b>Total Assessment Amount</b>	<b>\$ 7,686.91</b>

\*1 unit = 100 frontage feet

The following tables include total cost estimates for a M&O approach throughout the entire project area and includes a table identifying an equal assessment amount for all residents within the project area under the assumption that all residents within the neighborhood utilize the roadways equally and receive the same benefit, as well as a table identifying split assessment amounts for all residents within the project area based on the pavement rehabilitation approach in which the driveway access stems from:

<b>Project Total</b>	<b>Total Estimated</b>
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	<b>Costs (2025 and 2026)</b>
Street Improvements	\$ 3,422,484.50
10% Contingency	\$ 342,248.45
Indirect Costs for Street Improvements (20%)*	\$ 752,946.59
<b>Total Costs for Street Improvements</b>	<b>\$ 4,517,679.54</b>
Park Improvements	\$ 142,000.00
10% Contingency	\$ 14,200.00
Indirect Costs Park Improvements (20%)*	\$ 31,240.00
<b>Total Costs for Park Improvements</b>	<b>\$ 187,440.00</b>
Storm Sewer Improvements	\$ 638,275.00
Water Improvements	\$ 15,500.00
Sanitary Improvements	\$ 985,328.00
10% Contingency (All Utility Improvements)	\$ 163,910.30
<b>Total Cost for Utility Improvements</b>	<b>\$ 1,803,013.30</b>
Saint Paul Regional Water Service Watermain Replacement	\$ 1,399,640.00
10% Contingency	\$ 139,964.00
Indirect Costs for SPRWS (15%)*	\$ 230,940.61

<b>Total Cost for SPRWS Improvements</b>	<b>\$ 1,770,544.61</b>
Total Improvement Cost	\$ 6,603,227.50
Total Contingency Cost	\$ 660,322.75
Total Indirect Costs*	\$ 1,015,127.20
<b>Total Cost</b>	<b>\$ 8,278,677.45</b>
<b>Rounded Total Cost</b>	<b>\$ 8,278,679.00</b>

<b>Funding Source – Mill &amp; Overlay w/ Equal Assessment Amounts</b>	<b>Project Total</b>
Municipal Levy	\$ 1,958,839.77
City Assessment (Municipal Levy)	\$ 136,149.25
Park Fund (Municipal Levy)	\$ 187,440.00
<b>Total Municipal Levy</b>	<b>\$ 2,282,429.02</b>
Municipal State Aid Funds	\$ 300,000.00
Residential Assessments (50%)	\$ 2,122,690.52
Utility Fund - Storm Sewer	\$ 702,102.50
Utility Fund - Sanitary	\$ 1,083,860.80
Utility Fund - Water	\$ 17,050.00
Saint Paul Regional Water Services	\$ 1,770,544.61

<b>Total</b>	<b>\$ 8,278,677.45</b>
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<b>Assessment Calculation – Mill &amp; Overlay w/ Equal Assessment Amounts</b>	<b>Total</b>
Total Project Cost	\$ 8,278,677.45
Assessable Amount	\$ 4,517,679.54
Assessment Amount (50% of Assessable Amount)	\$ 2,258,839.77
Total Units - Residential*	343
Assessment - Residential	\$ 2,122,690.52
Total Units - City of Mendota Heights*	22
City Assigned Assessment Amount	\$ 136,149.25
Total Units	365
Unit Assessment (Assessable amount/ XX Units)	\$ 6,188.60
<b>Total Assessment Amount</b>	<b>\$ 6,188.60</b>

\*1 unit = 100 frontage feet

<b>Funding Source – Mill &amp; Overlay w/ Split Assessment Amounts</b>	<b>Project Total</b>
Municipal Levy	\$ 1,958,839.77
City Assessment (Municipal Levy)	\$ 82,616.57
Park Fund (Municipal Levy)	\$ 187,440.00
<b>Total Municipal Levy</b>	<b>\$ 2,228,896.34</b>

Municipal State Aid Funds	\$ 300,000.00
Residential Assessments (50%)	\$ 2,176,223.20
Utility Fund - Storm Sewer	\$ 702,102.50
Utility Fund - Sanitary	\$ 1,083,860.80
Utility Fund - Water	\$ 17,050.00
Saint Paul Regional Water Services	\$ 1,770,544.61
<b>Total</b>	<b>\$ 8,278,677.45</b>

<b>Assessment Calculation - Split</b>	<b>Total</b>
Total Project Cost	\$ 8,278,677.45
FDR Assessable Amount	\$ 3,745,987.08
M&O Assessable Amount	\$ 771,692.46
FDR Assessment Amount (50% of Assessable Amount)	\$ 1,872,993.54
M&O Assessment Amount (50% of Assessable Amount)	\$ 385,846.23
FDR Total Units - Residential*	249
M&O Total Units - Residential*	94
Assessment - Residential	\$ 2,176,223.20
FDR Total Units - City of Mendota Heights*	2
M&O Total Units - City of Mendota Heights*	20
City Assigned Assessment Amount	\$ 82,616.57

Total Units	365
FDR Unit Assessment (Assessable amount/ XX Units)	\$ 7,462.13
M&O Unit Assessment (Assessable amount/ XX Units)	\$ 3,384.62
<b>FDR Total Assessment Amount</b>	<b>\$ 7,462.13</b>
<b>M&amp;O Total Assessment Amount</b>	<b>\$ 3,384.62</b>

\*1 unit = 100 frontage feet

The tables above identify a varying total Municipal Levy and total project cost based on the pavement rehabilitation approach and assessment split determination.

It is presumed that the City would secure bonding for the Municipal Levy and Assessment portions of the project. The assessment amount also varies and is equivalent to 48.0% to 49.4% of the bond amount depending on the pavement rehabilitation approach and assessment split determination. Minnesota Statutes Chapter 429 Special Assessment Bond Issue requires that a minimum of 20% of the total bond issue amount be recovered through special assessments. The Assessment Hearing for the project is proposed to take place following construction of the overall project in 2026 and anticipated for the October timeframe for all parcels includes, regardless of construction in 2025 or 2026.

#### **ATTACHMENTS:**

1. Revised Geotechnical Evaluation Excerpt
2. Total Project Cost Alternatives
3. Pavement Rehabilitation Approach Exhibits
4. Existing Watermain Type Exhibit

#### **CITY COUNCIL PRIORITY:**

Inclusive and Responsive Government, Premier Public Services & Infrastructure

November 1, 2024

Project B2402483.00

Luke Moren, PE  
Kimley-Horn and Associates, Inc.  
14800 Galaxie Avenue, Suite 200  
Apple Valley, MN 55124

Re: Addendum 1 to the Revised Geotechnical Evaluation  
Friendly Hills Neighborhood – Cores and GPR  
Multiple Streets  
Mendota Heights, Minnesota

Dear Mr. Moren:

This letter serves as Addendum 1 to our Revised Geotechnical Evaluation Report for this project, dated July 29, 2024. This Addendum addresses updates for pavement rehabilitation for the Friendly Hills Neighborhood streets based off the pavement cores and ground penetrating radar (GPR) collected for the project.

We performed our work in general accordance with our revised proposal for an Addendum to the Revised Geotechnical Evaluation (QTB203836), dated September 25, 2024.

## Background

Braun Intertec completed a Revised Geotechnical Evaluation Report for Kimley-Horn and Associates, Inc. (KHA), titled *Friendly Hills Neighborhood Improvements*, under Braun Intertec project number B2402483. The geotechnical recommendations from that report provided recommendations for the design and construction of pavement rehabilitation and spot utilities (pipe bursting) on several streets in the Friendly Hills Neighborhood.

## New Information

Based on email correspondence with Kimley-Horn and Associates, Inc., we understand the City of Mendota Heights was looking for additional pavement data to provide updated pavement recommendations for street rehabilitation within the Friendly Hills Neighborhood. We understand the City is interested in determining the feasibility of a mill and overlay approach on some or all of the streets.

Our scope of services for this Addendum included the performance of GPR and performance of seventeen (17) pavement cores and hand auger borings through the existing pavement section, with the provision of supplemental geotechnical recommendations.

## Results

### Ground Penetrating Radar Results

GPR was used to approximate pavement layer thicknesses along the various residential road sections for the Friendly Hills Neighborhood project. The data was collected at a nominal 1-foot interval. Where “ground truth” data (cores and hand augers) were performed, the interpreted layers from the GPR scan were compared directly to the measured thicknesses from the cores/hand augers, to validate the accuracy of the GPR analysis.

Based on our analysis using the RADAN 7.0 software program, Table 1 shows summary statistics of the bituminous pavement layer thicknesses, while the Appendix presents the entire results in graphical format. We can provide complete results electronically at your request. Areas where larger variation in measured bituminous thickness can be attributed to potential interference or previous work done on the roadway being observed in the scans.

A second layer (probable aggregate base) was not visible in some of the scans (i.e. it was difficult to identify/discern as a distinct layer due to ambient interference with the GPR signal). A lack of a visible second layer in the GPR scan does not imply an absence of one within the pavement section. Refer to our pavement core and hand auger boring results for pavement and approximate apparent aggregate base depths.

**Table 1. Statistics of GPR-Estimated Pavement Thicknesses**

Segment	Cores (Dir*)	Bituminous Thickness (inches)				
		Average	Standard Deviation	Min.	Max.	10th Percentile
Creek Ave (Dodd Rd – Aztec Ln)	PC-1 (WB)	3.4	0.5	2.8	4.4	3.0
Fox Pl (Creek Ave – Aztec Ln)	PC-2 (NB)	3.3	0.4	2.4	4.7	2.8
Hokah Ave (Dodd Rd – Aztec Ln)	PC-3 (EB)	3.2	0.7	2.5	4.7	2.8
Pagel Rd (Dodd Rd – Havenview Ct)	PC-15 (SB)	3.6	0.5	2.3	6.0	3.1



Segment	Cores (Dir*)	Bituminous Thickness (inches)				
		Average	Standard Deviation	Min.	Max.	10th Percentile
Pueblo Dr (Keokuk Ln – Cul-de-sac)	PC-9 (NB)	3.4	0.9	2.7	5.6	3.0
Apache St (Decorah Ln – Pueblo Ln)	PC-10 (NB)	3.7	0.6	2.9	5.3	3.1
	PC-8 (SB)					
Navajo Ln (Pontiac Pl – Pueblo Ln)	PC-6	3.6	0.6	2.7	5.0	3.1
Decorah Ln (Apache St – Huber Dr)	PC-5 (WB)	4.4	1.0	2.5	7.1	3.4
	PC-14 (EB)					
Ocala Ln (Pontiac Pl – Decorah Ln)	PC-4 (SB)	3.6	0.8	2.5	6.2	2.9
Cheyenne Ln (Pontiac Pl – Huber Dr)	PC-12 (WB)	4.2	0.6	3.4	5.7	3.8
Hazel Ct/Havenview Ct (Cul-de-sac to cul-de-sac)	PC-16 (WB)	3.9	0.8	3.0	6.2	3.1
Pueblo Ln (Mohican Ln – Decorah Ln)	PC-7 (SB)	3.6	0.8	2.6	7.1	3.0
Ocala Ct (Ocala Ln – Cul-de-sac)	---**	3.8	0.7	3.0	5.0	3.3
Nashua Ln (Decorah Ln – Cheyenne Ln)	PC-13 (SB)	3.5	0.5	2.5	5.3	3.0
Apache Ln (Cul-de-sac – Apache Ct)	PC-17 (EB)	4.5	1.1	2.5	7.4	3.5
Apache Ct (Cul-de-sac – Huber Dr)	---**	3.3	0.6	1.8	4.9	2.7
Mohican Ln (Pueblo Dr – Cul-de-sac)	PC-11 (NB)	3.6	0.8	2.1	7.1	3.0

\*Travel Direction (Dir) the pavement cores were performed in.

\*\*Pavement core was not performed on this specified segment.

### Pavement Core and Hand Auger Boring Results

We performed pavement coring and hand auger borings at 17 locations along the various residential segments on the project, as shown in the sketch in the Appendix. Hand auger borings were also performed through the aggregate base layer and into the shallow subgrade in core locations.

The pavement cores and hand auger borings were used to measure pavement layer thicknesses for the bituminous and aggregate base layers, to assess bituminous conditions, and verify the shallow subgrade soil type. The results are provided in Table 2. Photos of the pavement cores and apparent aggregate base, as well as shallow subgrade soils encountered are also included in the Appendix.

**Table 2. Pavement Core and Hand Auger Boring Results**

Core Number	Location	Bituminous Thickness (inches)	Apparent Aggregate Base Thickness (inches)	Total Thickness (inches)	Core Condition
PC-1	Creek Ave	3 1/2	5	8 1/2	Low to moderate severity stripping; Debonding at 2 inches below surface.
PC-2	Fox Pl	3 1/4	4	7 1/4	Low severity stripping.
PC-3	Hokah Ave	4	5	9	Moderate to high severity stripping throughout.
PC-4	Ocala Ln	3 3/4	7	10 3/4	Good core condition.
PC-5	Decorah Ln	5	7	12	Upper 1 1/2 inches good condition; Moderate to high severity stripping in bottom 3 1/2 inches.
PC-14		5 3/4	11	16 3/4	Good core condition.
PC-6	Navajo Ln	4 1/2	8	12 1/2	Highly deteriorated; Debonding at 2 1/2 inches.
PC-7	Pueblo Ln	3	7	10	High severity stripping throughout.
PC-9	Pueblo Dr	3	6	9	Highly deteriorated; debonding at 1 1/2 inches.
PC-8	Apache St	3	6	9	Low to moderate deterioration.
PC-10		4	7	11	Moderate to high severity stripping; surface deterioration.
PC-11	Mohican Ln	4	5	9	Surface deterioration; low core deterioration.
PC-12	Cheyenne Ln	4 1/2	8	12 1/2	Good core condition.
PC-13	Nashua Ln	3	4	7	Highly deteriorated.
PC-15	Pagel Rd	3 1/2	7	10 1/2	Low to moderate severity stripping.
PC-16	Havenview Ct/Hazel Ct	3 1/4	7	10 1/4	Moderate to high core deterioration; debonding at 1 1/2 inches.
PC-17	Apache Ln	3 1/2	5	8 1/2	Highly deteriorated.

As noted in the table, most of the cores were observed to have underlying stripping and even deterioration. Stripping is the deterioration of the asphalt/aggregate bond in a bituminous pavement due to the presence of moisture. Stripping often begins at the bottom of the bituminous layer, where it may be in contact with saturated aggregate or soil and proceeds upward.

Low-severity stripping is common in bituminous pavements over time. However, those that have stripped to moderate to severe degrees would typically not be considered for rehabilitation methods that may leave any damaged portions of the pavement in place, such as mill-and-overlay.

## **Pavement Recommendations**

The results from the GPR, pavement cores and hand auger borings collected for the Friendly Hills Neighborhood provides additional information regarding the in-situ pavement section (bituminous and apparent aggregate base). The results indicate the pavement section is generally in fair to poor condition. Our pavement recommendations for the Friendly Hills Neighborhood are unchanged from the Revised Geotechnical Report.

However, we understand the City is interested in determining the feasibility of a mill and overlay approach on some or all of the streets. We have provided recommendations for mill and overlay for the City to consider on some of the streets, with the understanding that pavement life expectancy should be anticipated to be reduced as compared to full depth reclamation.

### **Mill-and-Overlay**

If the City elects using a mill and overlay option, the streets listed below could be potential candidates with the understanding that anticipated pavement life expectancy should be limited to 12 to 15 years:

- Creek Avenue
- Decorah Lane
- Pueblo Lane
- Apache Street
- Mohican Lane/Court
- Pagel Road

We recommend milling these pavements, to a depth of about 2 inches, in accordance with MnDOT Specification 2232.

In addition, the following streets could be potential candidates for an edge-mill and overlay option, with anticipated pavement life expectancy of 10 to 12 years:

- Fox Place
- Hokah Avenue
- Ocala Lane
- Navajo Lane
- Cheyenne Lane

Following the milling, place a 2-inch bituminous overlay meeting bituminous wear course mix SPWEA340B (MnDOT Material Specification 2360). Pavement depth can vary between the boring and core locations. The contractor may need to adjust the mill depth to account for unexpected conditions such as areas of thin pavement.

The surface condition prior to milling can indicate where deeper repairs to the milled surface may be necessary to improve the life of the overlay. This includes distresses such as severe longitudinal and transverse cracking, alligator/fatigue cracking of any severity, potholes, edge cracking, and similar failures. MnDOT defines these distresses in their surface rating procedure as follows:

- High-severity transverse cracking: Any crack running transverse to the centerline of the roadway with significant adjacent random cracking (12 inches or more apart), have large areas of spalling, missing material and/or potholes.
- High-severity longitudinal cracking: Any crack running parallel to the centerline of the roadway with significant adjacent random cracking (12 inches or more apart), large areas of spalling, missing material and/or potholes.
- Alligator cracking: A series of interconnected cracks forming many-sided, sharp-angled pieces, 6 inches or less in size, typically located in the wheel paths and under concentrated traffic loads.

We recommend an experienced engineer walk the milled surface to delineate areas for these repairs based on conditions exposed by the milling process. We recommend performing the full-depth mill to at least 1-foot beyond the edge of the visible distresses where present.

## **Procedures**

### **GPR Data Collection**

GPR data was collected on October 15, 2024. GPR collection occurred at posted speed limits and data was recorded continuously along the pavement to a depth of up to 2 feet. Analysis of this data provides a continuous estimate of layer thickness for identifiable layers.

Scans of the pavement were collected according to GSSI, Inc. (manufacturer) SIR-20 processor settings at a specified interval of approximately one scan per lineal foot in the outer wheel path. A calibration file, required for data post-processing, was collected at the onset of testing. The RoadScan system from GSSI, Inc. allows for the entry of user marks to note events. This capability was used to mark and tie in core locations. Distance along the pavement is measured using a Distance Measuring Instrument (DMI).

### **GPR Analysis**

Data collected by the GPR unit was returned to our office and analyzed to estimate the pavement thickness. Pavement layer interpretation was accomplished using RADAN 7.0, a software package included with the GSSI RoadScan system. The software includes tools to aid in delineating pavement layer transitions and automatically calculates their depths from the pavement surface using the calibration file(s) collected prior to or following testing.

Where “ground-truth” data (cores and hand augers) were performed, the interpreted layers from the GPR scan were compared directly to the measured thicknesses from the borings to validate the accuracy of the GPR analysis.

### **Pavement Coring and Hand Auger Borings**

We performed pavement cores on October 15, 2024. Exploration locations were selected based on GPR results and were conducted using a 4-inch core barrel. The bituminous pavement was repaired with a cold-mix bituminous patch immediately after coring.

The cores were measured to obtain approximate bituminous thicknesses, and their material conditions were noted based on visual observation. A sample of underlying base material was obtained at each of the exploration locations and was sent to our laboratory for review by a geotechnical engineer.

## Remarks

This Addendum should be attached to and considered a part of our Revised Geotechnical Evaluation Report. With the exception of any results or recommendations changed by this Addendum, the information contained in our Revised Geotechnical Evaluation Report remains unchanged.

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

If you have any questions about this Addendum, please contact Zach Semlak at 651.788.5071 ([zsemlak@braunintertec.com](mailto:zsemlak@braunintertec.com)) or Chris Kufner at 651.248.2850 ([ckufner@braunintertec.com](mailto:ckufner@braunintertec.com)).

Sincerely,

BRAUN INTERTEC CORPORATION



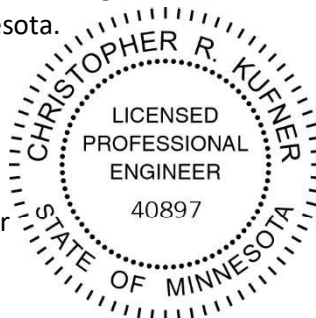
Zachary T. Semlak  
Staff Engineer

### Professional Certification:

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



Christopher R. Kufner, PE  
Associate Director, Principal Engineer  
License Number: 40897  
November 1, 2024



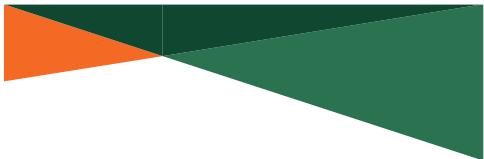
### Attachments:

Boring, Pavement Coring, and GPR Testing Location Sketch  
Ground Penetrating Radar Data (Graphical Plots)  
Photographic Core and Apparent Aggregate Base Log





- Pavement Core Location
- Sanitary Sewer Soil Borings
- Watermain Soil Borings
- Denotes GPR Testing was Performed



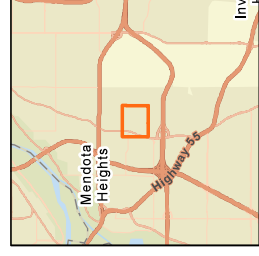
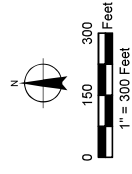
Drawing Information	
Project No:	B2402483.00
Drawing No:	ZS
Boring Coring GPR Sketch	
Drawn By:	6/27/2024 ZTS
Checked By:	ZTS
Last Modified:	10/29/2024
Project Information	
Mendota Heights - Friendly Hills Neighborhood Improvements	
Multiple Streets	
Mendota Heights, Minnesota	

**Boring, Pavement Coring, and GPR Testing Location Sketch**





- Pavement Core Location
- FDR Soil Borings
- Sanitary Sewer Soil Borings
- Watermain Soil Borings
- Denotes GPR Testing was Performed



Drawing Information

Project No:  
B2402483.000

Drawing No:  
ZS

Boring Coring GPR Sketch

Drawn By:  
6/27/2024

Checked By:  
ZTS

Last Modified:  
10/29/2024

Project Information

Mendota Heights

- Friendly

Hills Neighborhood

Improvements

Multiple Streets

Mendota Heights,

Minnesota

Boring,  
Pavement Coring,  
and GPR Testing  
Location Sketch

Sheet:  
2 of 2



ENGINEER'S OPINION OF PROBABLE COST - ALL FOR ALTERNATIVE																							
203 PROJECT AREA																							
ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT COST	TOTAL COST	ROADWAY (ASSESSABLE)		FOUR LANE (NON-ASSESSABLE)		WATERMAIN (NON-ASSESSABLE)		SEWER (NON-ASSESSABLE)		STORM SEWER (NON-ASSESSABLE)		WATERMAIN (NON-ASSESSABLE)		SEWER (NON-ASSESSABLE)		STORM SEWER (NON-ASSESSABLE)		TOTAL PROJECT AREA	
						ESTIMATED QUANTITY	COST	ESTIMATED QUANTITY	COST	ESTIMATED QUANTITY	COST	ESTIMATED QUANTITY	COST	ESTIMATED QUANTITY	COST	ESTIMATED QUANTITY	COST	ESTIMATED QUANTITY	COST	ESTIMATED QUANTITY	COST	ESTIMATED QUANTITY	COST
203.001	CONCRETE	CU YD	1	\$125,000.00	\$125,000.00	0.3	\$125,000.00	0.1	\$12,500.00	0.1	\$12,500.00	0.1	\$12,500.00	0.1	\$12,500.00	0.1	\$12,500.00	0.1	\$12,500.00	0.1	\$12,500.00	0.1	\$12,500.00
203.002	CONCRETE	CU YD	2	\$250,000.00	\$500,000.00	0.6	\$250,000.00	0.2	\$25,000.00	0.2	\$25,000.00	0.2	\$25,000.00	0.2	\$25,000.00	0.2	\$25,000.00	0.2	\$25,000.00	0.2	\$25,000.00	0.2	\$25,000.00
203.003	CONCRETE	CU YD	3	\$375,000.00	\$750,000.00	0.9	\$375,000.00	0.3	\$37,500.00	0.3	\$37,500.00	0.3	\$37,500.00	0.3	\$37,500.00	0.3	\$37,500.00	0.3	\$37,500.00	0.3	\$37,500.00	0.3	\$37,500.00
203.004	CONCRETE	CU YD	4	\$500,000.00	\$1,000,000.00	1.2	\$500,000.00	0.4	\$50,000.00	0.4	\$50,000.00	0.4	\$50,000.00	0.4	\$50,000.00	0.4	\$50,000.00	0.4	\$50,000.00	0.4	\$50,000.00	0.4	\$50,000.00
203.005	CONCRETE	CU YD	5	\$625,000.00	\$1,250,000.00	1.5	\$625,000.00	0.5	\$62,500.00	0.5	\$62,500.00	0.5	\$62,500.00	0.5	\$62,500.00	0.5	\$62,500.00	0.5	\$62,500.00	0.5	\$62,500.00	0.5	\$62,500.00
203.006	CONCRETE	CU YD	6	\$750,000.00	\$1,500,000.00	1.8	\$750,000.00	0.6	\$75,000.00	0.6	\$75,000.00	0.6	\$75,000.00	0.6	\$75,000.00	0.6	\$75,000.00	0.6	\$75,000.00	0.6	\$75,000.00	0.6	\$75,000.00
203.007	CONCRETE	CU YD	7	\$875,000.00	\$1,750,000.00	2.1	\$875,000.00	0.7	\$87,500.00	0.7	\$87,500.00	0.7	\$87,500.00	0.7	\$87,500.00	0.7	\$87,500.00	0.7	\$87,500.00	0.7	\$87,500.00	0.7	\$87,500.00
203.008	CONCRETE	CU YD	8	\$1,000,000.00	\$2,000,000.00	2.4	\$1,000,000.00	0.8	\$100,000.00	0.8	\$100,000.00	0.8	\$100,000.00	0.8	\$100,000.00	0.8	\$100,000.00	0.8	\$100,000.00	0.8	\$100,000.00	0.8	\$100,000.00
203.009	CONCRETE	CU YD	9	\$1,125,000.00	\$2,250,000.00	2.7	\$1,125,000.00	0.9	\$112,500.00	0.9	\$112,500.00	0.9	\$112,500.00	0.9	\$112,500.00	0.9	\$112,500.00	0.9	\$112,500.00	0.9	\$112,500.00	0.9	\$112,500.00
203.010	CONCRETE	CU YD	10	\$1,250,000.00	\$2,500,000.00	3.0	\$1,250,000.00	1.0	\$125,000.00	1.0	\$125,000.00	1.0	\$125,000.00	1.0	\$125,000.00	1.0	\$125,000.00	1.0	\$125,000.00	1.0	\$125,000.00	1.0	\$125,000.00
203.011	CONCRETE	CU YD	11	\$1,375,000.00	\$2,750,000.00	3.3	\$1,375,000.00	1.1	\$137,500.00	1.1	\$137,500.00	1.1	\$137,500.00	1.1	\$137,500.00	1.1	\$137,500.00	1.1	\$137,500.00	1.1	\$137,500.00	1.1	\$137,500.00
203.012	CONCRETE	CU YD	12	\$1,500,000.00	\$3,000,000.00	3.6	\$1,500,000.00	1.2	\$150,000.00	1.2	\$150,000.00	1.2	\$150,000.00	1.2	\$150,000.00	1.2	\$150,000.00	1.2	\$150,000.00	1.2	\$150,000.00	1.2	\$150,000.00
203.013	CONCRETE	CU YD	13	\$1,625,000.00	\$3,250,000.00	3.9	\$1,625,000.00	1.3	\$162,500.00	1.3	\$162,500.00	1.3	\$162,500.00	1.3	\$162,500.00	1.3	\$162,500.00	1.3	\$162,500.00	1.3	\$162,500.00	1.3	\$162,500.00
203.014	CONCRETE	CU YD	14	\$1,750,000.00	\$3,500,000.00	4.2	\$1,750,000.00	1.4	\$175,000.00	1.4	\$175,000.00	1.4	\$175,000.00	1.4	\$175,000.00	1.4	\$175,000.00	1.4	\$175,000.00	1.4	\$175,000.00	1.4	\$175,000.00
203.015	CONCRETE	CU YD	15	\$1,875,000.00	\$3,750,000.00	4.5	\$1,875,000.00	1.5	\$187,500.00	1.5	\$187,500.00	1.5	\$187,500.00	1.5	\$187,500.00	1.5	\$187,500.00	1.5	\$187,500.00	1.5	\$187,500.00	1.5	\$187,500.00
203.016	CONCRETE	CU YD	16	\$2,000,000.00	\$4,000,000.00	4.8	\$2,000,000.00	1.6	\$200,000.00	1.6	\$200,000.00	1.6	\$200,000.00	1.6	\$200,000.00	1.6	\$200,000.00	1.6	\$200,000.00	1.6	\$200,000.00	1.6	\$200,000.00
203.017	CONCRETE	CU YD	17	\$2,125,000.00	\$4,250,000.00	5.1	\$2,125,000.00	1.7	\$212,500.00	1.7	\$212,500.00	1.7	\$212,500.00	1.7	\$212,500.00	1.7	\$212,500.00	1.7	\$212,500.00	1.7	\$212,500.00	1.7	\$212,500.00
203.018	CONCRETE	CU YD	18	\$2,250,000.00	\$4,500,000.00	5.4	\$2,250,000.00	1.8	\$225,000.00	1.8	\$225,000.00	1.8	\$225,000.00	1.8	\$225,000.00	1.8	\$225,000.00	1.8	\$225,000.00	1.8	\$225,000.00	1.8	\$225,000.00
203.019	CONCRETE	CU YD	19	\$2,375,000.00	\$4,750,000.00	5.7	\$2,375,000.00	1.9	\$237,500.00	1.9	\$237,500.00	1.9	\$237,500.00	1.9	\$237,500.00	1.9	\$237,500.00	1.9	\$237,500.00	1.9	\$237,500.00	1.9	\$237,500.00
203.020	CONCRETE	CU YD	20	\$2,500,000.00	\$5,000,000.00	6.0	\$2,500,000.00	2.0	\$250,000.00	2.0	\$250,000.00	2.0	\$250,000.00	2.0	\$250,000.00	2.0	\$250,000.00	2.0	\$250,000.00	2.0	\$250,000.00	2.0	\$250,000.00
203.021	CONCRETE	CU YD	21	\$2,625,000.00	\$5,250,000.00	6.3	\$2,625,000.00	2.1	\$262,500.00	2.1	\$262,500.00	2.1	\$262,500.00	2.1	\$262,500.00	2.1	\$262,500.00	2.1	\$262,500.00	2.1	\$262,500.00	2.1	\$262,500.00
203.022	CONCRETE	CU YD	22	\$2,750,000.00	\$5,500,000.00	6.6	\$2,750,000.00	2.2	\$275,000.00	2.2	\$275,000.00	2.2	\$275,000.00	2.2	\$275,000.00	2.2	\$275,000.00	2.2	\$275,000.00	2.2	\$275,000.00	2.2	\$275,000.00
203.023	CONCRETE	CU YD	23	\$2,875,000.00	\$5,750,000.00	6.9	\$2,875,000.00	2.3	\$287,500.00	2.3	\$287,500.00	2.3	\$287,500.00	2.3	\$287,500.00	2.3	\$287,500.00	2.3	\$287,500.00	2.3	\$287,500.00	2.3	\$287,500.00
203.024	CONCRETE	CU YD	24	\$3,000,000.00	\$6,000,000.00	7.2	\$3,000,000.00	2.4	\$300,000.00	2.4	\$300,000.00	2.4	\$300,000.00	2.4	\$300,000.00	2.4	\$300,000.00	2.4	\$300,000.00	2.4	\$300,000.00	2.4	\$300,000.00
203.025	CONCRETE	CU YD	25	\$3,125,000.00	\$6,250,000.00	7.5	\$3,125,000.00	2.5	\$312,500.00	2.5	\$312,500.00	2.5	\$312,500.00	2.5	\$312,500.00	2.5	\$312,500.00	2.5	\$312,500.00	2.5	\$312,500.00	2.5	\$312,500.00
203.026	CONCRETE	CU YD	26	\$3,250,000.00	\$6,500,000.00	7.8	\$3,250,000.00	2.6	\$325,000.00	2.6	\$325,000.00	2.6	\$325,000.00	2.6	\$325,000.00	2.6	\$325,000.00	2.6	\$325,000.00	2.6	\$325,000.00	2.6	\$325,000.00
203.027	CONCRETE	CU YD	27	\$3,375,000.00	\$6,750,000.00	8.1	\$3,375,000.00	2.7	\$337,500.00	2.7	\$337,500.00	2.7	\$337,500.00	2.7	\$337,500.00	2.7	\$337,500.00	2.7	\$337,500.00	2.7	\$337,500.00	2.7	\$337,500.00
203.028	CONCRETE	CU YD	28	\$3,500,000.00	\$7,000,000.00	8.4	\$3,500,000.00	2.8	\$350,000.00	2.8	\$350,000.00	2.8	\$350,000.00	2.8	\$350,000.00	2.8	\$350,000.00	2.8	\$350,000.00	2.8	\$350,000.00	2.8	\$350,000.00
203.029	CONCRETE	CU YD	29	\$3,625,000.00	\$7,250,000.00	8.7	\$3,625,000.00	2.9	\$362,500.00	2.9	\$362,500.00	2.9	\$362,500.00	2.9	\$362,500.00	2.9	\$362,500.00	2.9	\$362,500.00	2.9	\$362,500.00	2.9	\$362,500.00
203.030	CONCRETE	CU YD	30	\$3,750,000.00	\$7,500,000.00	9.0	\$3,750,000.00	3.0	\$375,000.00	3.0	\$375,000.00	3.0	\$375,000.00	3.0	\$375,000.00	3.0	\$375,000.00	3.0	\$375,000.00	3.0	\$375,000.00	3.0	\$375,000.00
203.031	CONCRETE	CU YD	31	\$3,875,000.00	\$7,750,000.00	9.3	\$3,875,000.00	3.1	\$387,500.00	3.1	\$387,500.00	3.1	\$387,500.00	3.1	\$387,500.00	3.1	\$387,500.00	3.1	\$387,500.00	3.1	\$387,500.00	3.1	\$387,500.00
203.032	CONCRETE	CU YD	32	\$4,000,000.00	\$8,000,000.00	9.6	\$4,000,000.00	3.2	\$400,000.00	3.2	\$400,000.00	3.2	\$400,000.00	3.2	\$400,000.00	3.2	\$400,000.00	3.2	\$400,000.00	3.2	\$400,000.00	3.2	\$400,000.00
203.033	CONCRETE	CU YD	33	\$4,125,000.00	\$8,250,000.00	9.9	\$4,125,000.00	3.3	\$412,500.00	3.3	\$412,500.00	3.3	\$412,500.00	3.3	\$412,500.00	3.3	\$412,500.00	3.3	\$412,500.00	3.3	\$412,500.00	3.3	\$412,500.00
203.034	CONCRETE	CU YD	34	\$4,250,000.00	\$8,500,000.00	10.2	\$4,250,000.00	3.4	\$425,000.00	3.4	\$425,000.00	3.4	\$425,000.00	3.4	\$425,000.00	3.4	\$425,000.00	3.4	\$425,000.00	3.4	\$425,000.00	3.4	\$425,000.00
203.035	CONCRETE	CU YD	35	\$4,375,000.00	\$8,750,000.00	10.5	\$4,375,000.00	3.5	\$437,500.00	3.5	\$437,500.00	3.5	\$437,500.00	3.5	\$437,500.00	3.5	\$437,500.00	3.5	\$437,500.00	3.5	\$437,500.00	3.5	\$437,500.00
203.036	CONCRETE	CU YD	36	\$4,500,000.00	\$9,000,000.00	10.8	\$4,500,000.00	3.6	\$450,000.00	3.6	\$450,000.00	3.6	\$450,000.00	3.6	\$450,000.00	3.6	\$450,000.00	3.6	\$450				



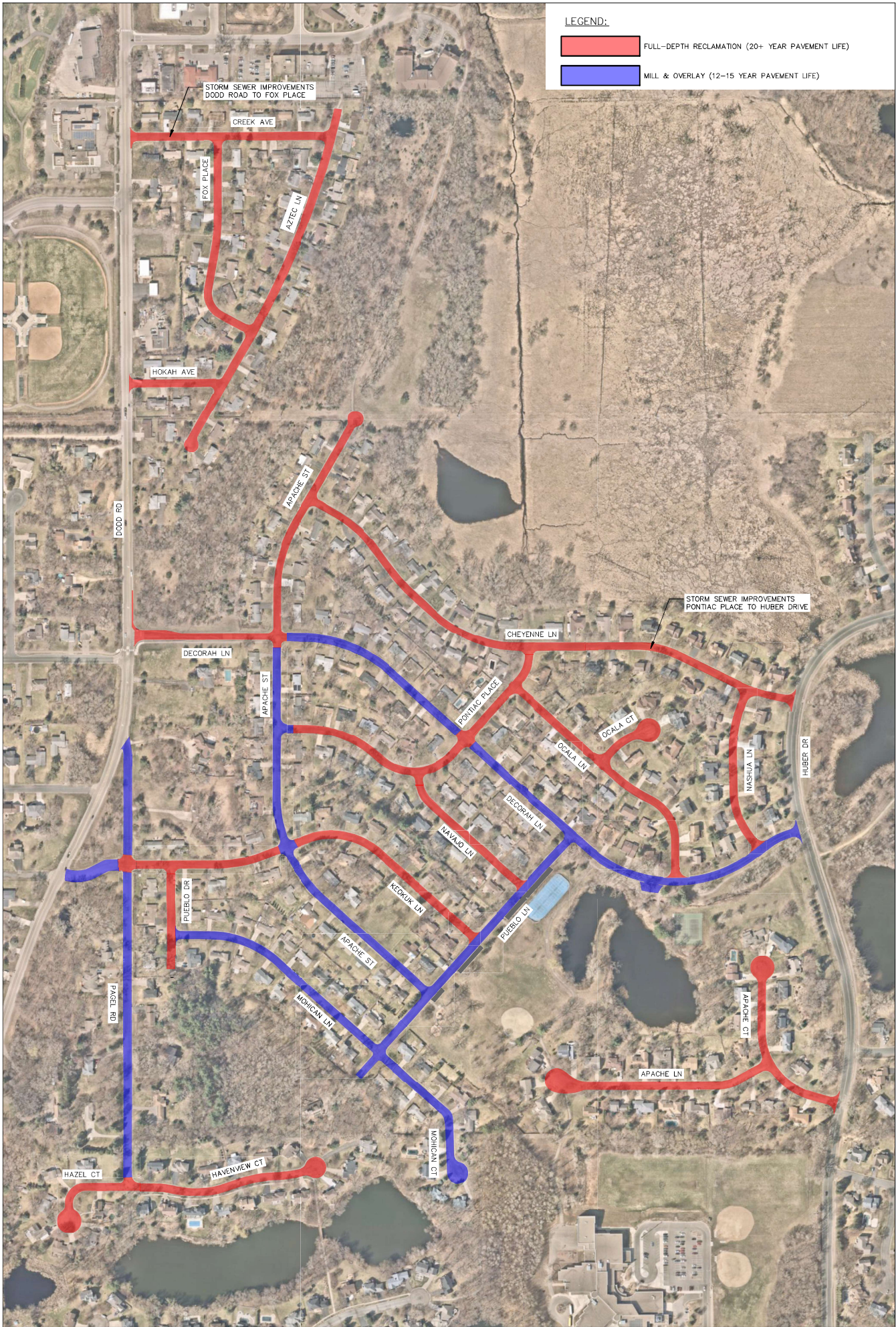
ENGINEERING DIVISION OF PROBABLE COST - MILL OVERLAY ALTERNATIVE

2025 PROJECT AREA

ITEM NO.	ITEM DESCRIPTION	UNIT	ESTIMATED QUANTITY	UNIT COST	TOTAL COST	PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING AREA OVERLAY (ASPHALT)		PAVING 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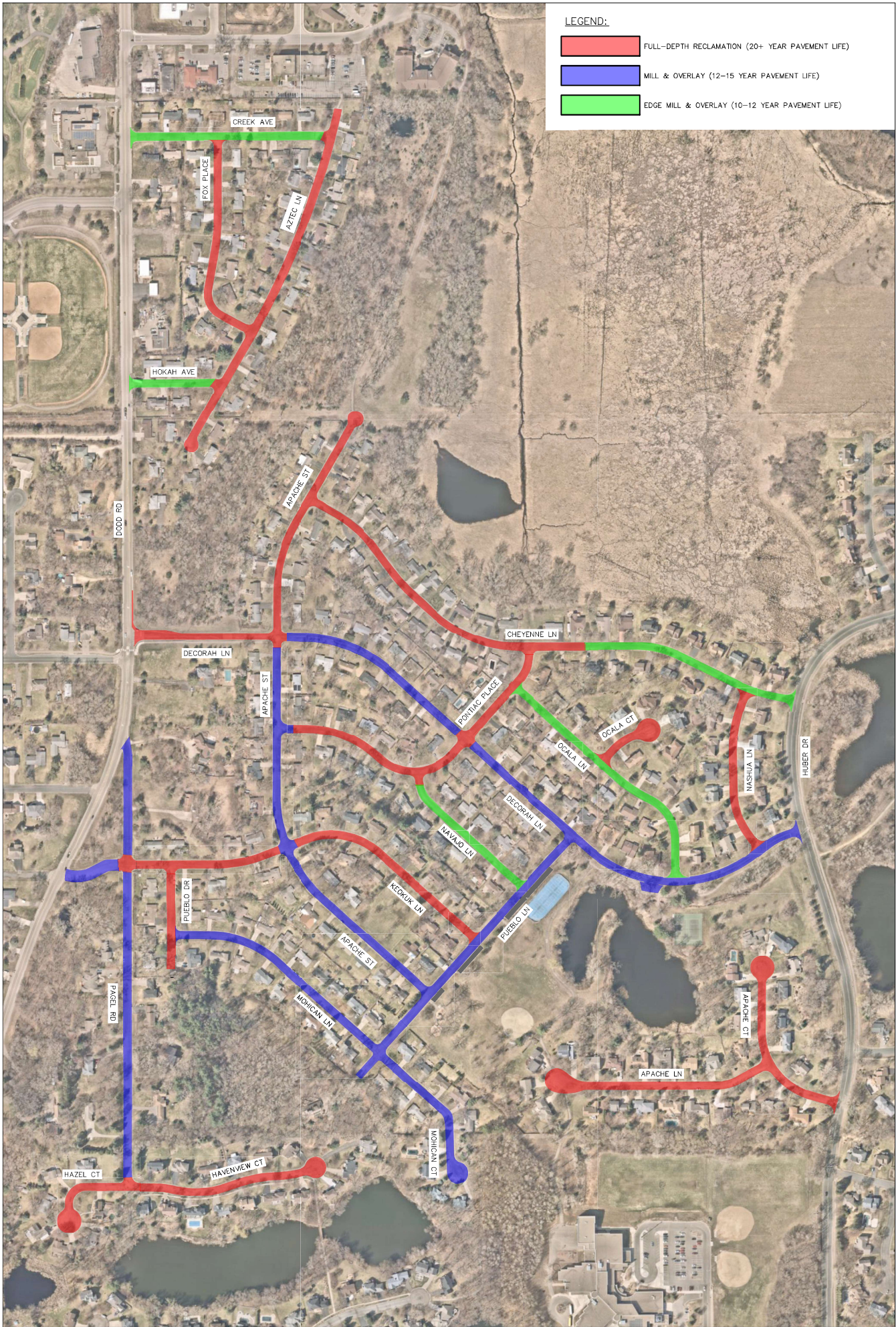


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# Friendly Hills Neighborhood Existing Watermain Type

Date: 11/13/2024



0 410  
SCALE IN FEET



## Legend

- Existing Cast Iron Watermain
- Existing Ductile Iron Watermain

