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Feasibility Report for

2021 Pavement Management Project

City of Cottage Grove, Minnesota

December 2020

Submitted by:
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December 2, 2020

Honorable Mayor and City Council
City of Cottage Grove
12800 Ravine Parkway South
Cottage Grove, MN 55016

RE: 2021 Pavement Management Project

BMI Project No. N14.122421

Honorable Mayor and City Council Members,

Enclosed for your review is the 2021 Pavement Management Project Feasibility Report. The project scope includes street rehabilitation and utility repairs within the Pine Meadow, Sandy Hills, East Meadow Cliff neighborhoods and Jamaica Avenue from 80th Street to Indian Boulevard, as identified in this report.

This report describes the improvements necessary within the project area. Cost estimates for the proposed improvements are presented in the Report.

We would be happy to discuss this report at your convenience. Please contact me at 651-968-7674 if you have any questions.

Sincerely,

BOLTON & MENK, INC.

Michael Boex, PE

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Certification

Feasibility Report

for

2021 Pavement Management Report

City of Cottage Grove, Minnesota

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.

By: ______________________________

Michael Boex, PE
License No. 44576
Bolton & Menk, Inc.

Date: December 2, 2020

INTRODUCTION

The Pine Meadows, Sandy Hills, and East Meadow Cliff neighborhoods, along with Jamaica Avenue from 80th Street to Indian Boulevard, have been identified as candidates for rehabilitation during the 2021 construction season as a part of the City of Cottage Grove's ongoing roadway rehabilitation program. The City Council authorized preparation of this report to determine the feasibility of rehabilitating these streets as a part of the 2021 Pavement Management Project.

Pine Meadows 2nd, 4th, and 5th Additions and Sandy Hills 7th and 8th Additions are located south of 85th Street (including 85th between Johansen Avenue and CSAH 19), approximately 280 feet west of Keats Avenue (CSAH 19), and east of Jewel Lane, as shown on Figure 1.

The East Meadow Cliff neighborhood is located south of 80th Street and east of Jamaica Avenue, as shown on Figure 1.

Jamaica Avenue, between 80th Street and Indian Boulevard, is also included in this project and is shown on Figure 1.

There are 11 residential streets within these neighborhoods totaling approximately 14,000 linear feet, plus approximately 4,000 linear feet of an urban collector roadway.

The purpose of this report is to further evaluate the work required for this street rehabilitation project, to provide an estimate of cost, and to establish a method of cost allocation or assessment in order to determine the physical and economic feasibility.

This feasibility report examines the following street segments:

Pine Meadows 2nd, 4th and 5th Additions

1. 85th Street, from approximately 280 feet west of Keats Avenue to Johansen Avenue (9603 – 9998)
2. Jorgensen Avenue, from 85th Street to Joliet Avenue (8506 – 8749)
3. Joliet Avenue, from Jorgensen Avenue to the end of the street (8536 – 8750)
4. Jorgensen Bay (8531 – 8571)

Sandy Hills 7th and 8th Additions

1. Johansen Avenue, from 85th Street to the end of the street
2. Jody Circle, west of Johansen Avenue (8502 – 8896)
3. 87th Street, from Jody Circle to Johansen Avenue
4. Hillside Trail, from Jody Circle to Johansen Avenue, including the segment east of Johansen Avenue

East Meadow Cliff Neighborhood

1. Jefferey Avenue, from 80th Street to the cul-de-sac (8001 – 8305)
2. Upper 81st Street, from Jeffery Avenue to approximately 285 feet west of Jefferey Avenue (9055 – 9071)
3. Jeffery Lane, west of Jefferey Avenue (8044 – 8228)

Jamaica Avenue

1. Between Indian Boulevard and 80th Street

If the City decides to proceed with the proposed street and utility improvements as described in this report, it is anticipated construction would begin in 2021 as shown in the detailed project schedule found on page 13.

EXISTING CONDITIONS – RESIDENTIAL

STREETS

The streets within these neighborhoods are urban-residential and are generally 32 feet wide (from face of curb to face of curb) with D412 concrete curb and gutter; Johansen Avenue is 40-feet wide (from face of curb to face of curb). The streets in the East Meadow Cliff neighborhood were constructed in 1991. The streets in the Pine Meadows 2nd, 4th and 5th Additions were constructed between 1992 and 1996. The in-place pavement section of streets in the East Meadow Cliff and Pine Meadows neighborhoods were designed to be approximately 3-inches of bituminous over 6-inches of aggregate base. The streets in Sandy Hills 7th and 8th Additions were constructed between 1997 and 1998. The in-place pavement section of these streets was designed to be approximately 3.5-inches of bituminous over 6-inches of aggregate base. Figure 2 depicts the age of the streets.

A visual inspection was performed in 2020 to evaluate the pavement surface conditions in the three residential neighborhoods. The inspection determined the pavement conditions are considered “Poor” to “Fair” and generally have major distress. Figure 4 depicts the pavement condition within the neighborhoods, and Appendix A contains some representative photos of the existing pavement condition. In addition, there are sections of existing curb and gutter that have settled, cracked, or have other defects that will require replacement.

Pothole repairs and skin patch overlays have been performed to keep the road in a drivable and relatively smooth condition. A significant amount of street maintenance funds have been used or are anticipated in upcoming maintenance cycles in these areas.

Past experience on recent projects has shown that the pavement cracking pattern on streets of this general age and condition range extends well below the surface. In fact, the previous seal coat can help mask the cracking in some instances.

It should be noted that the visual surface rating is a preliminary indicator of condition and potential rehabilitation techniques; it should not solely dictate the maintenance or rehabilitation strategy. Factors such as age, traffic projections, pavement strength, and pavement structure condition should also be considered.

Coring of the pavement was performed to determine the thickness of the existing street section and evaluate pavement condition. The core locations are shown on Figure 2 and photos of the pavement cores can be seen in Appendix E. From the cores, it can be seen that the average section in the neighborhoods consists of approximately 3.81 inches of bituminous over 6.75 inches of base, as shown in Table 1. The thicker than expected bituminous is in part due to multiple seal coat applications or skin patch overlays, as well as difficulty in evaluating bituminous depths from the stripped cores.

Table 1: Residential Streets Existing Street Section				
No.	Location		Bituminous (in)	Aggregate Base (in)
	Street	Neighborhood		
C-1	Upper 81st Street	East Meadow Cliff	3.50[2]	6.50
C-2	Jeffery Lane	East Meadow Cliff	3.75[1]	8.25
C-3	Jeffery Avenue	East Meadow Cliff	4.00[2]	8.75
C-4	Jeffery Avenue	East Meadow Cliff	4.00[1]	7.50
C-05	85th Street	Pine Meadows 2nd Addition	4.10[1]	5.75
C-06	85th Street	Pine Meadows 4th Addition	4.50[2]	3.75
C-07	85th Street	Pine Meadows 4th Addition	3.50[1]	7.25
C-08	Jorgensen Avenue	Pine Meadows 5th Addition, Phase 1	3.80[2]	9.25
C-09	Joliet Avenue	Pine Meadows 5th Addition, Phase 1	3.10	8.25
C-10	Jorgensen Avenue	Pine Meadows 5th Addition, Phase 2	3.60	2.50
C-11	Jorgensen Avenue	Pine Meadows 5th Addition, Phase 2	4.00[1]	4.50
C-12	Jody Circle	Sandy Hills 7th Addition	4.40[1]	5.25
C-13	Johansen Avenue	Sandy Hills 7th Addition	4.00[1]	9.00
C-14	Hillside Trail	Sandy Hills 8th Addition	3.00[1]	7.25
C-15	Jody Circle	Sandy Hills 8th Addition	3.90[1]	7.50
Average			**3.81**	**6.75**

1. Stripping present (Varying severity)
2. Severe stripping present (Core was broken upon extraction)

Thirteen of the fifteen cores within the residential neighborhoods displayed some degradation due to asphalt stripping. Stripping is generally described as the separation of aggregate from the asphalt due to moisture. The stripping found degrades the strength and durability of the pavement. Four of the cores were noted as broken, meaning the stripping was severe enough that the bituminous fell apart as the core was extracted. The locations of stripping generally coincided with areas where Public Works has performed extensive maintenance via skin patch overlays and patching, whereas areas with slight stripping may not be visible at the pavement surface.

Due to the granular subgrade soils and good aggregate base, the pavement structure as a whole is typically structurally sound. Therefore, the issue facing the City is typically functional and not structural – meaning the recurring maintenance issues are due to the stripped pavement material raveling and breaking apart.

SANITARY SEWER

The sanitary sewer system within the residential neighborhoods consists primarily of 8-inch diameter polyvinyl chloride pipe (PVC). The existing sanitary sewer has been televised to evaluate pipe condition. The televising reports show that the pipe is generally in good condition. Miscellaneous structure repairs including patching and other repairs were noted during the inspections.

WATER MAIN

The water mains within the residential neighborhoods are 6 to 18-inch diameter ductile iron pipe (DIP), which were installed in conjunction with the development of the neighborhoods.

The water mains are believed to be in good condition. However, projects of similar eras have had instances of excessive bolt corrosion on valves and it is possible the valves in this project area may be in a similar condition. Therefore, some select valves will be checked for corrosion prior to street work occurring. Additionally, there are expected to be some valves which are not operational and will need to be addressed with the project. The valves will be operated and evaluated by Public Works prior to the start of the project.

STORM SEWER

The existing storm sewer has been televised to determine pipe condition and necessary repairs. In addition, storm structures were also inspected. The televising reports show that the storm sewer mains are generally in good condition. However, some problems encountered in the existing storm sewer were cracked or broken pipes. Most structures were identified as in good condition with some miscellaneous structure patching, and other repairs noted during the inspections.

EXISTING CONDITIONS – JAMAICA AVENUE

STREETS

Jamaica Avenue, between 80th Street and Indian Boulevard, is a four-lane divided urban roadway consisting of B618 concrete curb and gutter, 14-foot lanes and a grass median. In 1980, a 74-foot wide section was constructed with a 6-inch aggregate base and a 24-foot bituminous mat, consisting of two 1.5-inch lifts, on the west side. In 1981, a 24-foot bituminous mat, consisting of two 1.5-inch lifts, was constructed on the east side of the original 74-foot aggregate base section. In 1993, the existing south bound and northbound lanes had a 1.5-inch bituminous overlay on the existing 3-inch bituminous mat. As part of this 1993 project, the lanes were constructed to a 28-foot (from face of curb to face of curb) street width for each direction of traffic, with B618 concrete curb and gutter, a grass median, and concrete sidewalk. The in-place pavement section of Jamaica Avenue was designed to be 4.5-inches of bituminous over 6-inches of aggregate base. Figure 3 depicts the age of the streets.

Coring of the pavement was performed to determine the thickness of the existing street section and evaluate pavement condition. The core locations are shown on Figure 3 and photos of the pavement cores can be seen in Appendix F. From the cores, it can be seen that the average section along Jamaica Avenue consists of approximately 5.5-inches of bituminous over 7-inches of base, as shown in Table 2. The thicker than expected bituminous is in part due to multiple seal coat applications or thin overlays. The cores show slight to severe stripping occurring in various depths of the pavement, depending on the location. All cores from Jamaica Avenue displayed some degradation due to stripping. The stripping found degrades the strength and durability of the pavement.

Table 2: Jamaica Avenue Existing Street Section

No.	Location	Bituminous (in)	Aggregate Base (in)
B-5	Between 80th Street and 75th Street	6.00[1]	11.00
B-6	Between 75th Street and Indian Boulevard	5.50[1]	5.00
B-7	South of 75th Street	5.00[1]	5.00
Average		**5.50**	**7.00**

1. Stripping present (Varying severity)

Additional testing was performed on Jamaica Avenue in an effort to better identify the properties of the roadway. Therefore, ground penetrating radar (GPR) and falling weight deflectometer (FWD) testing was performed on all four lanes.

Ground penetrating radar is a non-intrusive procedure that produces an image of the underground materials by sending and interpreting electromagnetic waves. GPR was used to supplement the cores and obtain more data points regarding pavement and aggregate base thickness. The pavement section properties, between 80th Street and Indian Boulevard, obtained from the GPR is presented below.

Table 3: Ground Penetrating Radar

Layer	SB Outside Lane		SB Inside Lane		NB Inside Lane		NB Outside Lane	
	Average (in)	CV	Average (in)	CV	Average (in)	CV	Average (in)	CV
BP	5.3	13%	5.2	13%	5.2	8%	5.7	8%
Base	5.9	20%	5.2	20%	5.3	22%	7.7	25%
Total	**11.2**	**12%**	**10.4**	**11%**	**10.6**	**11%**	**13.4**	**16%**

*BP = Bituminous Pavement; Base = Aggregate Base; Total = BP and Base; CV = Coefficient of Variation

The falling weight deflectometer is a non-destructive process used to evaluate pavement structural condition by providing an in-situ characterization of the pavement layer stiffness. The FWD applies dynamic loads to a pavement surface, simulating the magnitude and duration of a single wheel load. The downward movement (vertical deflection) of the pavement at various distances from the loading plate are measured with various sensors. These measurements help determine the overall pavement load rating, pavement layer characteristics and material properties (modulus), and subgrade strength characteristics (in-situ R-Value). The R-Value is representative of the ability of a soil to resist lateral spreading due to an applied vertical load from traffic. The 15th percentile R-Values and GE values, between 80th Street and Indian Boulevard, from the FWD are presented below.

Table 4: Falling Weigh Deflectometer

From	To	Lane	R-Value	GE
80th Street	75th Street	NB	23.7	27.4
75th Street	Indian Boulevard	NB	30.5	26.2
Indian Boulevard	75th Street	SB	36.9	22.0
75th Street	80th Street	SB	24.8	27.9
Average			**28.9**	**25.8**

Appendix F contains the complete Jamaica Avenue geotechnical report completed in July 2020. This report analyzes the pavement of Jamaica Avenue from Indian Boulevard to the Highway 61/Jamaica Avenue roundabout south of East Point Douglas Road.

SANITARY SEWER

The sanitary sewer system along Jamaica Avenue connects adjacent neighborhoods east and west of Jamaica Avenue. The sanitary sewer north of 80th Street that connects to the neighborhood east of Jamaica Avenue has been televised to determine pipe condition and necessary repairs. The televising reports show that the pipe is generally in good condition and no repairs are needed.

WATER MAIN

There are two locations where water main crosses Jamaica Avenue to connect adjacent neighborhoods, once at Indian Boulevard and once at 75th Street. The water main on the west side of Jamaica Avenue at Indian Boulevard is a 12-inch diameter DIP and was installed in 1979 in conjunction with the development of the neighborhood west of Jamaica Avenue. In 1980 this water main was connected to and installed across Jamaica Avenue in conjunction with the development of the neighborhood to the east of Jamaica Avenue.

The water main on the west side of Jamaica Avenue at 75th Street is a 12-inch diameter DIP and was installed in 1974 in conjunction with the development of the neighborhood west of Jamaica Avenue. In 1979 this water main was connected to and installed across Jamaica Avenue in conjunction with the development of the neighborhood to the east of Jamaica Avenue.

The water mains are believed to be in good condition. However, due to the age of the water main, there are expected to be some valves which are not operational and will need to be addressed with the project. The valves will be operated and evaluated by Public Works prior to the start of the project.

STORM SEWER

The existing storm sewer has been televised to determine pipe condition and necessary repairs. In addition, storm structures were also inspected. The televising reports show that the storm sewer mains are generally in good condition. However, some problems encountered in the existing storm sewer were cracked or broken pipes. Most structures were identified as in good condition with some miscellaneous structure patching, lining, and other repairs noted during the inspections.

PROPOSED IMPROVEMENTS – RESIDENTIAL

STREETS

Due to the age of pavements in the residential neighborhoods (22-29 years old), the observed depth and extent of the asphalt stripping in the cores, extent of previous City maintenance, and past City experience with streets of this age and condition, a mill-overlay is not recommended at this time for the Pine Meadows, Sandy Hills, and East Meadow Cliff neighborhoods.

The risks typical of all mill-overlay projects, i.e. reflective cracking, and the associated maintenance required were evaluated to determine acceptable risk levels. Past projects have shown that stripping of the pavement can extend well below the surface of the pavement, making complete removal of the stripped portions unfeasible. In those cases, the remaining pavement posed risk for excessive volume of cracking or raveling in the base course.

Due to the types of distress present in the existing pavement, the anticipated acceleration of deterioration due to asphalt stripping, and risks associated with a mill-overlay at this age, the residential streets within the Pine Meadows, Sandy Hill, and East Meadow Cliff neighborhoods are proposed to undergo a full pavement removal and replacement with 3.5-inches of new pavement. The wear course is proposed to be virgin mix, excluding the use of recycled asphalt pavement (RAP).

The concrete curb and gutter in all three neighborhoods are proposed to undergo spot replacement, as shown in Figure 5. The curb in poor condition will be evaluated for removal just prior to construction. Preliminary estimates indicate that approximately 17% will need to be removed and replaced in the Pine Meadows and Rolling Hills neighborhoods and 18% in the East Meadow Cliff neighborhood. The percentage of curb is not necessarily evenly distributed and there may be some long sections of curb replacement. Where conditions are favorable, the goal is that the concrete curb and gutter last two pavement lifecycles.

In locations where curb is removed and replaced in front of driveways, impacted concrete or bituminous driveways will be patched the entire width with in-kind materials as a part of the street rehabilitation process. In areas of spot curb replacement, this patch typically extends a few feet behind the curb.

Restoration is anticipated to consist of screened Loam Topsoil Borrow with seed and hydromulch.

Traffic signs are proposed to be replaced as a part of this project to meet federal retro reflectivity requirements. In addition, signs will be evaluated for conformance to the adopted City sign policy and signs will be removed or supplemented as required.

The existing streetlight system has received routine maintenance and does not have any major areas of concern. The existing four feed point cabinets in the residential neighborhoods are beyond their useful life and should be replaced as part of this project. Existing poles, direct-bury wire, and handholes will remain in place. Should the spot curb removal process impact the existing direct-buy wiring, spot repairs will be completed as necessary.

WALKWAY

Costs have been included in this report to update all pedestrian ramps to the current Americans with Disabilities Act (ADA) standards. All pedestrian ramps will be evaluated and reconstructed to compliant pedestrian ramps; this may include removing some segments of existing sidewalk to meet the required landings and grades. Spot sidewalk removal and replacement is also proposed to correct damaged curb panels along Johansen Avenue.

SANITARY SEWER

Utility improvements are shown in Figure 9.

The sanitary sewer manhole castings will be salvaged and reinstalled. The existing concrete adjusting rings will be replaced with new high-density polyethylene (HDPE) adjusting rings to conform to current City standards. Miscellaneous structure repairs such as patching or replacing a top slab will be performed as needed.

WATER MAIN

It is proposed that broken valve top sections be removed and replaced as a part of this project. It is anticipated that a small sample of valves be dug up in each neighborhood and checked for bolt corrosion in the spring. Any corroded bolts would be replaced if necessary, and additional valves with like conditions could be dug up and checked if warranted. As a part of this process, the valve box would be replaced in conjunction with the work. Also, it is proposed to extend the hydrant barrel on any hydrant requiring adjustment. Finally, hydrants will be reconditioned by sandblasting and painting, and concrete hydrant access pads are proposed to be constructed in accordance with current City standards.

STORM SEWER

Generally speaking, the intent of this project is to rehabilitate the streets and not change existing drainage patterns. In-line repairs are recommended to address cracks and offset joints. Structures in poor condition will be replaced to conform to current City standards. Adjustment rings for manholes and catch basins will be replaced with HDPE rings. The existing castings will be salvaged and reinstalled unless they are damaged or do not meet current City standards. Miscellaneous structure patching, lining, and other repairs will be performed as needed.

Public Works staff provided input on areas with historic drainage concerns. No major flooding or drainage issues were noted; therefore, only minor curb grade modifications are proposed to facilitate drainage.

STORM WATER QUALITY

Storm water quality improvements are not required in this neighborhood due to no increase of impervious surfacing.

PROPOSED IMPROVEMENTS – JAMAICA AVENUE

STREETS

Due to the condition of the pavement along Jamaica Avenue between Indian Boulevard and 80th Street, the observed depth and extent of the asphalt stripping in the cores, results of the GPR and FWD, extent of previous City maintenance and past City experience with streets of this age and condition, a full-depth pavement replacement is recommended at this time.

Due to the types of distress present in the existing pavement, the anticipated acceleration of deterioration due to asphalt stripping, and risks associated with a mill-overlay at this age, Jamaica Avenue is proposed to undergo a full pavement removal and replacement with 5.5-inches of new pavement. The wear course is proposed to be virgin mix, excluding the use of recycled asphalt pavement (RAP).

The concrete curb and gutter along Jamaica Avenue is proposed to undergo spot replacement, as shown in Figure 6. The curb in poor condition will be evaluated for removal just prior to construction. Preliminary estimates indicate that approximately 11% will need to be removed and replaced. The percentage of curb is not necessarily evenly distributed and there may be some long sections of curb replacement. Where conditions are favorable, the goal is that the concrete curb and gutter last two pavement lifecycles. In order to accommodate a future signal system at 80th Street, both north and south-bound Jamaica Avenue approaches will need geometric improvements to facilitate through traffic, at which time a full reconstruction should be coordinated. Due to the necessary geometric improvements, full curb replacement and the signal would be installed in conjunction with a future Jamaica Avenue project.

Restoration is anticipated to consist of screened Loam Topsoil Borrow with seed and hydromulch.

Traffic signs are proposed to be replaced as a part of this project to meet federal retro reflectivity requirements. In addition, signs will be evaluated for conformance to the adopted City sign policy and signs will be removed or supplemented as required.

The existing streetlight system has received routine maintenance and does not have any major areas of concern. Existing poles, direct-bury wire, and handholes will remain in place. Should the spot curb removal process impact the existing direct-buy wiring, spot repairs will be completed, as necessary.

WALKWAY

Costs have been included in this report to update all pedestrian ramps to the current Americans with Disabilities Act (ADA) standards. All pedestrian ramps will be evaluated and reconstructed to compliant pedestrian ramps; this may include removing some segments of existing sidewalk to meet the required landings and grades. Several pedestrian ramps along Jamaica Avenue have been recently reconstructed in past pavement management projects and will not need to be reconstructed as part of this project.

Spot sidewalk removal and replacement is also proposed to correct for damaged curb panels along both sides of Jamaica Avenue.

SANITARY SEWER

Utility improvements are shown in Figure 10.

The sanitary sewer manhole castings will be salvaged and reinstalled. The existing concrete adjusting rings will be replaced with new high-density polyethylene (HDPE) adjusting rings to conform to current City standards.

WATER MAIN

The valve boxes will be adjusted to final grades and any broken valve top sections will be removed and replaced as part of this project.

STORM SEWER

Generally speaking, the intent of this project is to rehabilitate the streets and not change existing drainage patterns. In-line repairs are recommended to address cracks, while pipes that had holes in them are recommended to be removed and replaced. Structures in poor condition will be replaced to conform to current City standards. Adjustment rings for manholes and catch basins will be replaced with HDPE rings. The existing castings will be salvaged and reinstalled unless they are damaged or do not meet current City standards. Miscellaneous structure patching and other repairs will be performed as needed.

Public Works staff provided input on areas with historic drainage concerns. No major flooding or drainage issues were noted; therefore, only minor curb grade modifications are proposed to facilitate drainage.

STORM WATER QUALITY

Storm water quality improvements are not required in this neighborhood due to no increase of impervious surfacing.

PROPOSED IMPROVEMENTS – ARBOR MEADOWS PARK

Arbor Meadows park is located south of 85th Street, east of Johansen Avenue, west of Joliet Avenue, and north of Hillside Trail. Similar to past pavement management projects, when a neighborhood undergoes a pavement management project, the neighborhood park is also evaluated for site improvements.

The parking lot for Arbor Meadows Park was constructed in 1997 along with the Sandy Hills 7th Addition and consists of approximately 3-inches of bituminous over 6-inches of aggregate base. The existing trail that connects the Arbor Meadows parking lot to Jorgensen Avenue, was constructed in 2016 with 6-inches of gravel and 3-inches of bituminous. As part of the 2021 project the parking lot is proposed to have a full pavement replacement with spot curb and gutter replacement. The existing pedestrian ramp will be reconstructed to meet ADA compliance. A new trail is proposed to connect to the existing trail near the playground, follow the perimeter of the park, and connect to the existing trail west of Jorgensen Avenue, as shown in Figure 7. This new trail would also connect to the two existing street connections at Johansen Avenue and Hillside Trail. In addition to these improvements, it is proposed to install a water irrigation service for future use. Bidding alternatives will be evaluated during design for additional improvements.

PROPOSED IMPROVEMENTS – RIVER OAKS GOLF COURSE

River Oaks Golf Course is a City-owned 18-hole scenic golf course located on Highway 61. In late 2020 the club house underwent construction with a kitchen addition to the northwest corner of the clubhouse. As part of the pavement management project, the parking lot is proposed to receive a full pavement replacement with spot curb and gutter replacement. As part of these improvements, the existing pedestrian ramps will be reconstructed to meet ADA compliance, new parking lot lighting and islands will be installed, as shown in Figure 8. We will continue to work with Cottage Grove staff to evaluate additional golf course site improvements during the final design phase of the project as budgetary conditions allow.

PERMITS AND EASEMENTS

A Phase II General Storm Water Permit from the MPCA is anticipated to be required for the project because disturbance and restoration will likely exceed one acre.

All streets in the project area are located within the South Washington Watershed District (SWWD), however, because there will be no disturbance to the existing subgrade a permit is not required.

No additional drainage and utility easements are anticipated in the neighborhoods; however, this will be evaluated during the final design phase of the project.

ESTIMATED COSTS

Cost estimates for the improvements have been prepared and are included in Appendix C. All costs for items to be constructed are based on anticipated unit prices for the 2021 construction season. All costs include a twenty-five percent allowance for indirect costs associated with the project (engineering, administrative, financing, and legal) as well as a ten percent contingency. No costs are included for capitalized interest during the construction period or before assessments are levied. The following is an overall summary of the estimated costs:

Table 5: Estimated Cost Summary

Location	Estimated Project Cost*
Pine Meadows, Sandy Hills & East Meadow Cliff Neighborhoods	$2,423,817.35
Jamaica Avenue	$1,442,819.13
Arbor Meadows Park	$291,142.50
River Oaks Golf Course	$522,119.81
Total	**$4,679,898.79**

*Costs presented include 10% contingency + 25% indirect costs

COST ALLOCATION

Assessments for this project will be based upon the "Infrastructure Maintenance Task Force Special Assessment Policy for Public Improvements," dated September 30, 2005, Revised August 8, 2012. All adjacent benefiting properties are proposed to be assessed. Per the Urban Residential policy, 45% of the project cost for both surface and subsurface improvements would be assigned to each individual residential lot on a unit basis. The intent of the City's policy is to treat all properties within a residential development as similar individual units regardless of lot frontage. The amount assessed is based on the City standard street section even if the width is greater. City funds would be responsible for the remaining 55% of the project costs.

Per the policy, 100% of the project costs adjacent to the property are assessed to City-owned property. In areas where residential property was opposite City property, half of the street width was assigned to the residential area and the other half to the City. The estimated project assessments are as follows:

Residential Land Use:

Infrastructure costs adjacent to City property or other land uses are removed from the neighborhoods to determine the residential cost contribution. The policy also states that all urban/residential lots on urban/residential streets shall be assessed based on the city standard street section even if the width is greater.

Table 6: Deductions to Residential Property

Location	City Property	Street Width	Estimated Assessment Deduct
Pine Meadows, Sandy Hills & East Meadow Cliff	$9,545.39	$43,290.84	$52,836.23
Jamaica Avenue	$1,442,819.13*	$0.00	$1,442,819.13
Arbor Meadows Park	$291,142.50	$0.00	$291,142.50
River Oaks Golf Course	$522,119.81	$0.00	$522,119.81
Total	**$2,265,626.83**	**$43,290.84**	**$2,308,917.67**

* Since no residential property that abuts Jamaica Ave has direct access, there are no assessable parcels and the City therefore covers the cost.

Per the IMTF policy, urban residential lots on urban/residential streets within or outside the MUSA, 45% of the project costs for both surface and sub-surface assessments will be assessed.

Table 7: Estimated Cost Allocation Per Policy

Location	Estimated Project Cost	Estimated Assessment Deduct	Residential Adjusted Cost	Residential Assessed Amount (45% of Total)
Pine Meadows, Sandy Hills & East Meadow Cliff	$2,423,817.35	$52,836.23	$2,370,981.12	$1,066,941.50
Jamaica Avenue	$1,442,819.13	$1,442,819.13	$0.00	$0.00
Arbor Meadows Park	$291,142.50	$291,142.50	$0.00	$0.00
River Oaks Golf Course	$522,119.81	$522,119.81	$0.00	$0.00
Total	**$4,679,898.79**	**$2,308,917.67**	**$2,370,981.12**	**$1,066,941.50**

Since all three neighborhoods have the same construction method and similar expected curb removal, a single assessment was determined by the total assessable RBLE units and total assessed amount for all three neighborhoods. Based on the table below, the total single-family residential assessment is **$4,167.74** per unit in the Pine Meadows, Sandy Hills Neighborhoods and East Meadow Cliff Neighborhood.

Table 8: Estimated Cost Per Unit				
Location	**Assessable RBLE Units**	**Assessed Amount (45% of Total)**	**Assessed Cost Per RBLE Unit Per Policy**	**Special Benefit Appraisal**
Pine Meadows, Sandy Hills & East Meadow Cliff	256	$1,066,941.50	$4,167.74	$5,600 - $7,600

When the calculated assessment exceeds the special benefit appraisal, the single-family assessments will be proposed to be capped at the amount of the special benefit appraisal. If needed, City funds will cover the difference between the calculated assessment and the benefit appraisal. The benefit appraisal was completed in October 2020 and resulted in a change of benefit from $5,600 to $7,600, which is greater than the policy calculation, therefore the policy calculation will determine the proposed assessment.

Religious Institution Use:

Crossroads Church, located at the northwest corner of Jamaica Avenue and 80th Street, is accessed from Ivystone Avenue. In 2016, when 80th Street was reconstructed, a benefit appraisal was completed for Crossroads Church and no benefit was found because it is not directly accessed from 80th Street. Due to a similar circumstance of no direct access from Jamaica Avenue, Crossroads Church will not be assessed.

Summary:

The IMTF policy therefore allocates costs in the following manner:

Table 9: Estimated Cost Allocation Per Policy			
Location	**Residential Assessed Amount (45% of Total)**	**Other Funds***	**Estimated Project Cost****
Pine Meadows, Sandy Hills & East Meadow Cliff	$1,066,941.50	$1,356,875.85	$2,423,817.35
Jamaica Avenue	$0.00	$1,442,819.13	$1,442,819.13
Arbor Meadows Park	$0.00	$291,142.50	$291,142.50
River Oaks Golf Course	$0.00	$522,119.81	$522,119.81
Total	**$1,066,941.50**	**$3,612,957.29**	**$4,679,898.79**

*See Appendix C for Fund Breakout
** Total Project Cost (10% contingency + 25% Indirect)

FINANCING

Assessments are proposed to be levied based on the City's current assessment policy. The remainder of the project would be financed through a combination of City funds such as the General Tax Levy and Utility and Enterprise funds for items such as storm sewer and street lighting improvements. Figure 11 depicts the assessable parcels for the project.

PUBLIC HEARING

Because the properties within the project area benefit from the proposed improvements, and the project will be partially funded through assessment, it will be necessary for the City to hold a public improvement hearing to receive comment on the proposed project and to determine further action to be taken.

PROJECT SCHEDULE

Below is the proposed schedule assuming starting construction in 2021:

- 08/19/2020 Council Orders Feasibility Report
- 12/02/2020 Council Receives and Approves Feasibility Report
Council Sets a Public Improvement Hearing Date
- 12/10/2020 Hold Neighborhood Meeting
- 01/06/2020 Council Holds Public Improvement Hearing
Council Orders the Preparation of the Plans and Specifications
- 03/03/2021 Council Approves the Plans and Specifications
- 03/25/2021 Project Bid Date
- 04/07/2021 Contract Award
- Spring 2021 Begin Construction
- September 2021 Complete Construction
- September 2021 Council Sets Assessment Hearing Date
- October 2021 Council Holds Assessment Hearing

CONCLUSION AND RECOMMENDATIONS

It is recommended that this report be used as a guide for the layout, design, and cost allocation for the public improvements to be made as part of the 2021 Pavement Management Project. It is further recommended that the owners of properties within the project limits be notified of the proposed improvements in order to provide comment.

To determine project feasibility, a comparison was made between the costs estimated herein and the costs experienced for other similar projects within the City. These comparisons, on a per linear foot construction cost basis (no indirect project costs), are shown in the following table:

Table 10: Cost Per Unit Comparison	
2021 Pavement Management Project (Estimated Costs per Linear Foot)	
Pine Meadows 2nd, 4th, and 5th Additions and Sandy Hills 7th and 8th Additions – Pavement Replacement Area & Spot Curb	$115.76 / LF
East Meadow Cliff – Pavement Replacement Area & Spot Curb	$115.40 / LF
2017 Pavement Management Project (Bid Results)	
Rolling Hills 3rd, 6th, and 7th Additions – Pavement Replacement Area & Spot Curb	$102.71 / LF
Jamaica Ridge Additions – Pavement Replacement Area & Spot Curb	$90.65 / LF
2016 Pavement Management Project (Bid Results)	
District F3/F5 – Pavement Replacement Area & Spot Curb	$97.06 / LF

From the tabulation above, it is indicated that the cost to rehabilitate in the residential areas are like past projects of similar scope. The increase depicted is partially due to rises in construction and material costs.

Financial responsibilities have been determined based on estimated project costs as well as adopted City policy. Funding sources consist of assessments to benefitted properties and use of existing designated City funds.

Based on the information contained herein, it can be concluded that the construction of utility and street improvements is feasible. The deteriorated condition of the pavement, stable condition of the subgrade, and condition of the concrete curb and gutter suggest that similar rehabilitation be performed in all three neighborhoods, as well as Jamaica Avenue. The improvements are cost effective as they utilize the existing subgrade and keep existing curb wherever possible.

From an engineering standpoint, this project is feasible, necessary, cost effective, and can best be accomplished by letting competitive bids for the work under one contract in order to complete the work in an orderly and efficient manner.

Appendix A: Existing Pavement Condition Photos

Pine Meadow Neighborhood

Approximate Location: 9821 85th Street

Temporary skin patch overlay across entire width of road performed in 2010. Additional patching has since occurred, and original distresses have reflected through.

Pine Meadow Neighborhood

Approximate Location: 9998 85th Street

Reflective cracking through temporary skin patch overlay.

Pine Meadow Neighborhood
Approximate Location: 8732 Joliet Avenue
Fatigue/small block cracking adjacent to an open transverse joint.

Pine Meadow Neighborhood
Approximate Location: 8719 Jorgensen Avenue
Curb and gutter settlement and resultant poor drainage evident; numerous street patches present.

Sandy Hills Neighborhood
Approximate Location: 8689 Johansen Avenue
Thin overlay along the curb line to address asphalt stripping, numerous patch attempts and crack sealing present.

Sandy Hills Neighborhood
Approximate Location: 9553 Hillside Trail
Large block cracking typical throughout.

Sandy Hills Neighborhood

Approximate Location: 9589 Hillside Trail

Asphalt stripping along the curb line; previous patching attempts evident.

East Meadow Cliff Neighborhood

Approximate Location: 8279 Jeffery Avenue

This photo was taken in 2018 and depicts fatigue cracking, previous route and seal of cul-de-sac. This area has since been patched but the underlying condition is still present.

East Meadow Cliff Neighborhood
Approximate Location: 8236 Jeffery Avenue South
This photo was taken in 2018 and depicts severe asphalt stripping and previous attempts to patch. This area has since been patched but the underlying condition is still present.

East Meadow Cliff Neighborhood
Approximate Location: 8241 Jeffery Lane
Functional concrete curb and gutter, although exposed aggregate surface appearance.

East Meadow Cliff Neighborhood
Approximate Location: 8033 Jeffery Lane
This photo was taken in 2018 and depicts typical block cracking and pavement fatigue in the neighborhood.

East Meadow Cliff Neighborhood
Approximate Location: 9063 Upper 81st Street
Asphalt stripping and associated patching attempts.

Appendix B: Figures

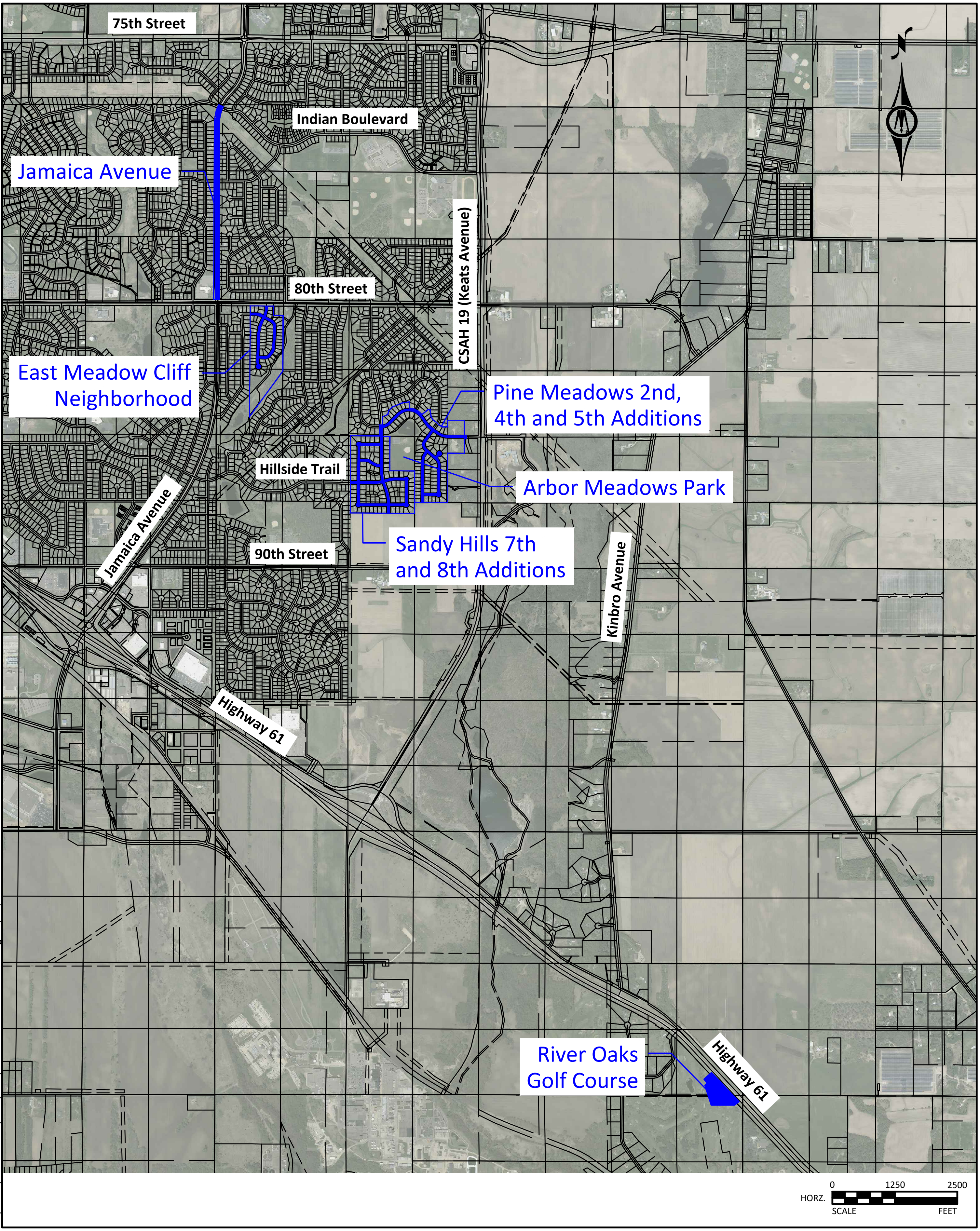
2021 Pavement Management Project

City of Cottage Grove, MN

Figure 1: Location

December 2020

BOLTON & MENK



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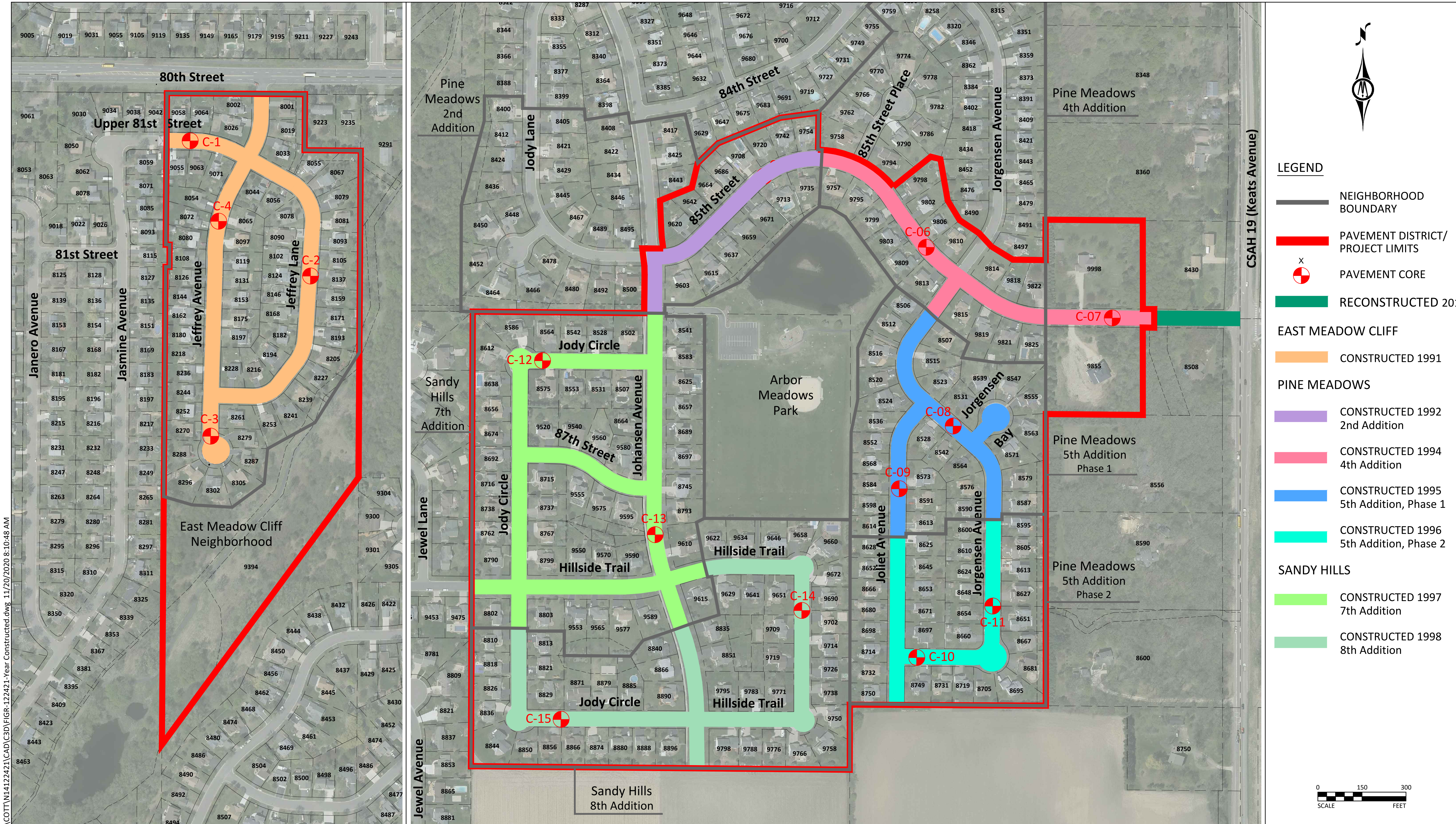
Cottage Grove
Where Pride and Prosperity Meet

2021 Pavement Management Project
City of Cottage Grove, MN

Figure 2: Year Constructed - Residential
December 2020

BOLTON & MENK



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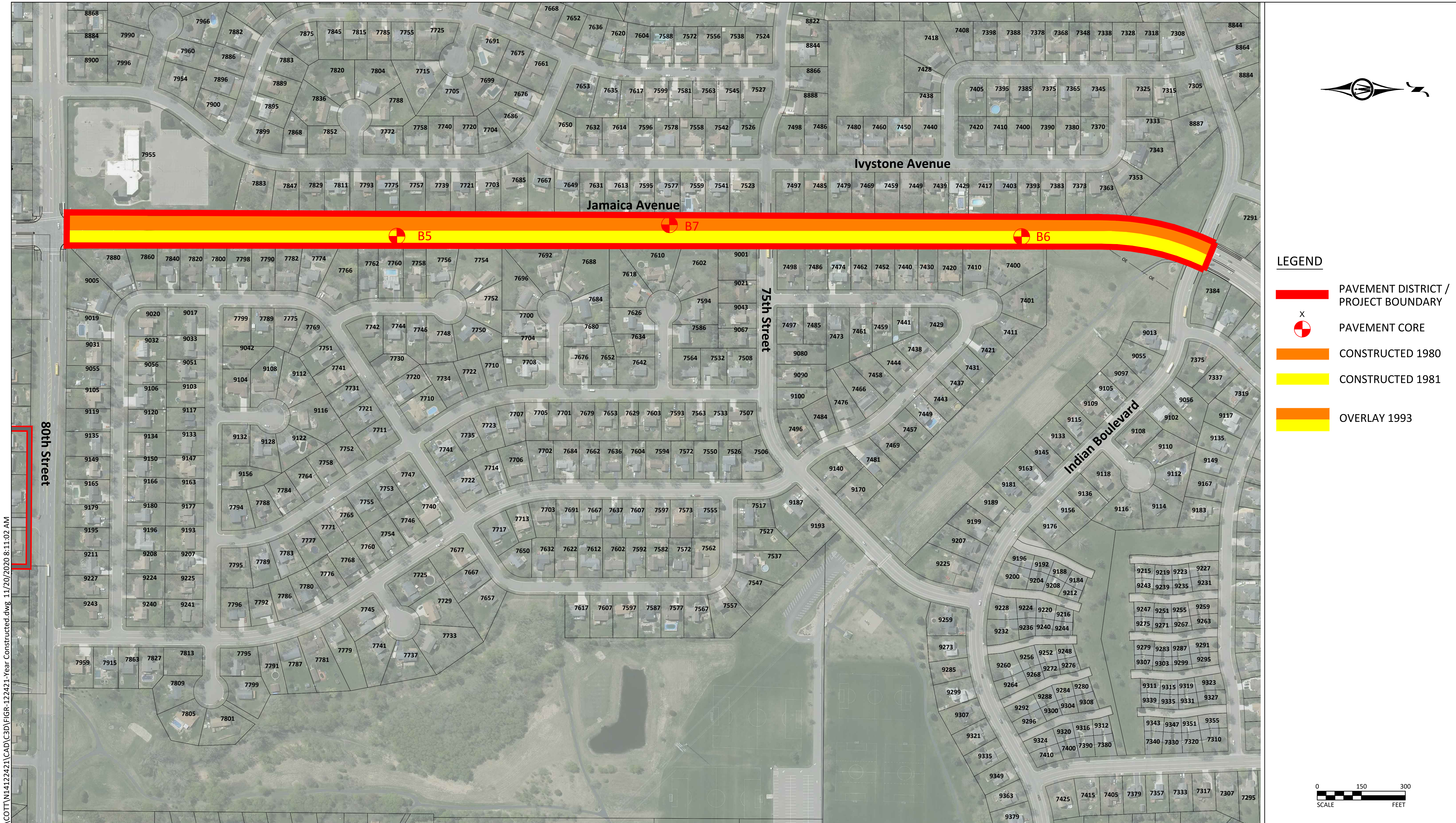
Cottage Grove
Where Pride and Prosperity Meet

2021 Pavement Management Project
City of Cottage Grove, MN

Figure 3: Year Constructed - Jamaica Avenue
December 2020

BOLTON & MENK



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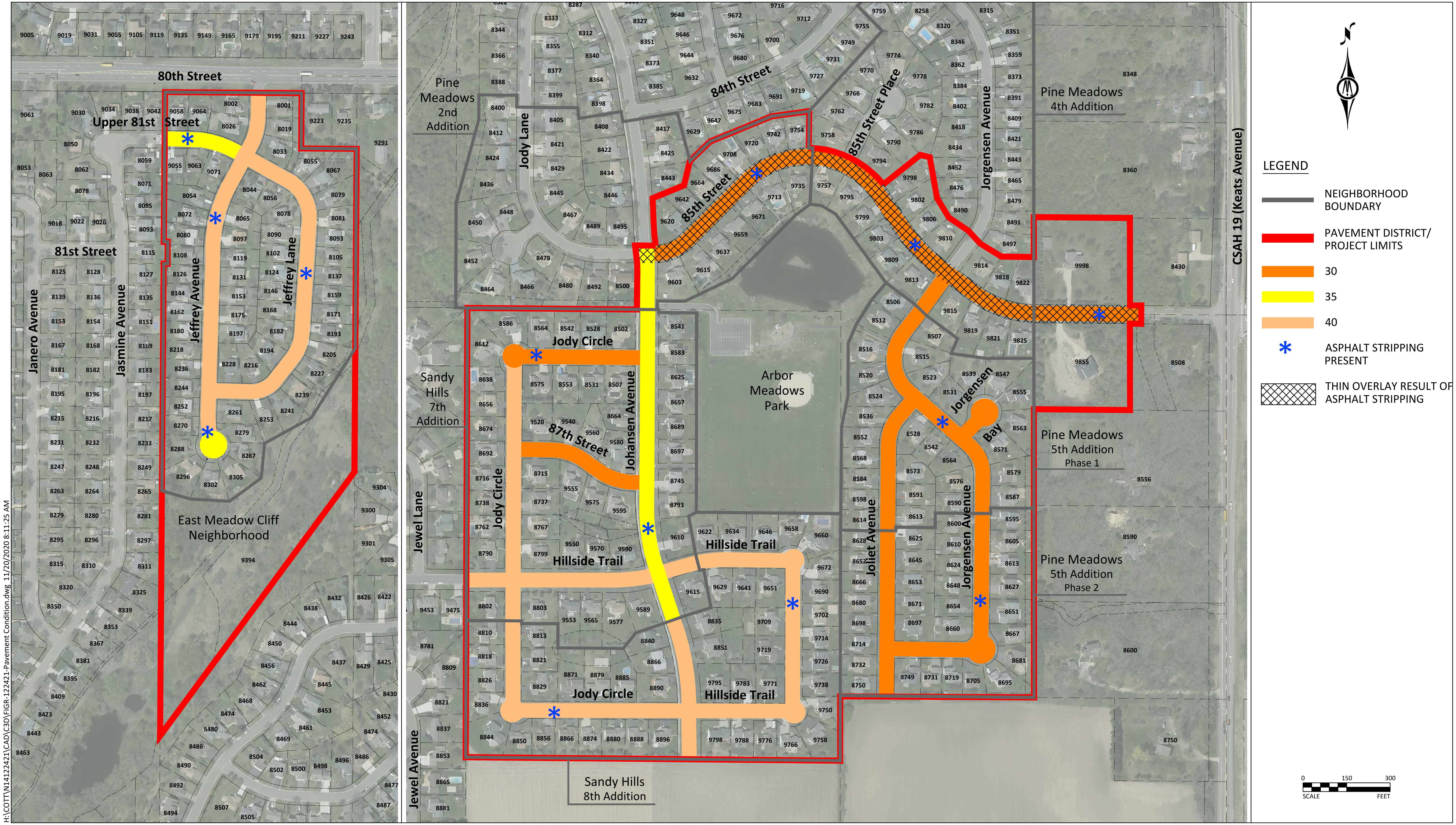
2021 Pavement Management Project

City of Cottage Grove, MN

Figure 4: Pavement Condition - Residential

December 2020



Cottage Grove
Where Pride and Prosperity Meet

2021 Pavement Management Project

City of Cottage Grove, MN

Figure 5: Street Improvements - Residential

December 2020

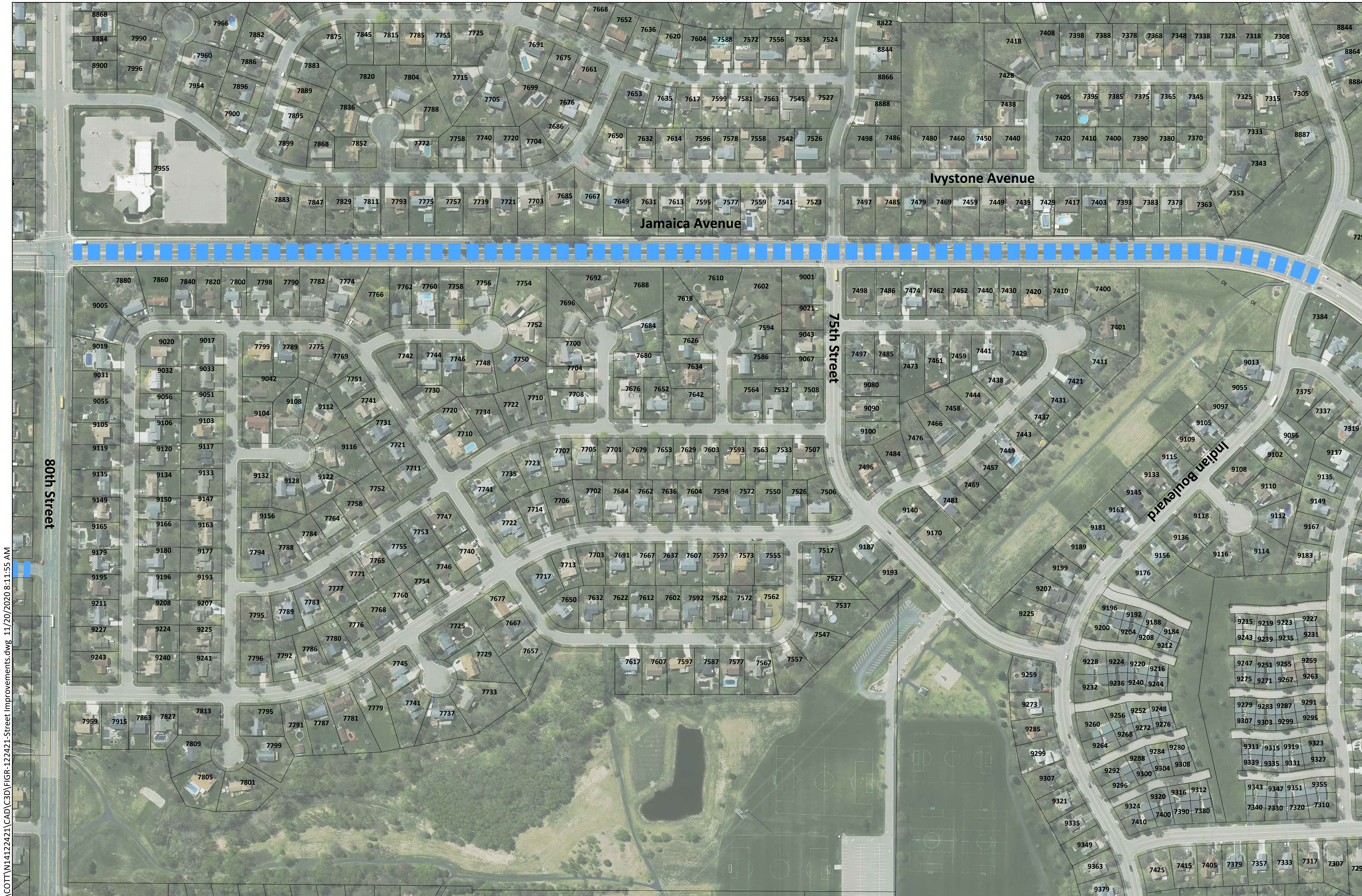
BOLTON & MENK

Cottage Grove
Where Pride and Prosperity Meet

2021 Pavement Management Project
City of Cottage Grove, MN

Figure 6: Street Improvements - Jamaica Avenue
December 2020

BOLTON & MENK



LEGEND

FULL PAVEMENT REPLACEMENT WITH SPOT CURB REPAIR

0 150 300
SCALE FEET

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Cottage Grove
Where Pride and Prosperity Meet

2021 Pavement Management Project
City of Cottage Grove, MN

Figure 7: Arbor Meadows Park Improvements
December 2020

BOLTON & MENK

LEGEND

- EXISTING BITUMINOUS TRAIL
- PROPOSED BITUMINOUS TRAIL
- FULL DEPTH PAVEMENT REPLACEMENT WITH SPOT CURB REPLACEMENT
- CONCRETE PEDESTRIAN RAMP REPLACEMENT
- CONCRETE PEDESTRIAN RAMP REPLACEMENT (INCLUDED IN RESIDENTIAL STREET IMPROVEMENTS)
- PROPOSED DIP IRRIGATION SERVICE

0 50 100
SCALE FEET

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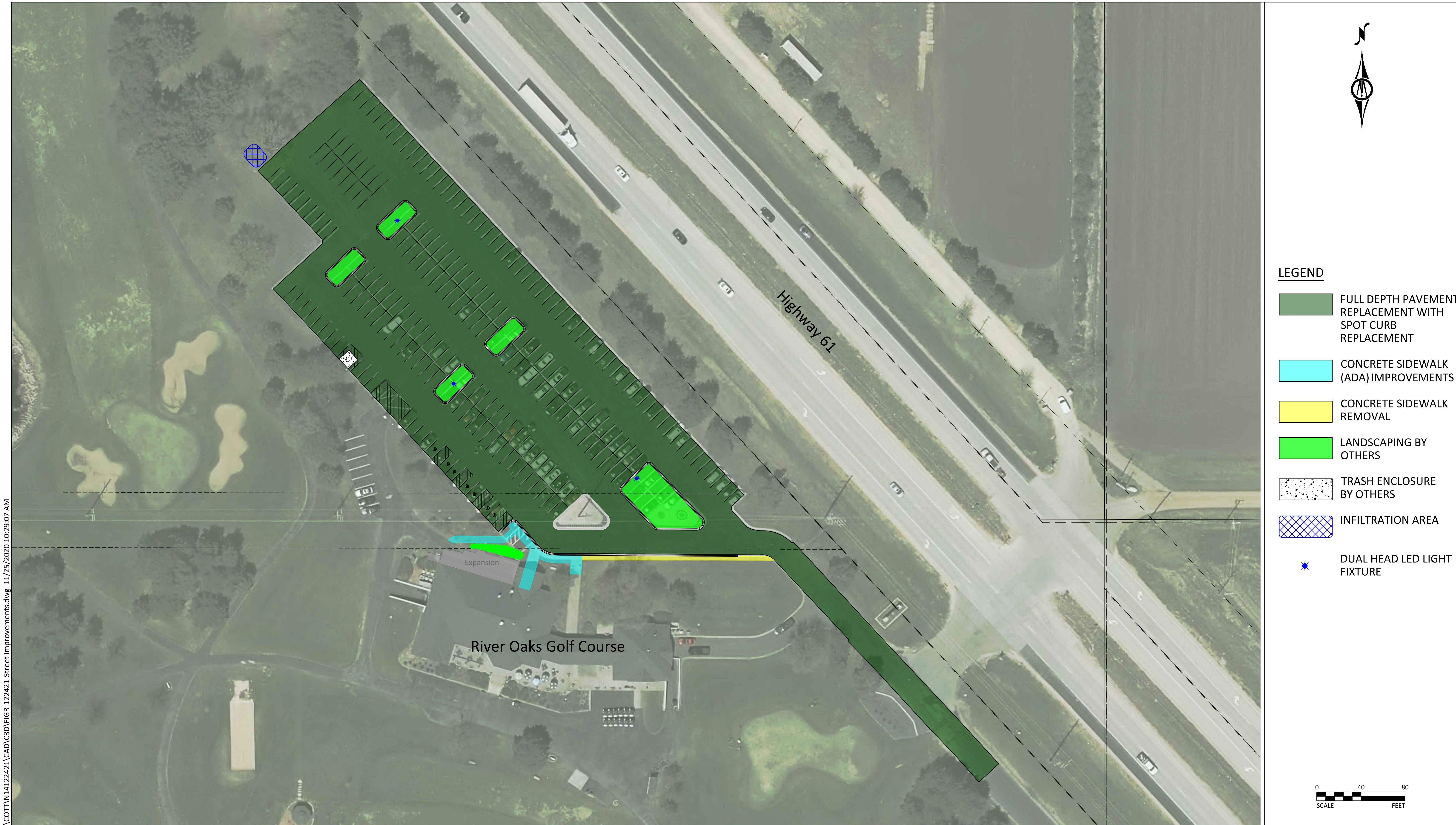
Cottage Grove
Where Pride and Prosperity Meet

2021 Pavement Management Project
City of Cottage Grove, MN

Figure 8: River Oaks Golf Course Parking Lot Improvements
December 2020

BOLTON & MENK



Cottage Grove
Where Pride and Prosperity Meet

2021 Pavement Management Project

City of Cottage Grove, MN

Figure 9: Utility Improvements - Residential

December 2020

BOLTON & MENK

LEGEND

- WATER MAIN: VALVE EVALUATION AND REPAIR
- WATER MAIN: EXTEND HYDRANT BARREL
- STORM SEWER: REPLACE STRUCTURE
- STORM SEWER: ROTATE TOP SLAB
- STORM SEWER: REPLACE CB RINGS
- STORM SEWER: REPLACE GRATE OR CASTING
- STORM SEWER: PATCH STRUCTURE (WALL, INVERT, OR DOGHOUSE)
- SANITARY SEWER: REPLACE CONE SECTION
- SANITARY SEWER: REPLACE LID
- SANITARY SEWER: PATCH STRUCTURE (WALL, INVERT, OR DOGHOUSE)
- SANITARY SEWER: ADD 1-FT BARREL SECTION

NOTE: ALL MANHOLE STRUCTURES WILL BE ADJUSTED AND ALL ADJUSTMENT RINGS WILL BE REPLACED

0 150 300
SCALE FEET

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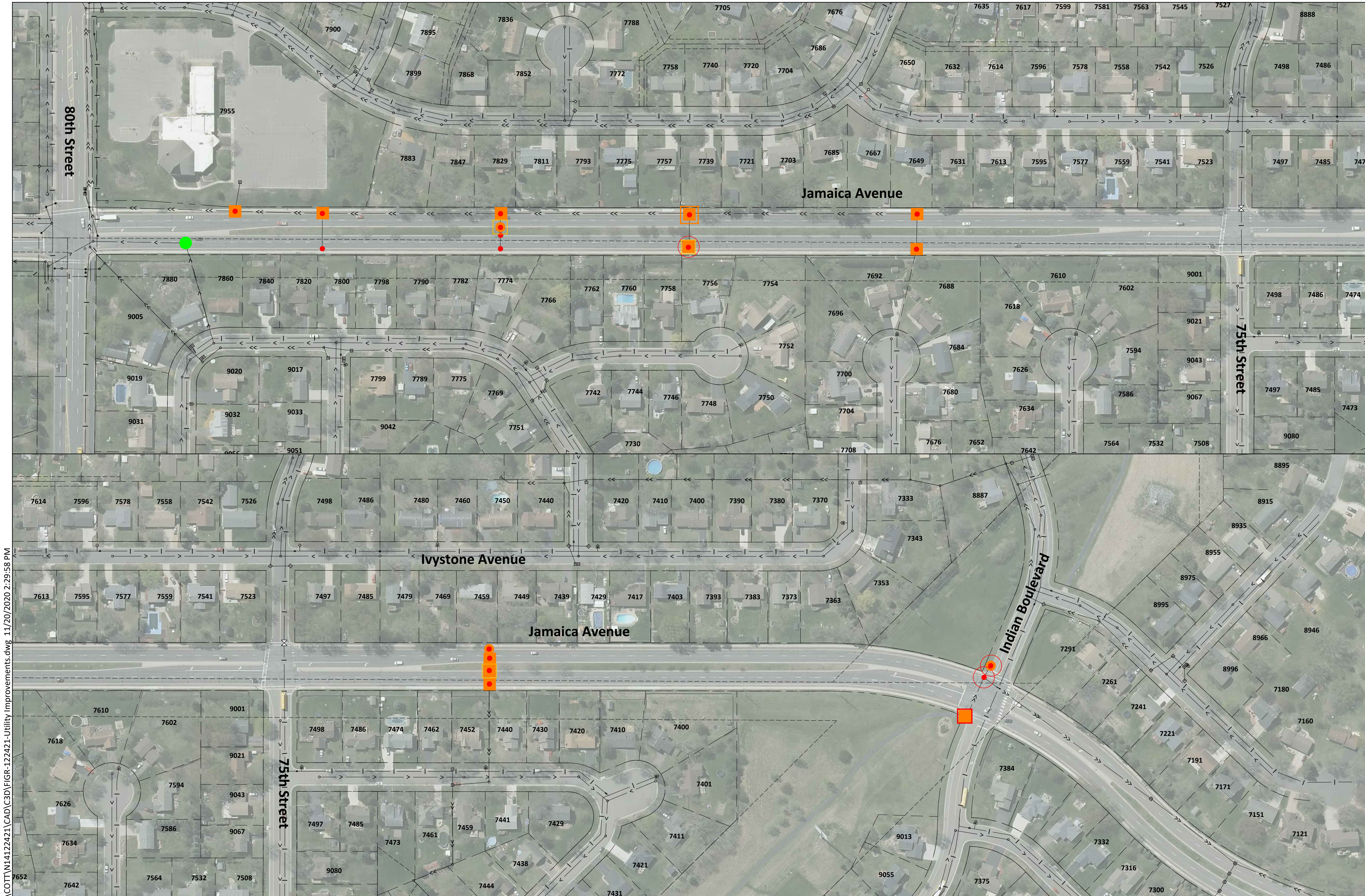
Cottage Grove
Where Pride and Prosperity Meet

2021 Pavement Management Project
City of Cottage Grove, MN

Figure 10: Utility Improvements - Jamaica Avenue
December 2020

BOLTON & MENK



LEGEND

- SANITARY SEWER: REPLACE RINGS
- STORM SEWER: REPLACE STRUCTURE
- STORM SEWER: REPLACE TOP SLAB
- STORM SEWER: REPLACE CB RINGS
- STORM SEWER: REPLACE GRATE OR CASTING
- STORM SEWER: ADD 1-FT BARREL SECTION
- STORM SEWER: PATCH STRUCTURE (WALL, INVERT, OR DOGHOUSE)
- STORM SEWER: LINE STRUCTURE

0 150 300
SCALE FEET

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Cottage Grove
Where Pride and Prosperity Meet

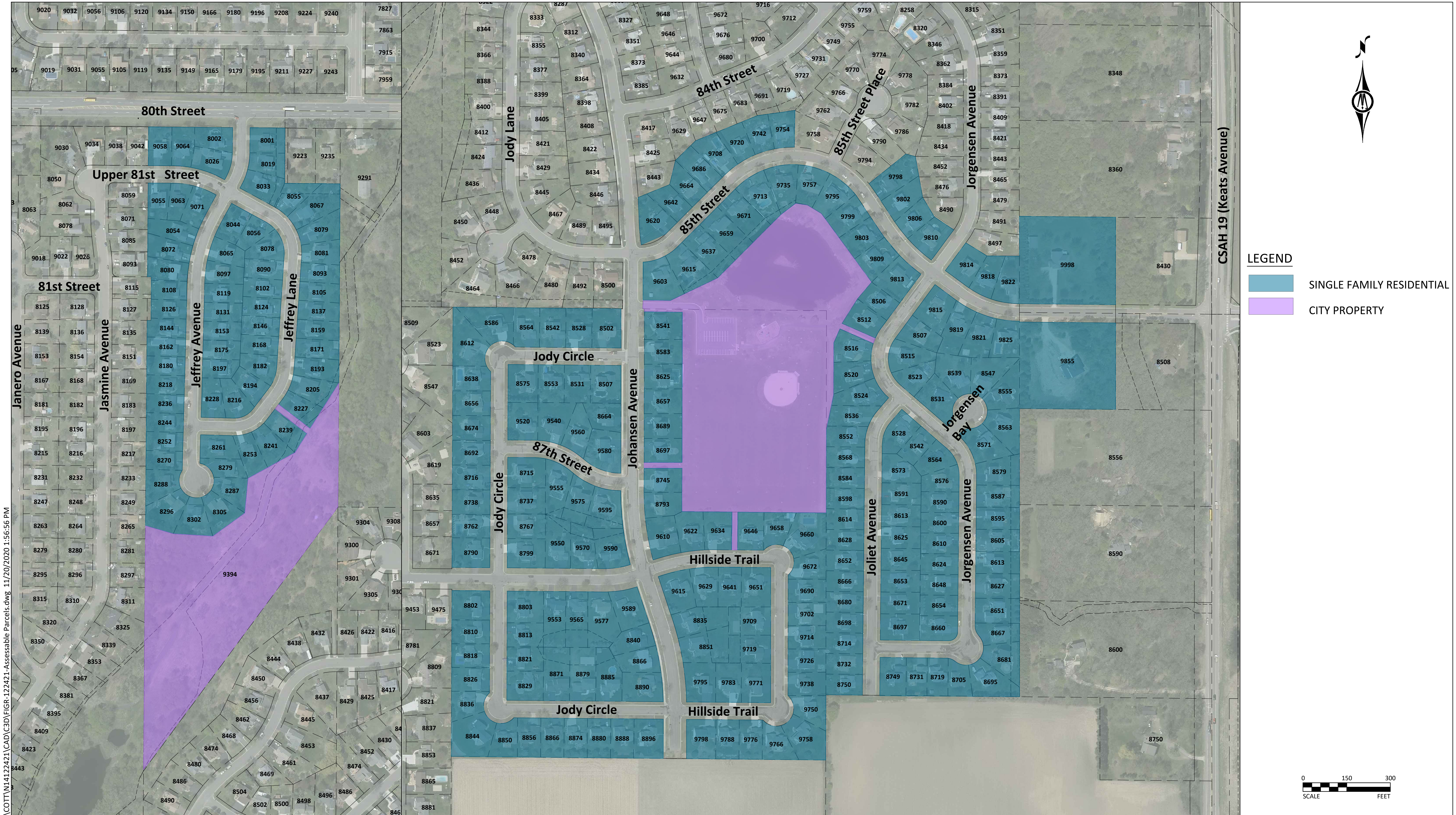
2021 Pavement Management Project

City of Cottage Grove, MN

Figure 11: Assessable Parcels

December 2020

BOLTON & MENK



Appendix C: Cost Estimate Summary

Cost Estimate Summary
2021 Pavement Management Project

Location	Feasibility Report Construction Cost	Total Cost *	Deduct For Street Width	Deduct For City Property Assessment	Residential Adjusted Total Cost	Residential Assessed Amount	City Funds	City Funds Breakout: Sanitary Utility Fund	Water Utility Fund	Stormwater Utility Fund	Streetlight Enterprise Fund	Playground/ Park Shelter Replacement/ Public Landscape Initiative	Park Improvement Fund	River Oaks Golf Course	MSA Funds	General Levy	Single Family Units	RBLE Units	Assessment Policy Calculation: Single Family Assessed $/Unit	Special Benefit Appraisal: Single Family Assessed $/Unit
						45% of Adjusted														
Pine Meadows, Sandy Hills & East Meadow Cliff - Pavement Replacement																				
Streets	$ 1,539,701.25	$ 2,117,089.22	$ (43,290.84)	$ (8,337.45)	$ 2,065,460.93	$ 929,457.42	$ 1,187,631.80	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,187,631.80				
Sanitary Sewer	$ 43,850.00	$ 60,293.75	$ -	$ (237.45)	$ 60,056.30	$ 27,025.34	$ 33,268.41	$ 33,268.41	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -				
Water Main	$ 84,325.00	$ 115,946.88	$ -	$ (456.62)	$ 115,490.26	$ 51,970.62	$ 63,976.26	$ -	$ 63,976.26	$ -	$ -	$ -	$ -	$ -	$ -	$ -	256.0	256.0	**$4,167.74**	**$5,600-$7,600**
Storm Sewer	$ 94,900.00	$ 130,487.50	$ -	$ (513.88)	$ 129,973.62	$ 58,488.13	$ 71,999.37	$ -	$ -	$ 71,999.37	$ -	$ -	$ -	$ -	$ -	$ -				
Subtotal - Pine Meadows, Sandy Hills & East Meadow Cliff - Pavement Replacement	***$ 1,762,776.25***	***$ 2,423,817.35***	***$ (43,290.84)***	***$ (9,545.39)***	***$ 2,370,981.12***	***$ 1,066,941.50***	***$ 1,356,875.85***	***$ 33,268.41***	***$ 63,976.26***	***$ 71,999.37***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ 1,187,631.80***				
Jamaica Avenue - Pavement Replacement																				
Streets	$ 1,005,998.00	$ 1,383,247.25	$ -	$ (1,383,247.25)	$ -	$ -	$ 1,383,247.25	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ 1,383,247.25				
Sanitary Sewer	$ 1,550.00	$ 2,131.25	$ -	$ (2,131.25)	$ -	$ -	$ 2,131.25	$ 2,131.25	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -				
Water Main	$ 2,400.00	$ 3,300.00	$ -	$ (3,300.00)	$ -	$ -	$ 3,300.00	$ -	$ 3,300.00	$ -	$ -	$ -	$ -	$ -	$ -	$ -	NA	NA	***NA***	NA
Storm Sewer	$ 39,375.00	$ 54,140.63	$ -	$ (54,140.63)	$ -	$ -	$ 54,140.63	$ -	$ -	$ 54,140.63	$ -	$ -	$ -	$ -	$ -	$ -				
Subtotal - Jamaica Avenue - Pavement Replacement	***$ 1,049,323.00***	***$ 1,442,819.13***	***$ -***	***$ (1,442,819.13)***	***$ -***	***$ -***	***$ 1,442,819.13***	***$ 2,131.25***	***$ 3,300.00***	***$ 54,140.63***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ 1,383,247.25***				
Arbor Meadows Park - Park Improvements	***$211,740.00***	***$ 291,142.50***	***$ -***	***$ (291,142.50)***	***$ -***	***$ -***	***$ 291,142.50***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ 291,142.50***	***$ -***	***$ -***	***$ -***	**NA**	**NA**	**NA**	**NA**
River Oaks Golf Course	***$379,723.50***	***$ 522,119.81***	***$ -***	***$ (522,119.81)***	***$ -***	***$ -***	***$ 522,119.81***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ -***	***$ 522,119.81***	***$ -***	***$ -***	**NA**	**NA**	**NA**	**NA**
Total - Project	**$ 3,403,562.75**	**$ 4,679,898.79**	**$ (43,290.84)**	**$ (2,265,626.83)**	**$ 2,370,981.12**	**$ 1,066,941.50**	**$ 3,612,957.29**	**$ 35,399.66**	**$ 67,276.26**	**$ 126,140.00**	**$ -**	**$ -**	**$ 291,142.50**	**$ 522,119.81**	**$ -**	**$ 2,570,879.05**				

* Includes 10% Contingency + 25% Indirect Costs

Appendix D: Preliminary Assessment Roll

Preliminary Assessment Roll

Pine Meadows 2nd, 4th, and 5th Additions Pavement Replacement

Parcel ID	Owner	Address	Units	$/Unit	Total /Unit
1502721410053	RAMEY ROBERT & LISA	8579 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410025	WOEHNKER PETER K & AMY L	8528 S JORGENSON AVE	1	$ 4,167.74	$ 4,167.74
1502721410009	SWABACK THEODORE R & BRITANY	8520 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410028	BRILLHART BREANNA & ALEX	8576 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410012	GUDERIAN CELESTE J	8552 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410062	SCHAEFER CHRISTOPHER L	8695 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410007	THAO SHENG & CHIP	8512 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410011	SPRINGMAN STEVEN W & CYNTHIA	8536 S JOLIET AVE	1	$ 4,167.74	$ 4,167.74
1502721410060	CASLAND ANTHONY R & AVIS A	8667 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410027	JONES MELANIE	8564 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410046	KELSEY TREVOR C & JULIE	8523 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410045	CHASE JESSE P & CYNTHIA M WILKEN	8515 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410064	KONZE MARLIN G & ANNABELLE M	8719 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410006	METCALF RICHARD L JR & SONYA L	8506 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410010	HEAVNER MICHAEL A & ROSEANN M	8524 JORGENSEN AVE	1	$ 4,167.74	$ 4,167.74
1502721410063	SUTTERFIELD SHERYL J	8705 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410061	TAUFEN VICKI L & ANTHONY R	8681 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410035	FARLEY MATTHEW & LISA	8660 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410008	LEWIS HOLLY A	8516 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410031	ADAMS MATTHEW	8610 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410056	INGRAM STEPHEN M & RITA M	8605 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410033	RAWAY ERIC & HALEY	8648 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410058	OLSON DAVID G	8627 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410032	BOLLE PETER A & RACHEL K	8624 JORGENSEN AVE N	1	$ 4,167.74	$ 4,167.74
1502721410057	NELSON MICHAEL D & CONSTANCE A	8613 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410065	VORWERK RICHARD K & PAMELA A	8731 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410066	TLUSTOS SAMUEL E	8749 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410059	ARNEBECK JASON R & ANNA L	8651 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410034	OAKLAND ERIC & MELANIE A	8654 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410030	ANDERSON JEFFREY & KELLY	8600 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410055	LINDUSKY GREGORY M & BRENDA L	8595 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410029	BUSS DANIEL L	8590 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410054	LLOYD DAVID S & CINDY C	8587 S JORGENSEN AVE	1	$ 4,167.74	$ 4,167.74
1502721410044	BERG VANESSA E & JEREMIAH M	8507 JORGENSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721410026	JOHNSON REV LIV TRS	2930 EDGERTON ST	1	$ 4,167.74	$ 4,167.74
1502721410017	MEYER MARC R & JENNIFER J LARSON	8628 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410022	STUEDLE WESTON & LYNDSEY	8714 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410038	FLAHERTY TIMOTHY J	8653 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410019	CHANDRAN BALA M	8666 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410018	SAVARD CHAD C & JENNIFER E	8652 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410039	THIELING ROBERT M	8645 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410014	BUSS CHRISTOPHER J & CARYN S	8584 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410043	BRASHER MICHAEL R & JOY R	8573 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410040	SIMON SANDRA & PELLINO III C E	8625 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410024	HENK WILLIAM J & NICOLE V	8750 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410023	MALOTT JAMES M & JACALYN J	8732 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410036	BRUDELIE JULIE B & NATHAN O	8697 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410021	JOHNSON BRUCE L & JEAN A	8698 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410037	PLUMBO DAVID A & AMANDA R	8671 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410020	BERG BRIAN C & REBECCAH A	8680 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410016	WITZANY GARY R & VERNA A	8614 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410041	SCHWARTAU CRAIG R & JULIE A	8613 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410015	MOODY JAMES D & AMANDA C PALMER	8598 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410042	RYAN RICHARD P	8591 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74
1502721410013	NORTON KATHLEEN M	8568 JOLIET AVE S	1	$ 4,167.74	$ 4,167.74

Preliminary Assessment Roll

Pine Meadows 2nd, 4th, and 5th Additions Pavement Replacement

1502721140050	HENRY CARLENE T	14683 TRIPLE EAGLE CT	1	$ 4,167.74	$ 4,167.74
1502721140052	MAASS ADAM L & JILL K	9810 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140053	DIEDRICH MARK & JULIE A	9806 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130097	MOSITES PATRICK J & CATHERINE M MOSITES	9742 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721410069	STEFFEN GREGORY P & JULIE K	9825 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130091	HILL DAVID A	9620 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130108	LANE GABRIEL D & ANDREA	9757 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130105	JAROSIEWICZ-LINDSEY KRISTINE M	9735 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130098	SEIDL TRAVIS J ETAL	9754 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130100	BESTLER DWANE L & PAMELA A	9615 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140048	VOELKER JOHN W & CYNTHIA M	9803 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721410068	HERMERDING BRYAN J & KATIE L	9821 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140032	MORAN MICHAEL P & THERESA A	9822 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140046	NCHANG ROSALINE	9795 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140055	SAUBER JENEL L	9798 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130096	NITTI GINO A	9720 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721410067	BABCOCK CHRISTOPHER & MICHELLE	9819 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130099	BLUE RONALD G & TARA L	9603 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140031	HARRINGTON APRIL & LUCAS	9818 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140049	SCHENCK KYLE & CAROLEE	9809 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140047	MANIS LIV TRS	9799 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130104	IH3 PROPERTY MINNESOTA LP	1717 MAIN ST STE 2000	1	$ 4,167.74	$ 4,167.74
1502721130095	MCNAMARA SCOT A	9708 S 85TH ST	1	$ 4,167.74	$ 4,167.74
1502721410070	ROBERTSON JULIE & BRIAN	9855 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140030	WENZEL BRIAN R & KELLY A	9814 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130094	PORTER TIMOTHY W & SANDRA A	9686 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140051	LEWIS JEFFREY C & KIMBERLEY A	9815 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130101	DOYLE JOHN A & TERI L	9637 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140003	POLZIN JILLIAN N	9998 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130103	PROWSE DAVID & JUDITH	9671 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130092	HOWELL MARLAN H & PEGGY A	9642 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721140054	HARDY STEVEN J & MARJORIE E	9802 S 85TH ST	1	$ 4,167.74	$ 4,167.74
1502721130102	HOMAN BRIAN G & LINDA L	9659 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721130093	SCHUMAN TIMOTHY & DANIELLE	9664 85TH ST S	1	$ 4,167.74	$ 4,167.74
1502721410048	HOUCK GARY & MARIA J HAAS	8539 JORGENSEN BAY S	1	$ 4,167.74	$ 4,167.74
1502721410052	PECHMANN DANIEL W & PATRICIA L	8571 JORGENSON BAY S	1	$ 4,167.74	$ 4,167.74
1502721410047	WHILLOCK STEVEN E & ROSLYN A	8531 JORGENSEN BAY S	1	$ 4,167.74	$ 4,167.74
1502721410049	CHRISTENSEN MARK D & JENNIFER A	8547 JORGENSEN BAY	1	$ 4,167.74	$ 4,167.74
1502721410051	LUMAN CHARLES J JR & LAURIE	8563 JORGENSEN BAY S	1	$ 4,167.74	$ 4,167.74
1502721410050	VANGERPEN MICHAEL & STEPHANIE	8555 JORGENSEN BAY S	1	$ 4,167.74	$ 4,167.74
Totals			**95**		**$ 395,935.32**

Preliminary Assessment Roll

Sandy Hills 7th and 8th Additions Pavement Replacement

Parcel ID	Owner	Address	Units	$/Unit	Total /Unit
1502721420097	WILLIAMS REYNOLD L	8890 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420082	KOPPE THOMAS J & SUZANNE M	8851 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420081	FALETTI MICHAEL J & DESIREE C	8835 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420098	BONAHOOM RICHARD M & RITA L	8866 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420099	JOHNSON ROBERT D	8840 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420062	SULLIVAN JAMES D & RUTH A	8793 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420061	BOESE JEFFREY L & LAUREL M	8745 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420055	HOLM SCOTT R & TERESA A	8541 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420057	HANSON DANNY W & SHELLEY A	8625 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420056	WILSON JESSE & SUSAN	8583 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420054	MEADE SALLY A	8664 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420058	PULANCO DANIEL D & MICHELE M	8657 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420060	SMITH DUANE A & MICHELLE L	8697 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420059	MORELAND LEAH J & JOHN	8689 JOHANSEN AVE S	1	$ 4,167.74	$ 4,167.74
1502721420021	HOLGATE GEORGE A JR & PAMELA L	8586 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420039	SMITH TIMOTHY J & CHRISTINA A	8715 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420020	ROSS EDWARD M & DEBRA K	8564 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420022	DUANE R ECKERT REV TRS ETAL	8612 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430012	HUERTA RICHARD L & MARY ANN	8844 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430011	GLAZIER DARIN & JODI	8836 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420023	PUST AARON D & LAUREN E	8638 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430013	FLOYSAND ERIC C & CHRISTINA M	8850 JODY CIR	1	$ 4,167.74	$ 4,167.74
1502721420042	GARRICK LYNN	8799 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420030	VAIL RAYMOND J & JOSCELYN S	8790 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430014	BRUMM TIMOTHY A & AMY K	8856 JODY CIR	1	$ 4,167.74	$ 4,167.74
1502721420096	DRAGT TODD & LINDA	8885 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420095	VANDENAVOND TODD M & DONNA J	8879 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420094	KLEINBOEHL CODY & AMY	8871 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420092	HPA US1 LLC	180 STETSON AVE N #3650	1	$ 4,167.74	$ 4,167.74
1502721420067	GRAMS ASHTON & CYNTHIA A	8818 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420091	GEORGE STEVIN L & CAROL J	8813 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420027	FILIPOVICH DANIEL & LAURINE	8716 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420029	WILLIAMS KATHLEEN A & BRICE M	8762 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420041	DAVY ZONA M & ROBERT M	8767 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430019	LISTERUD MARK & LEEANN PRAIRIE	8896 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430018	VANSCHOONHOVEN JAMES D & KIMBERLY A	8888 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430017	BANASZEWSKI KENNETH W & JULIE	8880 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430016	LEWICKI ROBERT A & EILEEN C	8874 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721430015	BEHR GEORGE F III & MOLLY AK	8866 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420093	BELL KIMBERLY L & SIDNEY M	8829 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420068	CORRIGAN BRETT & LISA	8826 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420066	ANDERSON DOUGLAS B & CINDY L	8810 JODY CIR	1	$ 4,167.74	$ 4,167.74
1502721420035	COLLUPY ROBERT A & JONNIE L	8803 JODY CIR N	1	$ 4,167.74	$ 4,167.74
1502721420065	BUYTENDORP JAMES L & JOANN M	8802 JODY CIR	1	$ 4,167.74	$ 4,167.74
1502721420028	KIELSA MICHAEL A & MICHELLE P	8738 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420040	WHITE PAUL B & ROXANNE D	8737 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420047	MAHER TROY D & TIFFANY A DRESSEN	8531 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420048	RYAN CARY L & KAREN C	8553 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420049	DEBAERE JOHN J & ELIZABETH M	8575 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420024	BARFELS THOMAS E & DIANNE M	8656 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420046	NEUMANN CHRISTOPHER & MICHELLE LAUS	8507 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420017	COLLETT CHRISTOPHER M & CRYSTAL M	8502 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420018	ARMBRUSTER REBECCA J & JOSEPH B	8528 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420019	SKEIE PAUL G & LOREE A	8542 JODY CIR	1	$ 4,167.74	$ 4,167.74
1502721420026	DOTY DAVID W & PENNY H	8692 JODY CIR S	1	$ 4,167.74	$ 4,167.74

Preliminary Assessment Roll Sandy Hills 7th and 8th Additions Pavement Replacement					
1502721420025	JOSLIN DAVID & HEATHER	8674 JODY CIR S	1	$ 4,167.74	$ 4,167.74
1502721420037	WILLHITE BERNARD J & DIANE E	9575 87TH ST S	1	$ 4,167.74	$ 4,167.74
1502721420038	MORRIS CRAIG L & DIANE M	9555 87TH ST S	1	$ 4,167.74	$ 4,167.74
1502721420050	LEPSCHE WILLIAM L & CASSONDRA D	9520 87TH ST S	1	$ 4,167.74	$ 4,167.74
1502721420036	ANDERSON RICHARD T & ASHLEY M	9595 87TH ST S	1	$ 4,167.74	$ 4,167.74
1502721420053	ELLINGSON MARK A & JILLIAN M	9580 87TH ST S	1	$ 4,167.74	$ 4,167.74
1502721420051	DEWAELE LAWRENCE E & JODI L	9540 87TH ST S	1	$ 4,167.74	$ 4,167.74
1502721420052	LURKEN KERRY & STEPHANIE	9560 87TH ST S	1	$ 4,167.74	$ 4,167.74
1502721420070	BUNESS RYAN T & KALLIE L	9658 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420079	GEEHAN ANDREA L & ALLEN S DEGEL	9634 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420072	SUNDELL RANDI L & RYAN D	9672 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420083	DAHLER WILLIAM M & JODI L	9795 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420080	BOCHE BLAKE C & JILL M	9615 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721430022	MAURER WILLIAM L & MELISSA M	9766 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420045	TRUDEL CHRISTOPHER P & ANGELA	9590 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420078	GABBERT CHRISTOPHER & MICHELE	9622 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420031	SWARD CRISTIE A & TIMOTHY J	9589 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420071	SCHULT JOSEPH W & BETH A	9660 HILLSIDE TRL	1	$ 4,167.74	$ 4,167.74
1502721430021	GIESER DANIEL H & NINA A	9758 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721430020	HANTEN JOHN A & TRACY A	9750 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420090	GILLELAND JAMES S & BETH A	9629 HILLSIDE TRL	1	$ 4,167.74	$ 4,167.74
1502721420063	DEVARENNES MARC S & JOYCE E	9610 HILLSIDE TRL	1	$ 4,167.74	$ 4,167.74
1502721420086	JOHNSON STEPHEN M & MALONE M M	9719 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420073	JANET L WININGER LIV TRS	9690 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420088	KING SUEANN & SHARON HANESTAD	9651 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420089	LUCAS MICHELLE W & MICHAEL S	9641 HILLSIDE TRL	1	$ 4,167.74	$ 4,167.74
1502721420076	WILLSON JOHN W & RUTH A	9726 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420075	EDWARDS DERICK B & KAREN E	9714 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420044	ALLIE MARC J & JACQUELYN M	9570 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420043	HERZOG DENNIS M & DENISE A	9550 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721430023	LANE RUSSELL & ESBERG SHARON	9776 HILLSIDE TRL	1	$ 4,167.74	$ 4,167.74
1502721430024	BOLLBACK JAMES D & JULIE	9788 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721430025	WRIGHT JOHN R & ASHTON M	9798 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420077	SOKOL BARBIE S	9738 HILLSIDE TRL	1	$ 4,167.74	$ 4,167.74
1502721420085	TATE DIRK A & JULIE R	9771 HILLSIDE TRL	1	$ 4,167.74	$ 4,167.74
1502721420084	LARSON KEVIN K & LORI L	9783 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420087	ENGELS JEFFREY T & JOETH J	9709 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420074	ISRAEL BRIAN W & JENNIFER M	9702 HILLSIDE TR	1	$ 4,167.74	$ 4,167.74
1502721420032	PFEIFFER BRYANT S & ERIN C	9577 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420033	FISCHER JOEL A & JENNIFER A	9565 HILLSIDE TRL	1	$ 4,167.74	$ 4,167.74
1502721420034	NADLER PAUL W	9553 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
1502721420069	KIRCHNER ANDREW A & MELONIE L	9646 HILLSIDE TRL S	1	$ 4,167.74	$ 4,167.74
Totals			**97**		**$ 404,270.80**

Preliminary Assessment Roll East Meadow Cliff Pavement Replacement					
Parcel ID	Owner	Address	Units	$/Unit	Total /Unit
1502721220069	KLEIN GREGORY J & CANDIUS S	8054 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220089	SKARA MICHAEL A & HOLLIE L	8044 JEFFERY LN	1	$ 4,167.74	$ 4,167.74
1502721220110	SCHIEMANN GREGORY R & LISA M	8033 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220122	MULVIHILL DENNIS M & DANIELLE	8227 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220121	ALLERTON LIV TRS	8205 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220120	MUCKENHIRN ROBERT J & JULIE BERGSTEDT	8193 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220113	GIBBONS JAMES P & VALORIE R	8079 JEFFREY LN S	1	$ 4,167.74	$ 4,167.74
1502721220084	MARKS BRIAN J & PATRICIA A	8279 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220100	KOEPSELL JAMES H & DORIS J	8182 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220070	HAIDER DAVID M & STEPHANIE M	8072 JEFFREY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220071	KLINGBEIL THOMAS R & PAMELA L	8080 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220068	DONAHUE MARK & JODI	9071 UPPER 81ST ST S	1	$ 4,167.74	$ 4,167.74
1502721220111	HEIMBRECHT KYLE R & JANESSA J	8055 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220063	GUZMAN ALANA	8026 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220082	OLSON NICHOLAS & JENNIFER FARINELLA	8288 JEFFERY AVE	1	$ 4,167.74	$ 4,167.74
1502721220099	KILBOURNE BRETT	8194 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220091	CHINN CHRISTOPHER & KATHERINE	8097 JEFFERY AVE	1	$ 4,167.74	$ 4,167.74
1502721220114	SAND STEPHEN D & LORI A	8081 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220061	ANDERSON KRISTINA L	8126 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220107	KEENAN BRIAN P	8056 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220112	LOVELL MATTHEW & JESSICA TOUTANT-LOVELL	8067 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220067	NUNEZ ELIAZAR & CATALINA	9063 UPPER 81ST ST	1	$ 4,167.74	$ 4,167.74
1502721220087	LEKO KAREN	8241 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220098	OLSON CHRISTOPHER G & VIRGINIA	8216 JEFFERY LN	1	$ 4,167.74	$ 4,167.74
1502721220064	JONES LAWRENCE D & SANDRA L	9064 UPPER 81ST ST S	1	$ 4,167.74	$ 4,167.74
1502721220086	GRAVES DIANNA E & JANE THEISSEN	8253 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220088	BAILEY LUKE J	8239 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220083	STINSON LEIF H	8287 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220090	PIERCE JAMES M	8065 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220066	WELTER THOMAS R & RUTH	9055 UPPER 81ST ST S	1	$ 4,167.74	$ 4,167.74
1502721220108	VERNSTROM GEORGE D & KATHLEEN S	8001 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220062	JOHNSON LYNDON B & EVELYN L	8002 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220065	GUTTETER ANDREW & KAYLA STAAB	9058 UPPER 81ST ST S	1	$ 4,167.74	$ 4,167.74
1502721220081	ESPERSEN ERIC D	8270 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220096	FORD ESTHER	8197 JEFFREY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220076	PORATH DONALD W & DIANE M	8180 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220079	DINGLE SEAN	8244 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220078	ROSENWALD TRAVIS J & ANGELA	8236 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220093	LEE VONG & SUCHAI VANG	8131 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220117	VOGT ANTHONY K & TAMERA L	8137 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220103	JANASZAK MEGHAN	8124 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220115	DOSMANN JODI I	8093 JEFFERY LN	1	$ 4,167.74	$ 4,167.74
1502721220105	BERGQUIST MICHAEL D & KRISTY	8090 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220080	TOMAI EDWARD M & TIFFANY	8252 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220097	BRINK TROY & ALISHA	8228 JEFFERY LN	1	$ 4,167.74	$ 4,167.74
1502721220077	KANE RAYMOND J	8218 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220102	CALLAIS SHELLY L	8146 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220095	JAROSIEWICZ TARA R	8175 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220119	BUTH MICHAEL & LANA	8171 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220075	CARLSON KENNETH C & MARJORIE	8162 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220094	OLSON BRIAN A & RYNKA E	8153 JEFFERY AVE	1	$ 4,167.74	$ 4,167.74
1502721220118	SMITHWICK JOSEPH R	8159 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721220074	KASZAS SUSAN M	8144 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220092	ASMEROM MEHARI & HIWOT M TESSEMA	8119 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220116	KUMMER BRIAN & SARAH	8105 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74

1502721220072	TOMASCHKO ANDREW JOHN	8108 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220104	BRUNSVOLD JENNIFER L & JUSTIN A	8102 JEFFERY LN S	1	$ 4,167.74	$ 4,167.74
1502721230048	BLAIR ROBERT & CAMILLE	8302 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721230047	ABTS JAMES E JR & JOY C	8296 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721230049	CHASE RICHARD L & KIMBERLY L	8305 JEFFERY AVE S	1	$ 4,167.74	$ 4,167.74
1502721220109	CURRIE DANIEL W	8605 INDIAN BLVD S	1	$ 4,167.74	$ 4,167.74
1502721220085	CUNNINGHAM BRAD L	1725 INNSBRUCK PKWY	1	$ 4,167.74	$ 4,167.74
1502721220106	FOGLE DONALD P JR	35625 63RD AVENUE WAY	1	$ 4,167.74	$ 4,167.74
1502721220101	PRIBYL NICOLE L & PATRICK D	6973 TIMBER RIDGE DR S	1	$ 4,167.74	$ 4,167.74
Totals			**64**		**$ 266,735.38**

Appendix E: Pavement Cores – Residential

Coring Location C-1

Coring Location C-2

Coring Location C-3

*Coring Location C-4**

*NTI's Field Technicians disturbed the aggregate base beneath the road with the coring drill barrel. The displaced materials were removed from the hole and the core prior to these pictures. This incident accounts for the discrepancy between the hole and core dimensions.

Pavement Core Log

Core ID :C-05

Roadway Name :85th St

Latitude :44.827501

Longitude :-92.909888

Direction of Travel :EB

Location Type :Right Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :4.1

Down-Hole Measurement (in) :4.25

Base Thickness (in) :5.75

AET Project No. :28-20367

Date :9/16/2020 1:43:58 PM

Comments :No visible lift thicknesses observed. Chip seal on surface and core showing minimal to moderate stripping throughout entire core.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

AMERICAN ENGINEERING TESTING, INC.

Core ID :C-06

Roadway Name :85th St

Latitude :

Longitude :

Direction of Travel :WB

Location Type :Right Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :4.5

Down-Hole Measurement (in) :4.25

Base Thickness (in) :3.75

AET Project No. :28-20367

Date :9/16/2020 1:22:18 PM

Comments :No visible lift thicknesses observed. Core broke at approximately 1" below the surface. Minimal stripping observed throughout entire core.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

Core ID :C-07

Roadway Name :85th St

Latitude :

Longitude :

Direction of Travel :EB

Location Type :Center of Lane

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :3.5

Down-Hole Measurement (in) :3.5

Base Thickness (in) :7.25

AET Project No. :28-20367

Date :9/16/2020 1:06:52 PM

Comments :No visible lift thicknesses observed. Minimal to moderate stripping observed throughout entire core.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

Core ID :C-08

Roadway Name :Jorgensen Ave

Latitude :

Longitude :

Direction of Travel :SB

Location Type :Right Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :3.8

Down-Hole Measurement (in) :3.5

Base Thickness (in) :9.25

AET Project No. :28-20367

Date :9/16/2020 2:57:32 PM

Comments :No visible lift thicknesses observed. Core broke at two places in the upper 2" of the core. Severe to moderate stripping throughout entire core.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

Core ID :C-09

Roadway Name :Joliet Ave

Latitude :44.824711

Longitude :-92.908117

Direction of Travel :SB

Location Type :Right Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :3.1

Down-Hole Measurement (in) :3.25

Base Thickness (in) :8.25

AET Project No. :28-20367

Date :9/16/2020 3:25:37 PM

Comments :From surface of core down, Lift 1: 1.3", Lift 2: 1.8". Core generally solid throughout.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

AMERICAN ENGINEERING TESTING, INC.

Core ID :C-10

Roadway Name :Jorgensen Ave

Latitude :44.823128

Longitude :-92.907949

Direction of Travel :WB

Location Type :Center of Lane

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :3.60

Down-Hole Measurement (in) :3.75

Base Thickness (in) :2.5

AET Project No. :28-20367

Date :9/16/2020 3:13:02 PM

Comments :From surface of core down, Lift 1: 1.5", Lift 2: 2.1". Core generally solid throughout.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

Core ID :C-11

Roadway Name :Jorgensen Ave

Latitude :44.823718

Longitude :-92.90685

Direction of Travel :SB

Location Type :Right Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :4.00

Down-Hole Measurement (in) :4

Base Thickness (in) :4.5

AET Project No. :28-20367

Date :9/16/2020 3:39:58 PM

Comments :From surface of core down, Lift 1: 1.75", Lift 2: 2.25". Chip seal on surface and minimal stripping observed throughout entire core.

The core location was moved approximately 20 feet south due to a car that was parked in the location of the core that was marked.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

Core ID :C-12

Roadway Name :Jody Cir

Latitude :44.825815

Longitude :-92.912776

Direction of Travel :EB

Location Type :Right Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :4.35

Down-Hole Measurement (in) :4.5

Base Thickness (in) :5.25

AET Project No. :28-20367

Date :9/16/2020 2:41:36 PM

Comments :From surface of core down, Lift 1: 1.75", Lift 2: 2.6". Chip seal on surface and minimal to moderate stripping observed throughout entire core.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

Core ID :C-13

Roadway Name :Johansen Ave

Latitude :44.824217

Longitude :-92.911295

Direction of Travel :SB

Location Type :Right Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :4.00

Down-Hole Measurement (in) :4

Base Thickness (in) :9

AET Project No. :28-20367

Date :9/16/2020 2:00:53 PM

Comments :From surface of core down, Lift 1: 1.75", Lift 2: 2.25". Chip seal on surface and minimal stripping observed in top lift.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

Core ID :C-14

Roadway Name :Hillside Tr

Latitude :

Longitude :

Direction of Travel :SB

Location Type :Left Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :3.00

Down-Hole Measurement (in) :3

Base Thickness (in) :7.25

AET Project No. :28-20367

Date :9/16/2020 2:13:59 PM

Comments :No visible lift thicknesses observed. Chip seal on surface and minimal stripping throughout entire core.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Pavement Core Log

Core ID :C-15

Roadway Name :Jody Cir

Latitude :44.822541

Longitude :-92.912726

Direction of Travel :WB

Location Type :Right Wheel Path

Lane ID :Drive Lane

Core Diameter (in) :6

Recovered Core (in) :3.85

Down-Hole Measurement (in) :4

Base Thickness (in) :4.5

AET Project No. :28-20367

Date :9/16/2020 2:27:55 PM

Comments :From surface of core down, Lift 1: 2.0", Lift 2: 1.85". Moderate to minimal stripping observed throughout entire core.

American Engineering Testing, Inc.
550 Cleveland Avenue North St. Paul, MN 55114
www.amengtest.com

Appendix F: Geotechnical Report – Jamaica Avenue

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
· ENVIRONMENTAL
· GEOTECHNICAL
· MATERIALS
· FORENSICS

REPORT OF GEOTECHNICAL EXPLORATION

Jamaica Avenue Improvements

Between Highway 61 and Indian Blvd
Cottage Grove, Minnesota

AET Report No. 28-20309

Date:

July 2, 2020

Prepared for:

Bolton & Menk, Inc.
2035 County Road D East
Maplewood, Mn 55109

www.amengtest.com

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
• ENVIRONMENTAL
• GEOTECHNICAL
• MATERIALS
• FORENSICS

July 2, 2020

Bolton & Menk, Inc.
2035 County Road D East
Maplewood, Mn 55109

Attn: Mike Boex, PE
Michael.boex@bolton-menk.com

RE: Geotechnical Exploration Data Report
Jamaica Avenue Improvements
Cottage Grove, Minnesota
AET Project No. 28-20309

Dear Mr. Boex:

American Engineering Testing, Inc. (AET) is pleased to present the results of our subsurface exploration program for the referenced project in Cottage Grove, Minnesota. These services were performed according to our proposal to you dated May 6, 2020.

We are submitting one electronic copy of the report to you. Paper copies can be provided upon request. Please contact me if you have any questions about the report.

Sincerely,
American Engineering Testing, Inc.

Jacob O. Michalowski, P.E.
Senior Engineer
Phone: (651) 283-2481
jmichalowski@amengtest.com

SIGNATURE PAGE

Prepared for:

Bolton & Menk, Inc.
2035 County Road D East
Maplewood, Mn 55109

Attn: Mike Boex, PE
Michael.boex@bolton-menk.com

Prepared by:

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, Minnesota 55114
(651) 659-9001/www.amengtest.com

Authored by:

Thomas Evans, P.E.
Engineer II

Reviewed by:

Jacob O. Michalowski, P.E.
Senior Engineer

TABLE OF CONTENTS

1.0 INTRODUCTION

The City of Cottage Grove (the City) and Bolton & Menk, Inc. (BMI) are proposing improvements to a segment of Jamaica Avenue in Cottage Grove, Minnesota. To assist planning and design, you have authorized American Engineering Testing, Inc. (AET) to conduct a subsurface exploration program at the site and conduct soil laboratory testing, This report presents the results of the above services, an

2.0 SCOPE OF SERVICES

AET's services were performed according to our proposal to you dated May 6, 2020. The authorized scope consists of:

- Obtaining eleven 4-inch pavement cores.
- Drilling and sampling eleven standard penetration test (SPT) borings to depths of 6 feet at the pavement core locations.
- Conducting a Ground Penetrating Radar (GPR) survey in both directions of travel and both lanes.
- Performing Falling Weight Deflectometer (FWD) testing at $1/10^{th}$ mile increments in each direction and both right lanes.
- Conducting soil laboratory testing.
- Preparation of this report.

These services are intended for geotechnical purposes. The scope is not intended to explore for the presence or extent of environmental contamination.

3.0 PROJECT INFORMATION

We understand the City and BMI are proposing improvements to a 2.1-mile section of Jamaica Avenue from Highway 61 to Indian Blvd in Cottage Grove, Minnesota. The bituminous-surfaced road is a 4-lane divided road. The annual average daily traffic (AADT) along the road reportedly varies from 6,400 vehicles per day in the northern sections to 21,900 vehicles per day near Highway 61. The traffic data was obtained from the MnDOT Traffic Mapping Application.

4.0 SUBSURFACE EXPLORATION AND TESTING

The subsurface exploration program conducted for the project consisted of ground penetrating radar (GPR) testing, falling weight deflectometer (FWD) testing, eleven standard penetration test (SPT) borings, and eleven pavement cores.

4.1 Ground Penetrating Radar

The pavement thickness testing program conducted for the project consisted of a high speed (air coupled) GPR antenna collecting pavement thickness data at a rate of four scans per foot. The data was collected using a 2 GHz antenna, which allows material layer measurements at depths of up to approximately 18 inches with a resolution less than about ½-inch. The data collected is linked to GPS and allows us to plot the data on a graph. The GPR test data and details of the methods used appear in Appendix C.

The GPR data was collected on May 18, 2020. Scans of the pavement were collected according to SIR-30 processor settings established by GSSI RoadScan system, in both the northbound and southbound directions of the right and left lanes. A calibration file, required for data post-processing, was collected at the beginning of the testing day.

GPR interface identification was accomplished using RADAN 7.0, a proprietary software package included with the GSSI RoadScan system. The software includes tools to aid in delineating pavement layer transitions, and it automatically calculates their depths from the pavement surface using the calibration file(s) collected prior to testing. The identified layers were compared to the soil boring and pavement core data collected at specific locations to validate the accuracy of the layer thicknesses.

Depending on pavement age and condition, the presence of moisture, ambient electromagnetic interference, and pavement structure, total depths of asphalt and aggregate base are not always explicitly clear. Where gaps in clear identification of pavement and base layer thicknesses are encountered, the results are reported as a percent of the picking rate of the layer interface. A picking rate of 100 percent indicates the layer interfaces were visible in 100 percent of the scanned points.

4.2 Falling Weight Deflectometer

The pavement deflection testing program conducted for the project consisted of falling weight deflectometer (FWD) testing at approximately 0.1-mile interval spacing in the right lanes of both northbound and southbound directions. The FWD testing was performed on May 19, 2020 using a Dynatest 8000FWD.

After seating drops, data for four impulse loads (two at 6,000 lbs. and two at 9,000 lbs. nominal load) were collected at each test point. The FWD test results and details of the methods used appear in Appendix B.

The deflection data was analyzed using MnDOT methods for determining the in-place (effective) subgrade and pavement strength, as well as allowable axle loads for a roadway (MnDOT Investigation 183 revised in 1983). The MnDOT methods use the Hogg Model for estimating the subgrade modulus. The effective GE of a pavement system is estimated from the deflection relationship equation, derived from MnDOT Investigations 183 and 195. Our methodology uses MnDOT's Investigation 183 for calculation of an estimated load capacity in late spring and required overlay to estimate the structure for future assumed traffic loading.

4.3 Field Exploration Program

After preliminary review of the GPR data, AET selected eleven soil boring and pavement core locations. Before drilling, we contacted Gopher State One Call to locate public underground utilities. The pavement cores and soil borings were performed on June 3, 2020.

Pavement core logs are provided in Appendix A. These logs include a photograph of the extracted core, as well as total recovered core height, lift thicknesses (where visible), and comments on pavement condition.

Subsurface boring logs and details of the methods used appear in Appendix A. The boring logs contain information concerning soil layering, soil classification, geologic description, and moisture condition. Relative density or consistency is also noted for the natural soils, which is based on the standard penetration resistance (N-value).

Borings B-2 through B-6 were performed in the northbound right lane, and borings B-7 through B-10 were performed in the southbound right lane. Boring B-1 was performed in the northbound right turn lane to E Point Douglas Road, and boring B-11 was performed in the southbound right turn lane to E Point Douglas Road. The locations of the pavement cores and soil borings are illustrated on the Figure 1 – Testing Locations Map preceding the pavement core logs and subsurface boring logs in Appendix A. The soil boring locations were recorded in the field by AET personnel using a GPS unit. The elevations at the boring locations were not recorded.

4.4 Laboratory Testing

The laboratory test program included four sieve analyses. The water content and the percent passing the #200 sieve results appear on the individual boring logs adjacent to the samples upon which they were performed. The full sieve analysis test results are shown on the Gradation Curves sheet in Appendix A following the boring logs.

5.0 SITE CONDITIONS

5.1 GPR Data

The GPR data shows clear interfaces between the bituminous pavement and possible aggregate base layer and between the possible aggregate base layer and underlying material both with a picking rate of 100%. The pavement cores and soil borings were used to aid in the interpretation of the GPR layer interfaces.

The GPR plots are included in Appendix C to illustrate the thickness of the identified bituminous and base layers within both the right and left lanes of northbound and southbound. The values presented in Tables 1 and 2 below were determined using 25-foot interval averages. The 15th percentile represents the value at which 85% of the section has a pavement layer thickness that is greater than identified. This is the value we generally recommend using for pavement design purposes.

Table 1 - GPR Thickness Summary NB Lanes

	NB Left Lane				NB Right Lane			
Layer	**Average**	**CV**	**15th**	**Min.**	**Average**	**CV**	**15th**	**Min.**
BP	5.6	11%	5.0	4.5	5.5	15%	4.7	4.2
Base	5.7	24%	4.3	2.4	7.3	24%	5.4	3.5
BP + Base	11.3	12%	10.0	7.1	12.8	16%	10.5	8.4

Note: BP – Bituminous Pavement. CV – coefficient of variation (Std Dev/Average). 15^{th} – 15^{th} percentile thickness value.

Table 2 - GPR Thickness Summary SB Lanes

	SB Left Lane				SB Right Lane			
Layer	**Average**	**CV**	**15th**	**Min.**	**Average**	**CV**	**15th**	**Min.**
BP	5.5	14%	4.8	4.2	5.6	15%	4.8	4.3
Base	5.2	23%	4.0	2.4	6.1	23%	4.7	1.8
BP + Base	10.7	12%	9.4	7.4	11.7	12%	10.3	7.7

Note: BP – Bituminous Pavement. CV – coefficient of variation (Std Dev/Average). 15^{th} – 15^{th} percentile thickness value.

5.2 Pavement Section

The pavement encountered at the core and soil boring locations consists of bituminous over a possible aggregate base layer. Table 3 below presents the bituminous and aggregate base thickness found at the pavement core/boring locations.

Table 3 - Pavement Thickness Summary

Pavement Core	Extracted Core Bituminous Thickness (in)[A]	Downhole Bituminous Thickness (in) [B.]	Approximate Base Thickness (in) [C.]	Approximate Total Thickness (in) [B.]
B-1	7.6	7¾	3	10¾
B-2	4.9	5	8	13
B-3	6.1	6	9	15
B-4	5.3	5½	5	10½
B-5	5.7	6	11	17
B-6	5.2	5½	5	10½
B-7	4.4	5	5	10
B-8	5.6	7½	5	12½
B-9	5.0	5½	6	11½
B-10	5.6	5½	8½	14
B-11	2.9	7¼	4	11¼

Notes: A. Average of three measurements of the core measured to the nearest 0.1-inch.
B. From borings and rounded to the nearest ¼-inch.
C. From borings and rounded to the nearest ½-inch.

The core lift thicknesses reported on the core logs are from the top down at one location along the core. The noted lift thicknesses were interpreted by AET. In summary, the bituminous thickness encountered at the soil boring and pavement core locations varies from 5 to 7¾ inches. The possible aggregate base material varies from about 3 inches to 11 inches and consists mostly of gravelly silty sand (A-1-b) and sand (A-1-b).

Bituminous condition was also evaluated based on the pavement cores obtained at the site. Photographs of the pavement cores are provided on the pavement core logs in Appendix A. The pavement cores indicate slight to severe stripping. The core from boring B-11 crumbled during coring operations and was not fully recovered. Additionally, a possible chip seal was observed at the surface of all eleven cores.

Stripping occurs when water or water vapor gets between the asphalt film and the aggregates, thereby breaking the adhesive bond between the aggregate and asphalt binder. This will “strip” the asphalt from the aggregate, eventually leading to pavement failure. When stripping within the pavement becomes excessive, severe pavement deformation and fatigue cracking will occur, and then traffic loadings will result in local failures such as alligator cracking, potholes, and excessive rutting in the wheel paths.

5.3 Subgrade Soils

The subgrade soils encountered in the borings below the possible aggregate base course consist mostly of additional fill soils consisting of sand with silt (A-2-4), silty sand (A-2-4), and sand (A-3). The fill soils extended to depths of between 1 foot and to the final drilling depths of 6 feet. Below the fill, medium dense to very dense sand (A-3) alluvial soils were encountered and extended to the final drilling depths of 6 feet.

5.4 FWD Results

Figure 1 in Appendix A illustrates the locations of the FWD tests. Figure 2 in Appendix B shows the effective subgrade R-value from each of the FWD tests. All FWD tests were performed in the right lanes. Table 4 below provides a summary of the FWD testing that was analyzed using MnDOT TONN 2010 software. The results show that the upper 3 to 4 feet of the existing subgrade has good soil support.

Table 4. FWD Test Results.

Roadway	From	To	Lane	Effective R			Effective GE		
				Avg	CV	15th	Avg	CV	15th
Jamaica Ave	Roundabout	East Point Douglas Rd	NB	32.9	NA	NA	31.9	NA	NA
Jamaica Ave	East Point Douglas Rd	90th St	NB	55.4	NA	NA	33.0	NA	NA
Jamaica Ave	90th St	Hillside Trl	NB	26.3	16%	21.7	26.2	7%	23.5
Jamaica Ave	Hillside Trl	80th St	NB	40.3	15%	35.0	33.0	7%	30.4
Jamaica Ave	80th St	75th St	NB	36.9	28%	23.7	31.1	11%	25.7
Jamaica Ave	75th St	Indian Blvd	NB	33.6	11%	30.5	30.9	8%	27.4
Jamaica Ave	Indian Blvd	75th St	SB	44.7	16%	36.9	29.5	8%	26.2
Jamaica Ave	75th St	80th St	SB	30.0	13%	24.8	24.6	9%	22.0
Jamaica Ave	80th St	Hillside Trl	SB	36.9	9%	34.0	30.5	6%	27.9
Jamaica Ave	Hillside Trl	90th St	SB	31.8	9%	28.6	30.6	6%	28.9
Jamaica Ave	90th St	East Point Douglas Rd	SB	41.6	16%	35.5	30.6	10%	27.4
Jamaica Ave	East Point Douglas Rd	Roundabout	SB	37.9	NA	NA	37.0	NA	NA

Note: CV – coefficient of variation (Std Dev/Average). 15th – 15th percentile thickness value.

5.5 Groundwater

Groundwater was not observed in our soil borings during the geotechnical exploration. Due to the relatively high permeability of most of the soils encountered, it is our opinion that the measured water levels should provide an accurate indication or lack thereof the groundwater level at the time of drilling. Groundwater levels do not remain constant; they fluctuate due to varying seasonal and annual rainfall and snow melt amounts, as well as other factors.

6.0 ASTM STANDARDS

When we refer to an ASTM Standard in this report, we mean that our services were performed in general accordance with that standard. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

7.0 CONCLUDING COMMENTS

Within the limitations of scope, budget, and schedule, we have endeavored to provide our services according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, either express or implied, is intended.

Appendix A

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
AASHTO Soil Classification System
Testing Locations
Pavement Core Reports
Subsurface Boring Logs
Gradation Curves

Appendix A
Geotechnical Field Exploration and Testing
AET Project 28-20309

A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling eleven Standard Penetration Test (SPT) borings and eleven pavement cores. The locations of the borings appear on the Boring Location Maps, preceding the Subsurface Boring Logs in this appendix.

A.2 SAMPLING METHODS

A.2.1 Split-Spoon Samples (SS) - Calibrated to N_{60} Values

Standard penetration (split-spoon) samples were collected in general accordance with ASTM: D1586 with one primary modification. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value. Our method uses a modified hammer weight, which is determined by measuring the system energy using a Pile Driving Analyzer (PDA) and an instrumented rod.

In the past, standard penetration N-value tests were performed using a rope and cathead for the lift and drop system. The energy transferred to the split-spoon sampler was typically limited to about 60% of its potential energy due to the friction inherent in this system. This converted energy then provides what is known as an N_{60} blow count.

The most recent drill rigs incorporate an automatic hammer lift and drop system, which has higher energy efficiency and subsequently results in lower N-values than the traditional N_{60} values. By using the PDA energy measurement equipment, we can determine actual energy generated by the drop hammer. With the various hammer systems available, we have found highly variable energies ranging from 55% to over 100%. Therefore, the intent of AET's hammer calibrations is to vary the hammer weight such that hammer energies lie within about 60% to 65% of the theoretical energy of a 140-pound weight falling 30 inches. The current ASTM procedure acknowledges the wide variation in N-values, stating that N-values of 100% or more have been observed. Although we have not yet determined the statistical measurement uncertainty of our calibrated method to date, we can state that the accuracy deviation of the N-values using this method is significantly better than the standard ASTM Method.

A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as "DS" or "SU" on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

A.2.3 Sampling Limitations

Unless observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of "topsoil" layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM: D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM: D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs. A chart explaining the USC system is attached in Appendix A.

Visual-manual judgment of the AASHTO Soil Group is also noted as a part of the soil description. A chart presenting details of the AASHTO Soil Classification System is also attached.

A.4 WATER LEVEL MEASUREMENTS

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under "Water Level Measurements" on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

A.5 LABORATORY TEST METHODS

A.5.1 Sieve Analysis of Soils (thru #200 Sieve)

Conducted per AET Procedure 01-LAB-040, which is performed in general conformance with ASTM: D6913, Method A.

A.6 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

A.7 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

BORING LOG NOTES

DRILLING AND SAMPLING SYMBOLS

Symbol	Definition
AR:	Sample of material obtained from cuttings blown out the top of the borehole during air rotary procedure.
B, H, N:	Size of flush-joint casing
CAS:	Pipe casing, number indicates nominal diameter in inches
COT:	Clean-out tube
DC:	Drive casing; number indicates diameter in inches
DM:	Drilling mud or bentonite slurry
DR:	Driller (initials)
DS:	Disturbed sample from auger flights
DP:	Direct push drilling; a 2.125 inch OD outer casing with an inner 1½ inch ID plastic tube is driven continuously into the ground.
FA:	Flight auger; number indicates outside diameter in inches
HA:	Hand auger; number indicates outside diameter
HSA:	Hollow stem auger; number indicates inside diameter in inches
LG:	Field logger (initials)
MC:	Column used to describe moisture condition of samples and for the ground water level symbols
N (BPF):	Standard penetration resistance (N-value) in blows per foot (see notes)
NQ:	NQ wireline core barrel
PQ:	PQ wireline core barrel
RDA:	Rotary drilling with compressed air and roller or drag bit.
RDF:	Rotary drilling with drilling fluid and roller or drag bit
REC:	In split-spoon (see notes), direct push and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered.
SS:	Standard split-spoon sampler (steel; 1.5" is inside diameter; 2" outside diameter); unless indicated otherwise
SU	Spin-up sample from hollow stem auger
TW:	Thin-walled tube; number indicates inside diameter in inches
WASH:	Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid
WH:	Sampler advanced by static weight of drill rod and hammer
WR:	Sampler advanced by static weight of drill rod
94mm:	94 millimeter wireline core barrel
▼:	Water level directly measured in boring
▽:	Estimated water level based solely on sample appearance

TEST SYMBOLS

Symbol	Definition
CONS:	One-dimensional consolidation test
DEN:	Dry density, pcf
DST:	Direct shear test
E:	Pressuremeter Modulus, tsf
HYD:	Hydrometer analysis
LL:	Liquid Limit, %
LP:	Pressuremeter Limit Pressure, tsf
OC:	Organic Content, %
PERM:	Coefficient of permeability (K) test; F - Field; L - Laboratory
PL:	Plastic Limit, %
q_p:	Pocket Penetrometer strength, tsf (approximate)
q_c:	Static cone bearing pressure, tsf
q_u:	Unconfined compressive strength, psf
R:	Electrical Resistivity, ohm-cms
RQD:	Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run)
SA:	Sieve analysis
TRX:	Triaxial compression test
VSR:	Vane shear strength, remolded (field), psf
VSU:	Vane shear strength, undisturbed (field), psf
WC:	Water content, as percent of dry weight
%-200:	Percent of material finer than #200 sieve

STANDARD PENETRATION TEST NOTES
(Calibrated Hammer Weight)

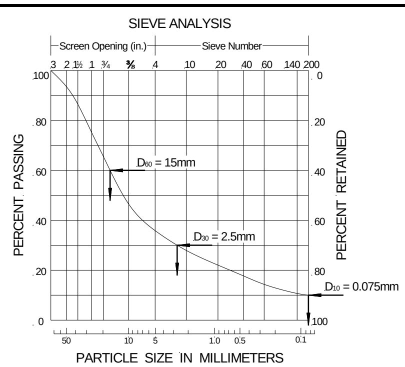
The standard penetration test consists of driving a split-spoon sampler with a drop hammer (calibrated weight varies to provide N_{60} values) and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

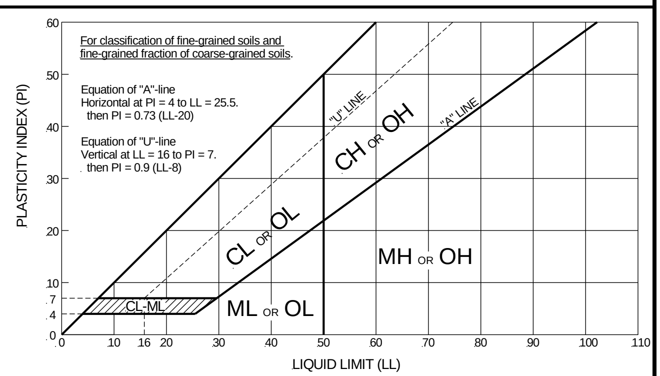
UNIFIED SOIL CLASSIFICATION SYSTEM
ASTM Designations: D 2487, D2488

AMERICAN ENGINEERING TESTING, INC.

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification: Group Symbol	Soil Classification: Group Name[B]
Coarse-Grained Soils More than 50% retained on No. 200 sieve	Gravels More than 50% coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	Cu≥4 and 1≤Cc≤3[E]	GW	Well graded gravel[F]
			Cu<4 and/or 1>Cc>3[E]	GP	Poorly graded gravel[F]
		Gravels with Fines more than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel[F.G.H]
			Fines classify as CL or CH	GC	Clayey gravel[F.G.H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	Cu≥6 and 1≤Cc≤3[E]	SW	Well-graded sand[I]
			Cu<6 and/or 1>Cc>3[E]	SP	Poorly-graded sand[I]
		Sands with Fines more than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand[G.H.I]
			Fines classify as CL or CH	SC	Clayey sand[G.H.I]
Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below)	Silts and Clays Liquid limit less than 50	inorganic	PI>7 and plots on or above "A" line[J]	CL	Lean clay[K.L.M]
			PI<4 or plots below "A" line[J]	ML	Silt[K.L.M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OL	Organic clay[K.L.M.N] Organic silt[K.L.M.O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K.L.M]
			PI plots below "A" line	MH	Elastic silt[K.L.M]
		organic	Liquid limit–oven dried / Liquid limit – not dried <0.75	OH	Organic clay[K.L.M.P] Organic silt[K.L.M.Q]
Highly organic soil			Primarily organic matter, dark in color, and organic in odor	PT	Peat[R]



$C_u = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200$ $\quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{2.5^2}{0.075 \times 15} = 5.6$



Plasticity Chart

Notes

[A]Based on the material passing the 3-in (75-mm) sieve.

[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C]Gravels with 5 to 12% fines require dual symbols:
- GW-GM well-graded gravel with silt
- GW-GC well-graded gravel with clay
- GP-GM poorly graded gravel with silt
- GP-GC poorly graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
- SW-SM well-graded sand with silt
- SW-SC well-graded sand with clay
- SP-SM poorly graded sand with silt
- SP-SC poorly graded sand with clay

[E]$Cu = D_{60} / D_{10}$, $\quad Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains ≥15% sand, add "with sand" to group name.

[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name.

[I]If soil contains ≥15% gravel, add "with gravel" to group name.

[J]If Atterberg limits plot is hatched area, soil is a CL-ML silty clay.

[K]If soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.

[L]If soil contains ≥30% plus No. 200, predominantly sand, add "sandy" to group name.

[M]If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N]PI≥4 and plots on or above "A" line.

[O]PI<4 or plots below "A" line.

[P]PI plots on or above "A" line.

[Q]PI plots below "A" line.

[R]Fiber Content description shown below.

ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

Grain Size

Term	Particle Size
Boulders	Over 12"
Cobbles	3" to 12"
Gravel	#4 sieve to 3"
Sand	#200 to #4 sieve
Fines (silt & clay)	Pass #200 sieve

Gravel Percentages

Term	Percent
A Little Gravel	3% - 14%
With Gravel	15% - 29%
Gravelly	30% - 50%

Consistency of Plastic Soils

Term	N-Value, BPF
Very Soft	less than 2
Soft	2 - 4
Firm	5 - 8
Stiff	9 - 15
Very Stiff	16 - 30
Hard	Greater than 30

Relative Density of Non-Plastic Soils

Term	N-Value, BPF
Very Loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	Greater than 50

Moisture/Frost Condition (MC Column)

D (Dry):	Absence of moisture, dusty, dry to touch.
M (Moist):	Damp, although free water not visible. Soil may still have a high water content (over "optimum").
W (Wet/ Waterbearing):	Free water visible, intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.
F (Frozen):	Soil frozen

Layering Notes

Laminations:	Layers less than ½" thick of differing material or color.
Lenses:	Pockets or layers greater than ½" thick of differing material or color.

Peat Description

Term	Fiber Content (Visual Estimate)
Fibric Peat:	Greater than 67%
Hemic Peat:	33 – 67%
Sapric Peat:	Less than 33%

Organic Description (if no lab tests)

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the Liquid Limit properties. *Slightly organic* used for borderline cases.

Root Inclusions

With roots:	Judged to have sufficient quantity of roots to influence the soil properties.
Trace roots:	Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.

AASHTO SOIL CLASSIFICATION SYSTEM

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

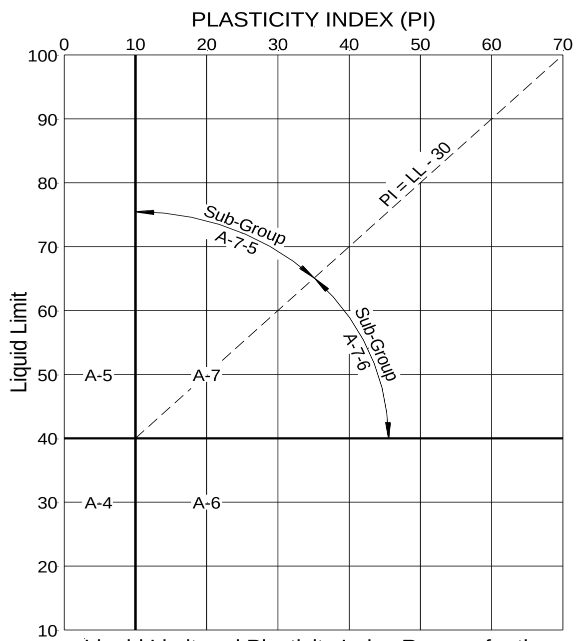
Classification of Soils and Soil-Aggregate Mixtures

General Classification	Granular Materials (35% or less passing No. 200 sieve)							Silt-Clay Materials (More than 35% passing No. 200 sieve)			
Group Classification	A-1			A-2							A-7
	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5 A-7-6
Sieve Analysis, Percent passing:											
No. 10 (2.00 mm)	50 max.	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
No. 40 (0.425 mm)	30 max.	50 max.	51 min.	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .	. . . .
No. 200 (0.075 mm)	15 max.	25 max.	10 max.	35 max.	35 max.	35 max.	35 max.	36 min.	36 min.	36 min.	36 min.
Characteristics of Fraction Passing No. 40 (0.425 mm)											
Liquid limit	. . . .		. . . .	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.	40 max.	41 min.
Plasticity index	6 max.		N.P.	10 max.	10 max.	11 min.	11 min.	10 max.	10 max.	11 min.	11 min.
Usual Types of Significant Constituent Materials	Stone Fragments, Gravel and Sand		Fine Sand	Silty or Clayey Gravel and Sand				Silty Soils		Clayey Soils	
General Ratings as Subgrade	Excellent to Good							Fair to Poor			

The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.

Group A-8 soils are organic clays or peat with organic content >5%.



Liquid Limit and Plasticity Index Ranges for the A-4, A-5, A-6 and A-7 Subgroups

Definitions of Gravel, Sand and Silt-Clay

The terms "gravel", "coarse sand", "fine sand" and "silt-clay", as determinable from the minimum test data required in this classification arrangement and as used in subsequent word descriptions are defined as follows:

GRAVEL - Material passing sieve with 3-in. square openings and retained on the No. 10 sieve.

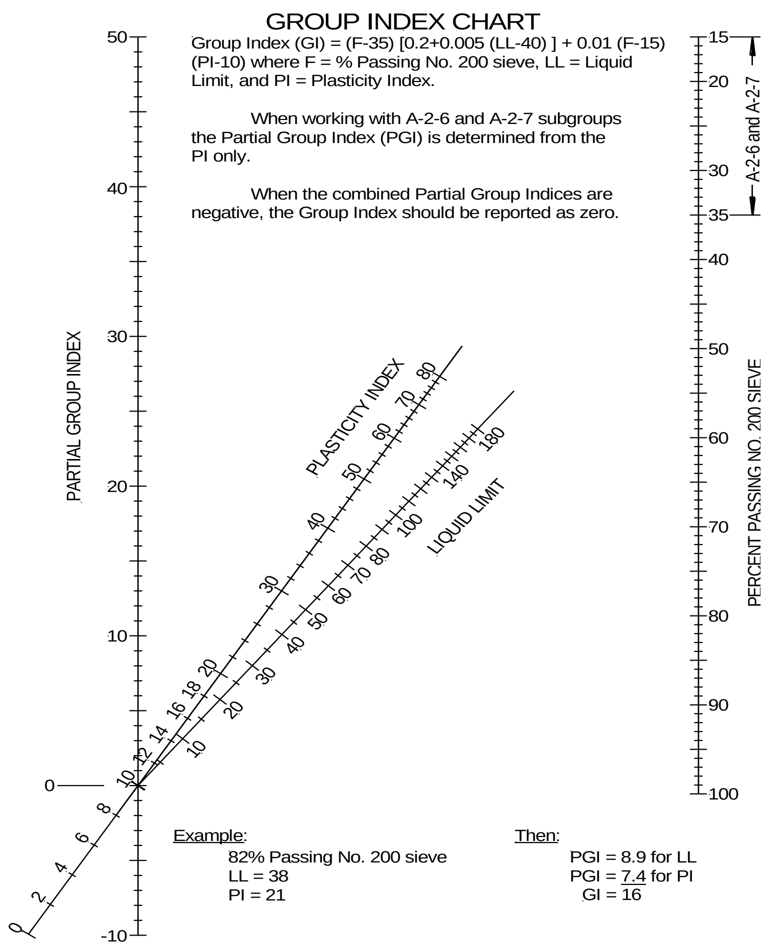
COARSE SAND - Material passing the No. 10 sieve and retained on the No. 40 sieve.

FINE SAND - Material passing the No. 40 sieve and retained on the No. 200 sieve.

COMBINED SILT AND CLAY - Material passing the No. 200 sieve

BOULDERS (retained on 3-in. sieve) should be excluded from the portion of the sample to which the classificaiton is applied, but the percentage of such material, if any, in the sample should be recorded.

The term "silty" is applied to fine material having plasticity index of 10 or less and the term "clayey" is applied to fine material having plasticity index of 11 or greater.



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Map Reference:

N

0 400 800 Feet

Figure 1
Testing Locations
Geotechnical Data Report
Jamaica Avenue Improvements
Cottage Grove, Minnesota

Date: 06/26/2020 AET Project No. 28-20309

File: 28-20309P-1.mxd Date: 06/26/2020

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· ENVIRONMENTAL
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· MATERIALS
· FORENSICS

PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota

AET Project Number: 28-20309

Core: B-1
Date Cored: June 2, 2020

Description:

Core Diameter: 4”
Total Core Height: 7.6”
Lift 1: 2.2”
Lift 2: 1.6”
Lift 3: 1.5”
Lift 4: 2.5”

Comments:

Possible chip seal at the surface. Core contains slight stripping throughout. Lift 4 contains slight to moderate stripping.

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PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota
AET Project Number: 28-20309

Core: B-2
Date Cored: June 2, 2020

Description:
Core Diameter: 4”
Total Core Height: 4.9”
Lift 1: 1.9”
Lift 2: 3.0”

Comments:
Possible chip seal at the surface.
Core contains moderate stripping throughout.

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PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota
AET Project Number: 28-20309

Core: B-3
Date Cored: June 2, 2020

Description:
Core Diameter: 4”
Total Core Height: 6.1”
Lift 1: 1.3”
Lift 2: 1.2”
Lift 3: 1.5”
Lift 4: 2.1”

Comments:
Possible chip seal at the surface. Core has slight to moderate stripping throughout.

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PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota
AET Project Number: 28-20309

Core: B-4
Date Cored: June 2, 2020

Description:
Core Diameter: 4”
Total Core Height: 5.3”
Lift 1: 2.0”
Lift 2: 1.5”
Lift 3: 1.8”

Comments:
Possible chip seal at the surface. Lift 1 contains slight stripping. Lifts 2 and 3 contain moderate to severe stripping.

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PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota
AET Project Number: 28-20309

Core: B-5
Date Cored: June 2, 2020

Description:
Core Diameter: 4”
Total Core Height: 5.7”
Lift 1: 2.2”
Lift 2: 1.9”
Lift 3: 1.6”

Comments:
Possible chip seal at the surface.
Lifts 1 and 2 contains slight stripping.
Lift 3 contains moderate stripping.

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PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota

AET Project Number: 28-20309

Core: B-6
Date Cored: June 2, 2020

Description:

Core Diameter: 4”
Total Core Height: 5.2”
Lift 1: 1.7”
Lift 2: 1.2”
Lift 3: 2.3”

Comments:

Possible chip seal at the surface. Lift 1 contains moderate to severe stripping. Bottom of lift 1 contained large voids. Lifts 2 and 3 contains slight to moderate stripping.

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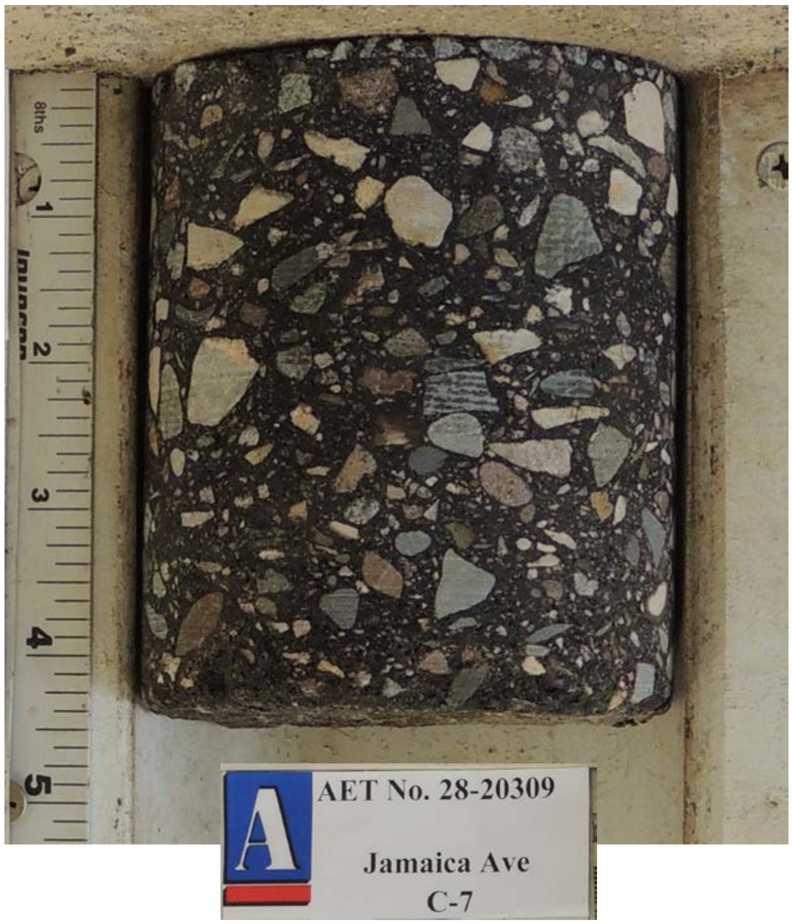
PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota
AET Project Number: 28-20309

Core: B-7
Date Cored: June 2, 2020

Description:
Core Diameter: 4”
Total Core Height: 4.4”
Lift 1: 1.8”
Lift 2: 1.3”
Lift 3: 1.3”

Comments:
Possible chip seal at the surface. Core generally has slight to moderate stripping throughout.



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PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota

AET Project Number: 28-20309

Core: B-8

Date Cored: June 2, 2020

Description:

Core Diameter: 4”

Total Core Height: 5.6”

Lift 1: 2.0”

Lift 2: 1.6”

Lift 3: 2.0”

Downhole Bituminous Thickness: 7 1/2”

Comments:

Possible chip seal at the surface.

Lifts 1 and 2 contain slight stripping.

Lift 3 contains moderate stripping.

Bottom of core not recovered.

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· MATERIALS
· FORENSICS

PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota
AET Project Number: 28-20309

Core: B-9
Date Cored: June 2, 2020

Description:
Core Diameter: 4”
Total Core Height: 5.0”
Lift 1: 1.6”
Lift 2: 1.7”
Lift 3: 1.8”

Comments:
Possible chip seal at the surface.
Lift 1 contains slight stripping.
Lift 2 contains moderate stripping.
Lift 3 contains severe stripping
and large voids.

PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota
AET Project Number: 28-20309

Core: B-10
Date Cored: June 2, 2020

Description:
Core Diameter: 4”
Total Core Height: 5.6”
Lift 1: 2.1”
Lift 2: 2.1”
Lift 3: 1.3”

Comments:
Possible chip seal at the surface. Core contains moderate stripping throughout.

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CONSULTANTS
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· GEOTECHNICAL
· MATERIALS
· FORENSICS

PAVEMENT CORE LOG

Jamaica Avenue Improvements – Cottage Grove, Minnesota

AET Project Number: 28-20309

Core: B-11
Date Cored: June 2, 2020

Description:
Core Diameter: 4”
Total Core Height: 2.9”
Bituminous Downhole Thickness: 7 1/4”

Comments:
Possible chip seal at the surface. Core contains severe stripping throughout. Core crumbled during coring operations.

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SUBSURFACE BORING LOG

AET JOB NO: 28-20309

LOG OF BORING NO. B-1 (p. 1 of 1)

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: 44.816568° LONGITUDE: -92.932841°

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	7.75" Bituminous pavement	FILL			CORE						
	3" FILL, mostly sand, a little gravel, dark brown (A-1-b) (possible aggregate base)										2
1	FILL, mixture of sand and silty sand, light brown (A-2-4)		44	M	SS	12					
2											
3			33	M	SS	20					
4	SAND, a little gravel, fine to medium grained, light brown, moist, medium dense (SP) (A-3)	COARSE ALLUVIUM									
5			17	M	SS	20					
6	**END OF BORING**										
	Northbound Right Turn Lane to E Point Douglas Road										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4'	**3.25" HSA**	**6/2/20**	**10:20**	**6.0**	**0.0**	**4.0**		**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **1C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.820932°** LONGITUDE: **-92.928463°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	5" Bituminous pavement	FILL			CORE						
	8" FILL, mostly sand, a little gravel, dark brown (A-1-b)										
1	FILL, mostly sand, a little gravel, brown (A-3)		38	M	SS	20					9
2											
3			21	M	SS	24					
4											
5			7	M	SS	14					
6	**END OF BORING**										
	Northbound Right Lane										

DEPTH:	DRILLING METHOD
0-4'	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
6/2/20	10:47	6.0	0.0	4.0		None

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **1C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.824840°** LONGITUDE: **-92.925149°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	6" Bituminous pavement	FILL			CORE						
1	9" FILL, mostly gravelly silty sand, dark brown (A-1-b) (possible aggregate base)										
	FILL, mostly silty sand, a little gravel, brown (A-2-4)		42	M	SS	18					
2	SAND, fine grained, light brown, moist, dense to medium dense (SP) (A-3)	COARSE ALLUVIUM									
3			36	M	SS	18					
4											
5			22	M	SS	24					
6	**END OF BORING**										
	Northbound Right Lane										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-4' 3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
	6/2/20	**11:06**	**6.0**	**0.0**	**4.0**		**None**	
BORING COMPLETED: **6/2/20**								
DR: **SS** LG: **SD** Rig: **1C**								

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309**   LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.830737°** LONGITUDE: **-92.923838°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	5.5" Bituminous pavement	FILL			CORE						
	5" FILL, mostly gravelly silty sand, brown (A-1-b) (possible aggregate base)										
1	FILL, mostly silty sand, a little gravel, brown (A-2-4)		33	M	SS	14					
2	SAND, a little gravel, fine to medium grained, light brown, moist, medium dense (SP) (A-3)	COARSE ALLUVIUM									
3			30	M	SS	24					
4											
5			26	M	SS	24					
6	**END OF BORING**										
	Northbound Right Lane										

DEPTH:	DRILLING METHOD
0-4'	**3.25" HSA**

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
6/2/20	**11:28**	**6.0**	**0.0**	**4.0**		**None**

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **1C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.836755°** LONGITUDE: **-92.923860°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	6" Bituminous pavement	FILL			CORE						
1	11" FILL, mostly gravelly sand with silt, dark brown (A-1-b) (possible aggregate base)		33	M	SS	14					6
2	FILL, mostly silty sand, a little gravel, brown (A-2-4)										
3			58	M	SS	24					
4											
5			74	M	SS	24					
6	**END OF BORING** Northbound Right Lane										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4'	**3.25" HSA**	**6/2/20**	**11:56**	**6.0**	**0.0**	**4.0**		**None**

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **1C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.842500°** LONGITUDE: **-92.923866°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	5.5" Bituminous pavement	FILL			CORE						
	5" FILL, mostly sand, a little gravel, brown (A-1-b) (possible aggregate base)										
1	SAND, fine to medium grained, light brown, moist, dense to medium dense (SP) (A-3) (possible fill)	COARSE ALLUVIUM OR FILL	38	M	SS	12					
2											
3			45	M	SS	24					5
4											
5			21	M	SS	24					
6	**END OF BORING**										
	Northbound Right Lane										

DEPTH:	DRILLING METHOD	WATER LEVEL MEASUREMENTS						
		DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4'	**3.25" HSA**	**6/2/20**	**1:05**	**6.0**	**0.0**	**4.0**		**None**

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **41**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.839348°** LONGITUDE: **-92.924089°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	5" Bituminous pavement	FILL			CORE						
	5" FILL, mostly sand, a little gravel, brown (A-1-b) (possible aggregate base)										
1	FILL, mostly sand, a little gravel, brown (A-3)		40	M	SS	20					
2	SAND, a little gravel, fine grained, light brown, moist, loose to medium dense (SP) (A-3) (possible fill)	COARSE ALLUVIUM OR FILL									
3			40	M	SS	24					
4											
5			42	M	SS	3					
6	**END OF BORING**										
	Southbound Right Lane										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4'	**3.25" HSA**	**6/2/20**	**1:33**	**6.0**	**0.0**	**4.0**		**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **41**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-8 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.832661°** LONGITUDE: **-92.924036°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	7.5" Bituminous pavement	FILL			CORE						
	5" FILL, mostly gravelly silty sand, dark brown (A-1-b) (possible aggregate base)										
1	FILL, mostly silty sand, a little gravel, brown (A-2-4)		32	M	SS	18					
2	FILL, mixture of sand and silty sand, a little gravel, brown (A-2-4)										
3			48	M	SS	24					
4	SAND, a little gravel, fine grained, light brown, moist, very dense (SP) (A-3) (possible fill)	COARSE ALLUVIUM OR FILL									
5			74	M	SS	24					
6	**END OF BORING** Southbound Right Lane										

DEPTH:	DRILLING METHOD
0-4'	3.25" HSA

WATER LEVEL MEASUREMENTS

DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
6/2/20	1:58	6.0	0.0	4.0		None

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **41**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-9 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.827981°** LONGITUDE: **-92.924220°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	5.5" Bituminous pavement	FILL			CORE						
	6" FILL, mostly gravelly silty sand, dark brown (A-1-b)										
1	FILL, mostly silty sand, a little gravel, brown (A-2-4)		26	M	SS	12					
2											
3	SAND, a little gravel, fine to medium grained, light brown, moist, dense to medium dense (SP) (A-3)	COARSE ALLUVIUM	48	M	SS	21					
4											
5			18	M	SS	16					
6	**END OF BORING** Southbound Right Lane										

DEPTH:	DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4'	**3.25" HSA**	**6/2/20**	**2:23**	**6.0**	**0.0**	**4.0**		**None**

WATER LEVEL MEASUREMENTS

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **41**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-10 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.822520°** LONGITUDE: **-92.927134°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	5.5" Bituminous pavement	FILL			CORE						
	8.5" FILL, mostly gravelly silty sand, dark brown (A-1-b) (possible aggregate base)										
1	FILL, mostly sand with silt, light brown (A-2-4)		30	M	SS	10					
2	SAND, a little gravel, fine grained light brown, moist, medium dense (SP) (A-3)	COARSE ALLUVIUM									
3			21	M	SS	24					
4											
5			17	M	SS	24					
6	**END OF BORING** Southbound Right Lane										

DEPTH: DRILLING METHOD	WATER LEVEL MEASUREMENTS							NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG
0-4' 3.25" HSA	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL	
	6/2/20	**2:43**	**6.0**	**0.0**	**4.0**		**None**	
BORING COMPLETED: **6/2/20**								
DR: **SS** LG: **SD** Rig: **41**								

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20

AMERICAN ENGINEERING TESTING, INC.

SUBSURFACE BORING LOG

AET JOB NO: **28-20309** LOG OF BORING NO. **B-11 (p. 1 of 1)**

PROJECT: **Jamaica Avenue Improvements; Cottage Grove, MN**

SURFACE ELEVATION: ________ LATITUDE: **44.818452°** LONGITUDE: **-92.931318°**

DEPTH IN FEET	MATERIAL DESCRIPTION	GEOLOGY	N	MC	SAMPLE TYPE	REC IN.	WC	DEN	LL	PL	%-#200
	7.25" Bituminous pavement	FILL			CORE						
1	4" FILL, mostly gravelly silty sand, dark brown (A-1-b) (possible aggregate base)										
	FILL, mostly silty sand, a little gravel, brown (A-2-4)		33	M	SS	18					
2	SAND, a little gravel, fine to medium grained, light brown to brown, moist, dense to medium dense (SP) (A-3) (possible fill)	COARSE ALLUVIUM									
3			36	M	SS	24					
4											
5			17	M	SS	24					
6	**END OF BORING**										
	Southbound Right Turn Lane to E Point Douglas Road										

DEPTH: DRILLING METHOD	DATE	TIME	SAMPLED DEPTH	CASING DEPTH	CAVE-IN DEPTH	DRILLING FLUID LEVEL	WATER LEVEL
0-4' 3.25" HSA	**6/2/20**	**3:10**	**6.0**	**0.0**	**4.0**		**None**

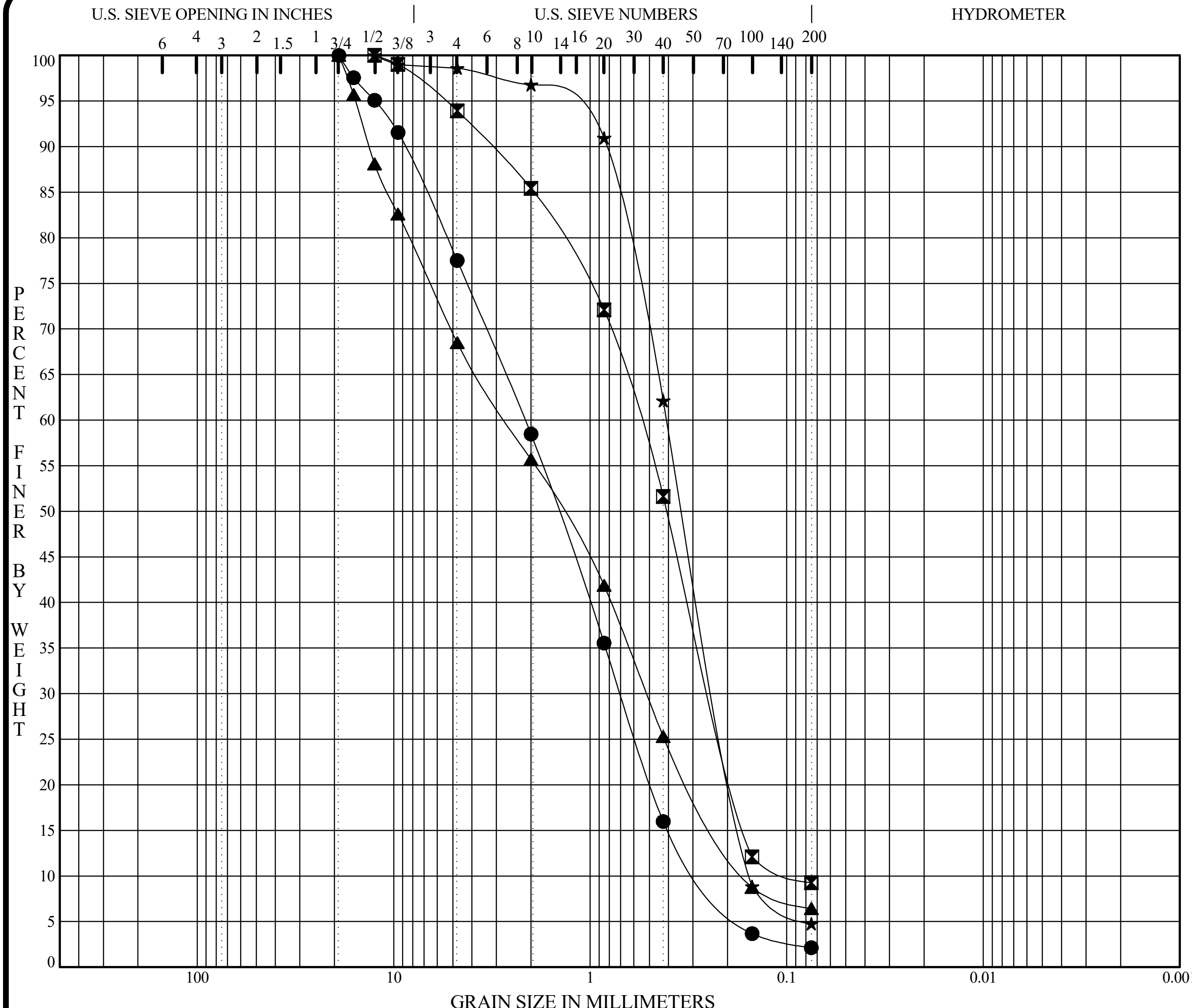
WATER LEVEL MEASUREMENTS

BORING COMPLETED: **6/2/20**

DR: **SS** LG: **SD** Rig: **41**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP W-LAT-LONG 28-20309.GPJ AET+CPT+WELL_20181012_JG.GDT 7/2/20



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
● B-1	0.8'	**Sand with gravel, dark brown (A-1-b)**					**0.89**	**8.4**
⧗ B-2	1.5'	**Sand, a little gravel, brown (A-3)**					**1.14**	**6.3**
▲ B-5	1.0'	**Gravelly sand with silt, dark brown (A-1-b)**					**0.62**	**16.5**
★ B-6	3.0'	**Sand, light brown (A-3)**					**0.82**	**2.7**

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
● B-1	0.8'	**19.00**	**2.14**	**0.699**	**0.2563**	**22.5**	**75.4**	**2.1**	
⧗ B-2	1.5'	**12.50**	**0.56**	**0.240**	**0.0897**	**6.1**	**84.7**	**9.3**	
▲ B-5	1.0'	**19.00**	**2.68**	**0.518**	**0.1623**	**31.5**	**62.1**	**6.4**	
★ B-6	3.0'	**12.50**	**0.41**	**0.227**	**0.1534**	**1.4**	**93.8**	**4.8**	

PROJECT **Jamaica Avenue Improvements; Cottage Grove, MN**

AET JOB NO. **28-20309**
DATE **6/2/20**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES

Appendix B

Falling Weight Deflectometer Field Exploration and Testing
Figure 2 – Effective Subgrade R-Value Map

Appendix B
Falling Weight Deflectometer Field Exploration and Testing
AET Project No. 28-20309

B.1 PAVEMENT TESTING

The pavement structural conditions at the site were evaluated nondestructively using Falling Weight Deflectometer (FWD). The description of the equipment precedes the Deflection Data and Analysis Results in this appendix.

B.2 EQUIPMENT DESCRIPTION

B.2.1 Dynatest 8000 FWD Test System

The FWD owned by AET is a Dynatest 8000 FWD Test System that consists of a Dynatest 8002 trailer and a third generation control and data acquisition unit developed in 2003, called the Dynatest Compact15, featuring fifteen (15) deflection channels. The new generation FWD, including a Compact15 System and a standard PC with the FwdWin Field Program constitutes the newest, most sophisticated Dynatest FWD Test System, which fulfills or exceeds all requirements to meet ASTM-4694 Standards. Figure B1 provides a view of this equipment.

Figure B1 Dynatest 8002 FWD Test System

The FWD imposes a dynamic impulse load onto the pavement surface through a load plate. Total pulse is an approximately half sine shape with a total duration typically between 25 to 30 ms. The FWD is capable of applying a variety of loads to the pavement ranging from 1,500 lbf (7 kN) to 27,000 ibf (120 kN) by dropping a variable weight mass from different heights to a standard, 11.8-inch (300-mm) diameter rigid plate.

The drop weights and the buffers are constructed so that the falling weight buffer subassembly may be quickly and conveniently changed between falling masses of 440 lbm (200 kg) for highways and 770 lbm (350 kg) for airports. With the 440 lbm (200 kg) package for highways three drop heights are used with the target load of 6,000 lbf (27 kN) at drop height 1, 9,000 lbf (40 kN) at drop height 2, and 12,000 lbf at drop height 3 (53 kN). The drop sequence consists of two seating drops from drop height 3 and 2 repeat measurements at drop height 1 and 1 measurement at drop height 2 for flexible pavements and 2 repeat measurements at drop height 2 and 1 measurement at drop height 3 for rigid pavements. The data from the seating drops is not stored.

The FWD is equipped with a load cell to measure the applied forces and nine geophones or deflectors to measure deflections up to 100 mils (2.5 mm). The load cell is capable of accurately measuring the force that is applied perpendicular to the loading plate with a resolution of 0.15 psi (1 kPa) or better. The force is expressed in terms of pressure, as a function of loading plate size.

Nine deflectors at the offsets listed in the following table in the Long Term Performance Program (LTPP) configuration are capable of measuring electronically discrete deflections per test, together with nine (9) separate deflection measuring channels for recording of the data. One (1) of the deflectors measures the deflection of the pavement surface through the center of the loading plate, while seven (7) deflectors are capable of being positioned behind the loading plate along the housing bar, up to a distance of 5 ft (2.5 m) from the center of the loading plate and one (1) being positioned in front of the loading plate along the bar.

Deflector	D9	D1	D2	D3	D4	D5	D6	D7	D8
Offset (in.)	-12	0	8	12	18	24	36	48	60

Field testing is performed in accordance with the standard ASTM procedures as described in ASTM D 4695-96, "Standard Guide for General Pavement Deflection Measurements" and the calibration of our equipment is verified each year at the Long Term Pavement Performance Calibration Center in Maplewood, MN.

B.2.2 Linear Distance and Spatial Reference System
Distance measuring instrument (DMI) is a trailer mounted two phase encoder system. When DMI is connected to the Compact15 it provides for automatic display and recording distance information in both English and metric units with a 1 foot (0.3 meters) resolution and four percent accuracy when calibrated using the provided procedure in the Field Program.

Spatial reference system is a Trimble ProXH Global Positioning System (GPS) that consists of fully integrated receiver, antenna and battery unit with Trimble's new H-Star™ technology to provide subfoot (30 cm) post-processed accuracy. The External Patch antenna is added to the ProXH receiver for the position of the loading plate. The External Patch antenna can be conveniently elevated with the optional baseball cap to prevent any signal blockage.

B.2.3 Air and Pavement Temperature Measuring System
A temperature monitoring probe, for automatic recording of air temperature, is an electronic (integrated circuit) sensing element in a stainless steel probe. The probe mounts on the FWD unit in a special holder with air circulation and connects to the Compact15. A non-contact Infra-Red (IR) Temperature Transmitter, for automatic recording of pavement surface temperature only, features an integrated IR-detector and digital electronics in a weather proof enclosure. The IR transmitter mounts on the FWD unit in a special holder with air circulation and connects to the Compact15. Both probe and IR transmitter have a resolution of 0.9 ºF (0.5 ºC) and accuracy within ± 1.8ºF (1 ºC) in the 0 to 158 ºF (-18 to +70ºC) range when calibrated using the provided procedure.

B.2.4 Camera Monitoring System
A battery operated independent DC-1908E multi-functional digital camera with a SD card is used for easy positioning of the loading plate or recording of the pavement surface condition at the testing locations.

B.3 SAMPLING METHODS
At the project level, the testing interval is set at 0.1 mi. (maximum) or 10 locations per uniform section in the Outside Wheel Path (OWP) = 2.5 ft ± 0.25 ft (0.76 m ± 0.08 m) for nominal 12 ft (3.7 m) wide lanes. Where a divided roadbed exists, surveys will be taken in both directions if the project will include improvements in both directions. If there is more than one lane in one direction the surveys will be taken in the outer driving lane versus the passing lane of the highway. FWD tests are performed at a constant lateral offset down the test section.

B.4 QUALITY CONTROL (QC) AND QUALITY ASSURANCE (QA)
In addition to the annual reference calibration, the relative calibration of the FWD deflection sensors is conducted monthly but not to exceed 6 weeks during the months in which the FWD unit is continually testing. The DMI is also calibrated monthly by driving the vehicle over a known distance to calculate the distance scale factor. The accuracy of the FWD air temperature and infra-red (IR) sensors are checked on a monthly basis or more frequently if the FWD operator observes "suspicious" temperature readings.

Some care in the placement of the load plate and sensors is taken by the survey crew, especially where the highway surface is rutted or cracked, to ensure that the load plate lays on a flat surface and that the load plate and all geophones lie on the same side of any visible cracks. Liberal use of comments placed in the FWD data file at the time of data collection is required. Comments pertaining to proximity to reference markers, bridge abutments, patches, cracks, etc., are all important documentation for the individual evaluating the data.

Scheduled preventive maintenance ensures proper equipment operation and helps identify potential problems that can be corrected to avoid poor quality or missing data that results if the equipment malfunctions while on site. The routine and major maintenance procedures established by the LTPP are adopted and any maintenance has been done at the end of the day after the testing is complete and become part of the routine performed at the end of each test/travel day and on days when no other work is scheduled.

B.5 DATA ANALYSIS METHODS

B.5.1 Inputs

The two-way AADT and HCADT are required to calculate the ESALs. The state average truck percent and truck type distribution are used when HCADT is not provided. The as-built pavement information (layer type, thickness, and construction year) are required and if not provided, GPR and/or coring and boring is needed.

B.5.2 Adjustments

Temperature adjustment to the deflections measured on bituminous pavements is determined from the temperature predicted at the middle depth of the pavement using the LTPP BELLS3 model that uses the pavement surface temperature and previous day mean air temperature. The predicted middle depth temperature and the standard temperature of 80 degrees Fahrenheit are used to calculate the temperature adjustment factor for deflection data analysis. Seasonal adjustment developed by Mn/DOT is also used.

B.5.3 Methods

For bituminous pavements, the deflection data were analyzed using the Mn/DOT method for determining the in-place (effective) subgrade and pavement strength, as well as allowable axle loads for a roadway (Investigation 603) revised in 1983 and automated with spreadsheet format in 2008. The Mn/DOT method uses Hogg Model for estimating the subgrade modulus and the Effective GE Equation (Investigation 603) for estimating the effective GE of pavements. The Mn/DOT method also uses the TONN method for estimating Spring Load Capacity and Required Overlay, as described in the Mn/DOT publication “Estimated Spring Load-Carrying Capacity”.

For gravel roads, the deflection data were analyzed using the American Association of State Highway and Transportation Officials’ (AASHTO) method for determining the in-place (effective) subgrade and pavement strength, as well as allowable axle loads for a roadway as in the AASHTO Guide for Design of Pavement Structures, 1993.

For concrete pavements, the deflection data were analyzed using the FAA methods for determining the modulus of subgrade reaction (k-value), effective elastic modulus of concrete slabs, load transfer efficiency (LTE) on approach and leave slabs of a joint, slab support conditions (void analysis) and impulse stiffness modulus ratio (durability analysis) as in the FAA AC 150/5370-11A, Use of Nondestructive Testing Devices in the Evaluation of Airport Pavement, 2004.

B.6 TEST LIMITATIONS

B.6.1 Test Methods

The data derived through the testing program have been used to develop our opinions about the pavement conditions at your site. However, because no testing program can reveal totally what is in the subsurface, conditions between test locations and at other times, may differ from conditions described in this report. The testing we conducted identified pavement conditions only at those points where we measured pavement surface temperature, deflections, and observed pavement surface conditions. Depending on the sampling methods and sampling frequency, every location may not be tested, and some anomalies which are present in the pavement may not be noted on the testing results. If conditions encountered during construction differ from those indicated by our testing, it may be necessary to alter our conclusions and recommendations, or to modify construction procedures, and the cost of construction may be affected.

B.6.2 Test Standards

Pavement testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

![American Engineering Testing, Inc]

AMERICAN ENGINEERING TESTING, INC

Map Reference:

N

0 400 800
Feet

Figure 2
Effective Subgrade R-value

Geotechnical Data Report

Jamaica Avenue Improvements
Cottage Grove, Minnesota

Date: 06/26/2020 | AET Project No. 28-20309

File: 28-20309P-1.mxd Date: 06/26/2020

Appendix C

AET Project No. 28-20309

Ground Penetrating Radar Field Exploration and Testing
GPR Plots

Appendix C
Ground Penetrating Radar Field Exploration and Testing
AET Project No. 28-20309

C.1 FIELD EXPLORATION

The pavement structural conditions at the site were evaluated nondestructively using Ground Penetrating Radar (GPR). The description of the equipment precedes the GPR Data and Analysis Results in this appendix.

C.2 EQUIPMENT DESCRIPTION

C.2.1 GSSI GPR Test System

The GPR test system owned by AET is a GSSI Roadscan System that consists of a bumper-mounted, 2 GHz air-coupled antenna and a SIR-20 control and data acquisition processor, featuring dual channels. The GPR processor, including a SIR-20 data acquisition system, wheel-mounted DMI (Distance Measuring Instrument), and a tough book with the SIR-20 Field Program constitutes the newest, most sophisticated GSSI Test System, which fulfills or exceeds all requirements to meet ASTM-4748, ASTM D-6087 Standards. Figure C1 provides a view of this equipment.

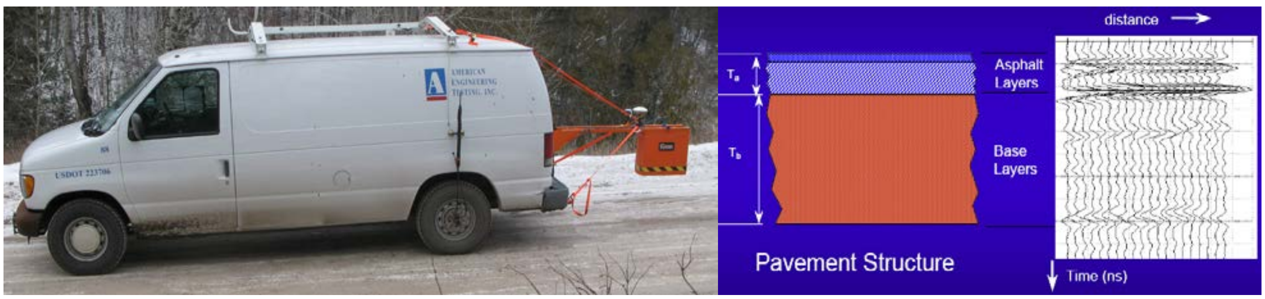


Figure C1 GSSI 2 GHz air-coupled GPR Test System

The GPR antenna emits a high frequency electromagnetic wave into the material under investigation. The reflected energy caused by changes in the electromagnetic properties within the material is detected by a receiver antenna and recorded for subsequent analysis. The 2 GHz air-coupled GPR is capable of collecting radar waveforms at more than 100 signals per second, allows for data to be collected at driving speeds along the longitudinal dimension of the pavements or bridge decks with the antennas fixed at the rear or in front of the vehicle.

The antenna used for Roadscan is the Horn antenna Model 4105 (2 GHz). The 2 GHz antenna is the current antenna of choice for road survey because it combines excellent resolution with reasonable depth penetration (18-24 inches in pavement materials). The data collection is performed at normal driving speeds (45-55 mph), requiring no lane closures nor causing traffic congestion. At this peed the 2 GHz antenna is capable of collecting data at 1-foot interval (1 scan/foot).

The data were collected at a rate of about 1 vertical scans per foot. Each vertical scan consisted of 512 samples and the record length in time of each scan was 12 nanoseconds. Filters used during acquisition were 300 MHz high pass and 5,000 MHz low pass.

In a GPR test, the antenna is moved continuously across the test surface and the control unit collects data at a specified distance increment. In this way, the data collection rate is independent of the scan rate. Alternatively, scanning can be performed at a constant rate of time, regardless of the scan distance. Single point scans can be performed as well. Data is reviewed on-screen and in the field to identify reflections and ensure proper data collection parameters.

Field testing is performed in accordance with the standard ASTM procedures as described in ASTM D 4695-96, "Standard Guide for General Pavement Deflection Measurements".

C.2.2 System Calibrations

Horn antenna processing is used to get the velocity of the radar energy in the material by comparing the reflection strengths (amplitudes) from a pavement layer interface with a perfect reflector (a metal plate). The calibration scan is obtained with the horn antenna placed over a metal plate at the same elevation as a scan obtained over pavement.

The same setting for data collection is used for metal plate calibration. Fifteen seconds are need for jumping up and down on the vehicle's bumper to collect the full range of motion for the vehicle's shocks. The filename of raw calibration file is recorded.

Survey wheel is calibrated by laying out a long distance (> 50 feet) with tape measure.

C.2.3 Linear Distance and Spatial Reference System

Distance measuring instrument (DMI) is a trailer mounted two phase encoder system. When DMI is connected to the SIR-20 it provides for automatic display and recording distance information in both English and metric units with a 1 foot (0.3 meters) resolution and four percent accuracy when calibrated using provided procedure in the Field Program.

Spatial reference system is a Trimble ProXH Global Positioning System (GPS) that consists of fully integrated receiver, antenna and battery unit with Trimble's new H-Star™ technology to provide subfoot (30 cm) post processed accuracy. The External Patch antenna is added to the ProXH receiver for the position of the loading plate. The External Patch antenna can be conveniently elevated with the optional baseball cap to prevent any signal blockage.

C.2.4 Camera Monitoring System

A battery operated independent DC-1908E multi-functional digital camera with a SD card is used for easy positioning of the loading plate or of the pavement surface condition at the testing locations.

C.3 SAMPLING METHODS

At the project level, the testing interval is set at 12 scans per foot in the Outside Wheel Path (OWP) = 2.5 ft ± 0.25 ft (0.76 m ± 0.08 m) for nominal 12 ft (3.7 m) wide lanes at a survey speed of approximately 10 mph. Where a divided roadbed exists, surveys will be taken in both directions if the project will include improvements in both directions. If there is more than one lane in one direction the surveys will be taken in the outer driving lane (truck lane) versus the passing lane of the highway. GPR tests are performed at a constant lateral offset down the test section. When GPR tests are performed on bridge decks, multiple survey lines are followed transversely at 2-foot spacing between survey lines.

At the network level, GPR tests on one scan per foot are set to be able to collect data on pavements at driving speeds, without statistically compromising the quality of the data collected. If GPR tests are for the in situ characterization of material GPR data will be collected at two scan per foot at slower driving speeds.

C.4 QUALITY CONTROL (QC) AND QUALITY ASSURANCE (QA)

Beside the daily metal plate calibration the DMI is also calibrated monthly by driving the vehicle over a known distance to calculate the distance scale factor. The GPR will be monitored in real time in the data collection vehicle to minimize data errors. The GPR units will be identified with a unique number and that number will accompany all data reported from that unit as required in the QC/QA plan.

Scheduled preventive maintenance ensures proper equipment operation and helps identify potential problems that can be corrected to avoid poor quality or missing data that results if the equipment malfunctions while on site. The routine and major maintenance procedures established by the LTPP are adopted and any maintenance has been done at the end of the day after the testing is complete and become part of the routine performed at the end of each test/travel day and on days when no other work is scheduled.

To insure quality data, the GPR assessments only took place on dry pavement surfaces, and data was collected in each wheel path.

C.5 DATA ANALYSIS METHODS

C.5.1 Data Editing

Field acquisition is seldom so routine that no errors, omissions or data redundancy occur. Data editing encompasses issues such as data re-organization, data file merging, data header or background information updates, repositioning and inclusion of elevation information with the data.

C.5.2 Basic Processing

Basic data processing addresses some of the fundamental manipulations applied to data to make a more acceptable product for initial interpretation and data evaluation. In most instances this type of processing is already applied in real-time to generate the real-time display. The advantage of post survey processing is that the basic processing can be done more systematically and non-causal operators to remove or enhance certain features can be applied.

The Reflection Picking procedure is used to eliminate unwanted noise, detects significant reflections, and records the corresponding time and depth. It uses antenna calibration file data to calculate the radar signal velocity within the pavement.

C.5.3 Advance Processing
Advanced data processing addresses the types of processing which require a certain amount of operator bias to be applied and which will result in data which are significantly different from the raw information which were input to the processing.

C.5.4 Data Interpretation
The EZ Tracker Layer Interpretation procedure uses the output from the first step to map structural layers and calculate the corresponding velocities and depths.

C.6 TEST LIMITATIONS

C.6.1 Test Methods
The data derived through the testing program have been used to develop our opinions about the pavement conditions at your site. However, because no testing program can reveal totally what is in the subsurface, conditions between test locations and at other times, may differ from conditions described in this report. The testing we conducted identified pavement conditions only at those points where we measured pavement thicknesses and observed pavement surface conditions. Depending on the sampling methods and sampling frequency, every location may not be tested, and some anomalies which are present in the pavement may not be noted on the testing results. If conditions encountered during construction differ from those indicated by our testing, it may be necessary to alter our conclusions and recommendations, or to modify construction procedures, and the cost of construction may be affected.

B.6.2 Test Standards
Pavement testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

C.7 SUPPORTING TEST METHODS

C.7.1 Falling Weight Deflectometer (FWD)
If the pavement layer moduli and subgrade soil strength are desired the deflection data are collected using a Dynatest 8000 FWD Test System that consists of a Dynatest 8002 trailer and a third generation control and data acquisition unit developed in 2003, called the Dynatest Compact15, featuring fifteen (15) deflection channels. The new generation FWD, including a Compact15 System and a standard PC with the FwdWin field Program constitutes the newest, most sophisticated Dynatest FWD Test System, which fulfills or exceeds all requirements to meet ASTM-4694, ASTM D-4695 Standards. The system provides continuous data at pre-set spacing.

C.7.2 Soil Boring/Coring Field Exploration
If both pavement thicknesses and subgrade soil types and conditions are desired the shallow coring/boring and sampling is used. The limited number of coring/boring is necessary to verify the GPR layer thickness data.

C.7.3 Pavement Surface Condition Survey
The type and severity of pavement distress influence the deflection response for a pavement. Therefore, GPR operators record any distress located from about 1 ft (0.3 m) in front of vehicle to about 30 ft (9 m) ahead. This information is recorded in the FWD file using the comment line in the field program immediately following the test.

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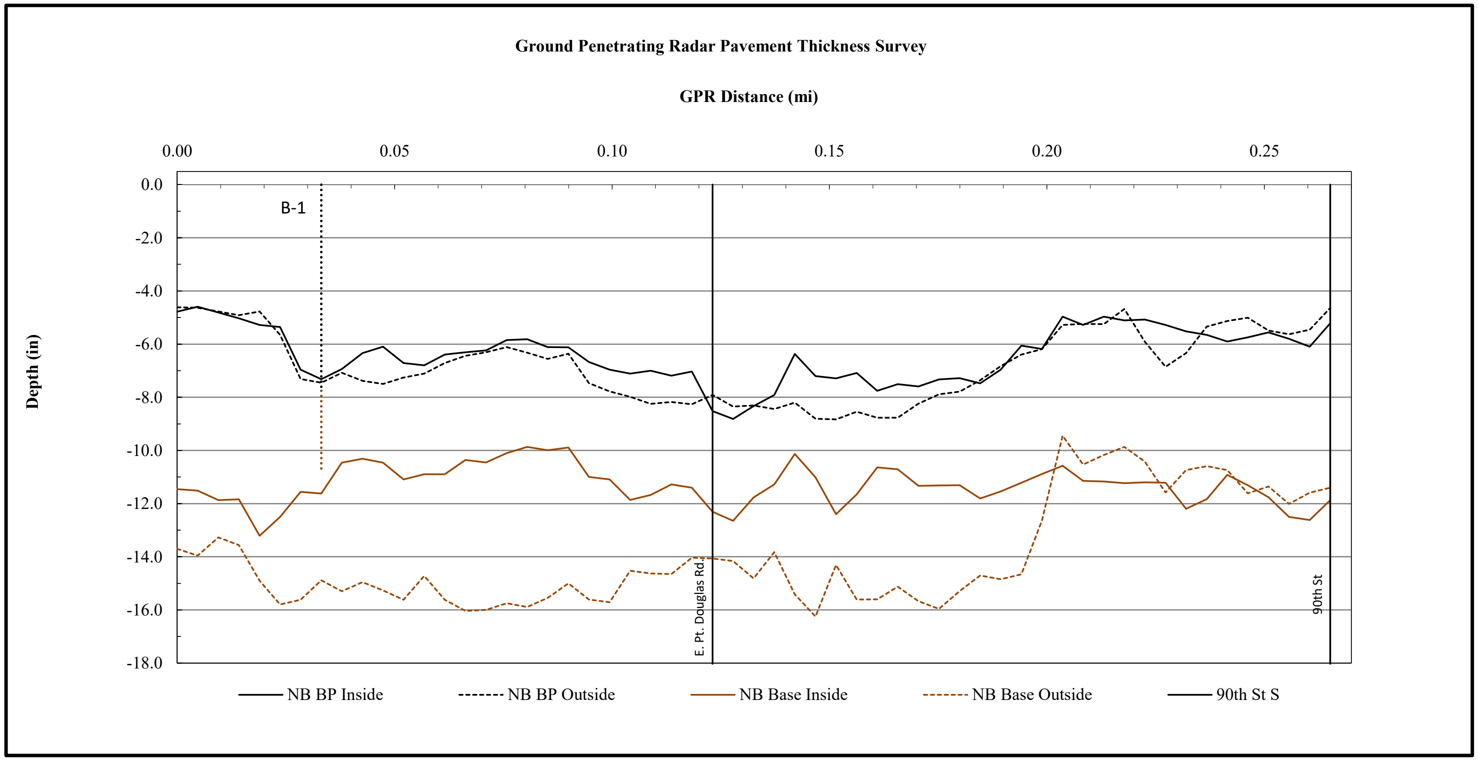
GENERAL INFORMATION: GROUND PENETRATING RADAR

Project:	Jamaica Avenue Improvements	**Date:**	7/1/20
AET Job No.:	28-20309	**Test Date:**	5/22/20
Road:	Jamaica Avenue	**Section/Grid:**	S01
From:	~80' N of US 10/61 WB Exit Ramp	**To:**	90th St

SUMMARY STATISTICS

Units: inches

Layer	NB Inside Lane				NB Outside Lane			
	Average	CV	15th	Min.	Average	CV	15th	Min.
BP	6.4	16%	5.2	4.6	6.8	20%	5.2	4.6
Base	4.9	25%	3.8	2.9	7.2	22%	5.4	4.2
BP + Base	11.3	7%	10.5	9.9	14.0	14%	11.4	9.5



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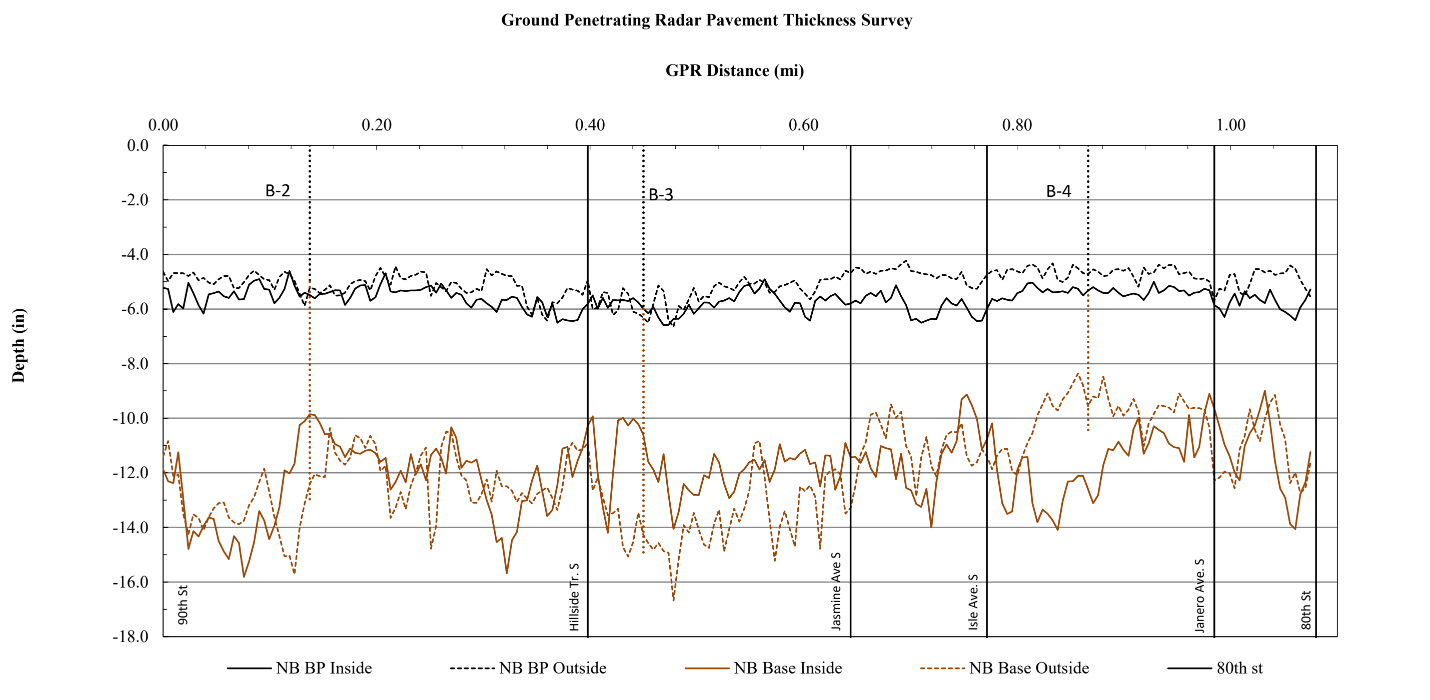
Project:	Jamaica Avenue Improvements	**Date:**	7/1/20
AET Job No.:	28-20309	**Test Date:**	5/22/20
Road:	Jamaica Avenue	**Section/Grid:**	S02
From:	90th St	**To:**	80th St

SUMMARY STATISTICS

Units: inches

Layer	NB Inside Lane				NB Outside Lane			
	Average	CV	15th	Min.	Average	CV	15th	Min.
BP	5.6	7%	5.3	4.6	5.0	10%	4.6	4.2
Base	6.3	22%	4.9	3.2	6.9	22%	5.2	3.7
BP + Base	11.9	11%	10.6	9.0	12.0	14%	9.9	8.4



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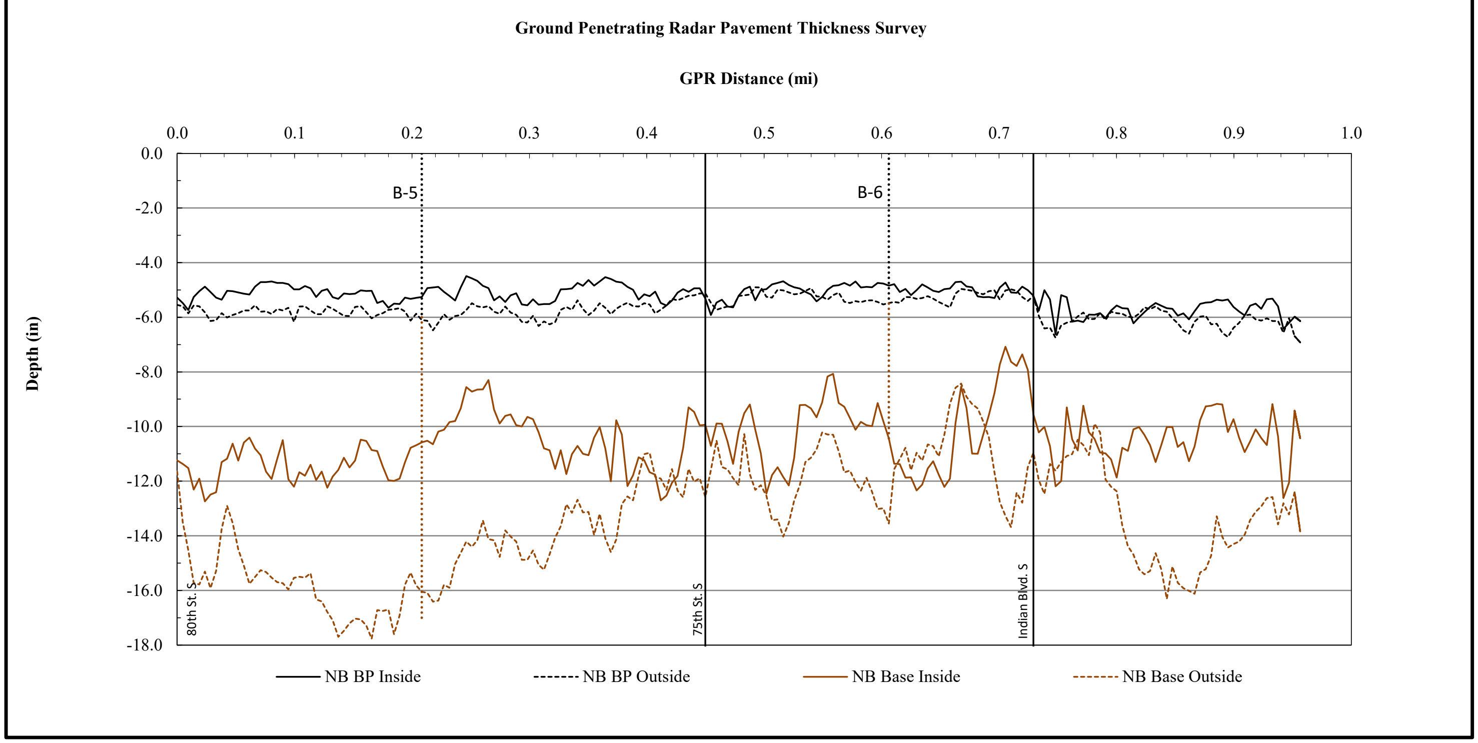
GENERAL INFORMATION: GROUND PENETRATING RADAR

Project:	Jamaica Avenue Improvements	**Date:**	7/1/20
AET Job No.:	28-20309	**Test Date:**	5/22/20
Road:	Jamaica Avenue	**Section/Grid:**	S03
From:	80th St	**To:**	~350' S of 70th Street

SUMMARY STATISTICS

Units: inches

Layer	NB Inside Lane				NB Outside Lane			
	Average	CV	15th	Min.	Average	CV	15th	Min.
BP	5.2	8%	4.8	4.5	5.7	8%	5.2	4.9
Base	5.3	22%	4.2	2.4	7.7	25%	5.7	3.5
BP + Base	10.6	11%	9.3	7.1	13.4	16%	11.1	8.4



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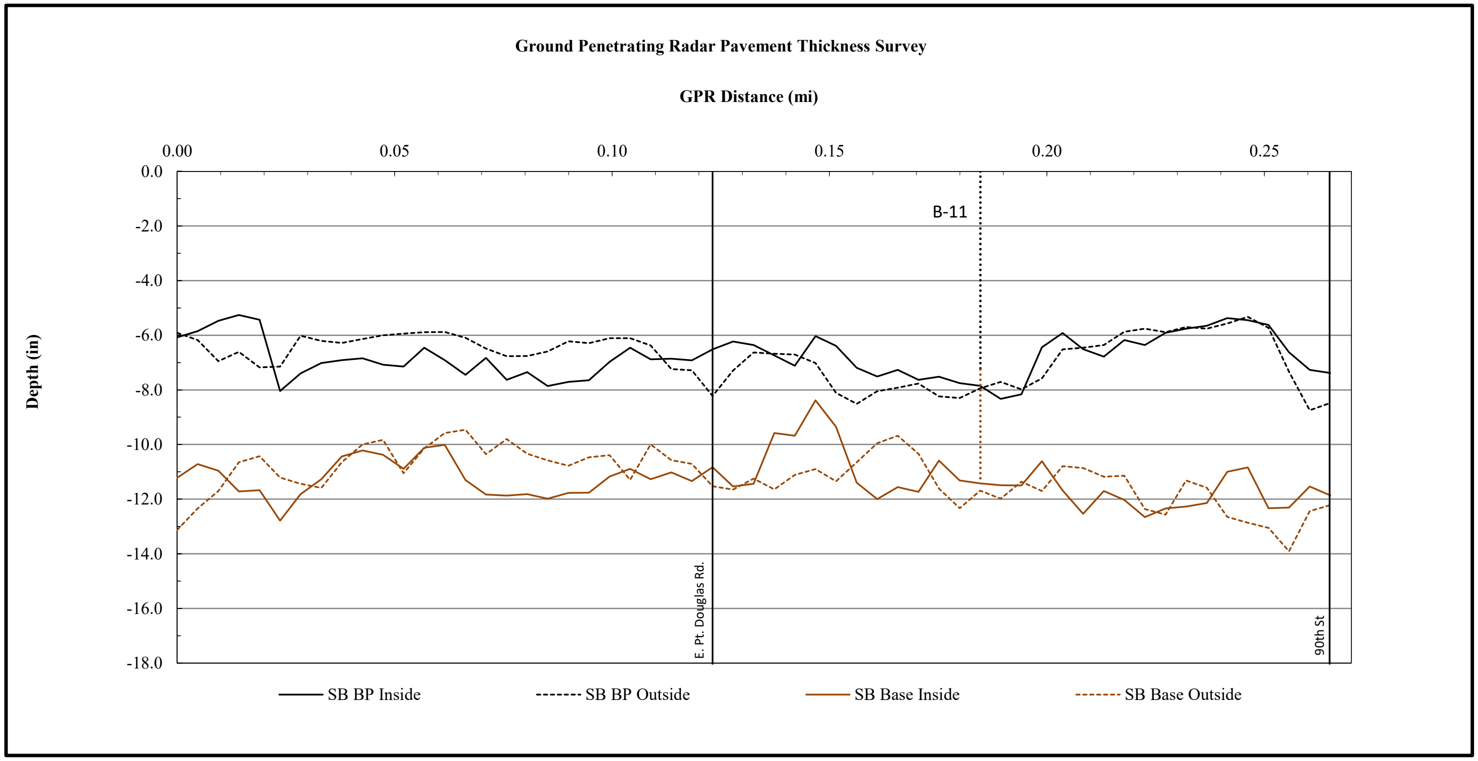
GENERAL INFORMATION: GROUND PENETRATING RADAR

Project:	Jamaica Avenue Improvements	**Date:**	7/1/20
AET Job No.:	28-20309	**Test Date:**	5/22/20
Road:	Jamaica Avenue	**Section/Grid:**	S01
From:	~80' N of US 10/61 WB On Ramp	**To:**	90th St

SUMMARY STATISTICS

Units: inches

Layer	SB Inside Lane				SB Outside Lane			
	Average	CV	15th	Min.	Average	CV	15th	Min.
BP	6.8	12%	5.9	5.3	6.8	13%	5.9	5.3
Base	4.5	24%	3.4	2.4	4.4	30%	3.3	1.8
BP +Base	11.3	8%	10.5	8.4	11.2	9%	10.2	9.5



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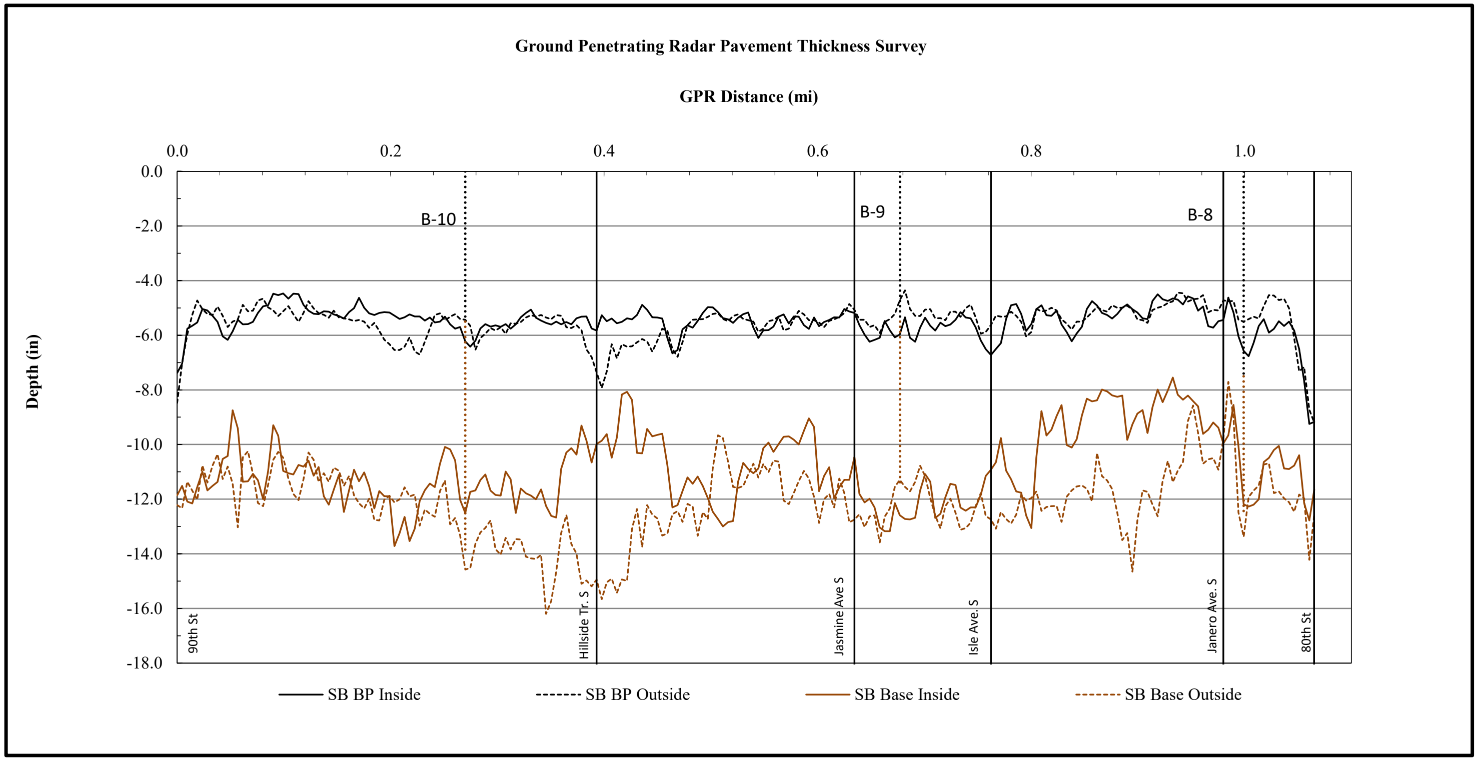
AET Job No.:	28-20309	**Test Date:**	5/22/20
Road:	Jamaica Avenue	**Section/Grid:**	S02
From:	90th St	**To:**	80th St

SUMMARY STATISTICS

Units: inches

	SB Inside Lane				SB Outside Lane			
Layer	**Average**	**CV**	**15th**	**Min.**	**Average**	**CV**	**15th**	**Min.**
BP	5.5	11%	5.0	4.5	5.5	13%	5.0	4.4
Base	5.3	25%	3.9	2.5	6.6	18%	5.5	3.0
BP +Base	10.9	13%	9.3	7.6	12.2	11%	10.9	7.7



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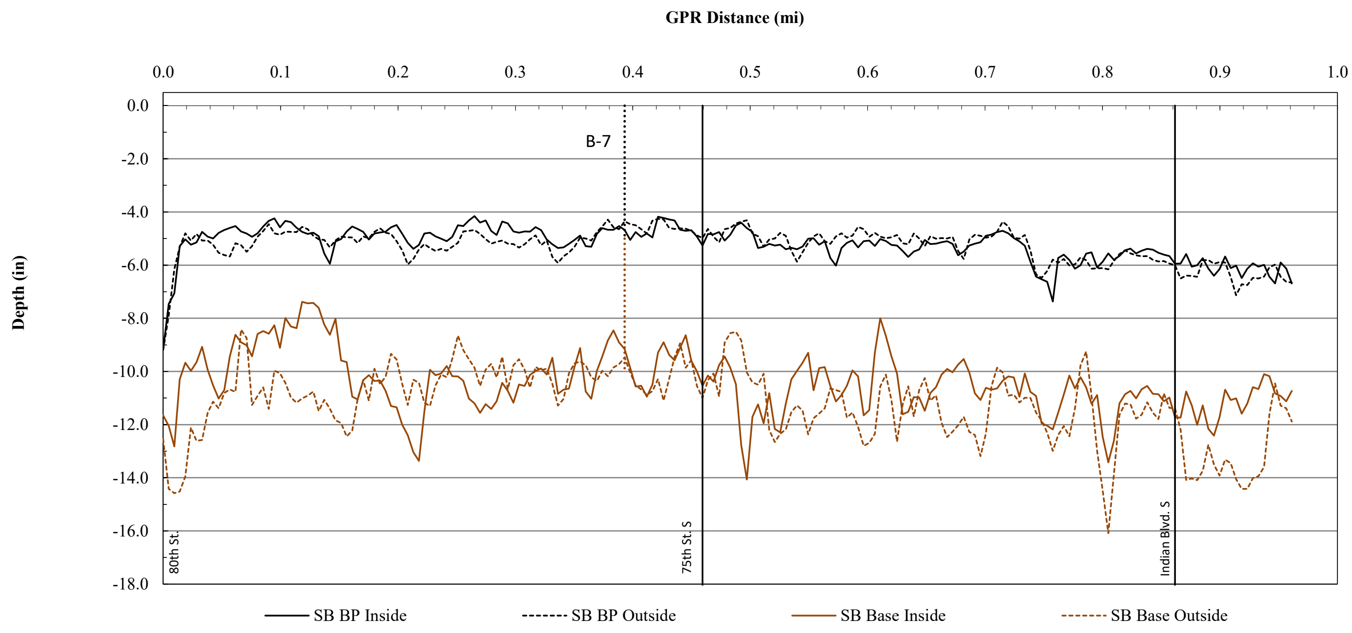
Road:	Jamaica Avenue	**Section/Grid:**	S03
From:	80th St	**To:**	~350' S of 70th Street

SUMMARY STATISTICS

Units: inches

Layer	SB Inside Lane				SB Outside Lane			
	Average	CV	15th	Min.	Average	CV	15th	Min.
BP	5.2	13%	4.7	4.2	5.3	13%	4.7	4.3
Base	5.2	20%	4.2	2.5	5.9	20%	4.8	3.2
BP +Base	10.4	11%	9.3	7.4	11.2	12%	9.9	8.4

Ground Penetrating Radar Pavement Thickness Survey



Appendix D

Geotechnical Report Limitations and Guidelines for Use

Appendix D
Geotechnical Report Limitations and Guidelines for Use
AET Project. 28-20309

D.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by ASFE[1], of which, we are a member firm.

D.2 RISK MANAGEMENT INFORMATION

D.2.1 Geotechnical Services are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. And no one, not even you, should apply the report for any purpose or project except the one originally contemplated.

D.2.2 Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

D.2.3 A Geotechnical Engineering Report is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a few unique, project-specific factors when establishing the scope of a study. Typically factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a rule, always inform your geotechnical engineer of project changes, even minor ones, and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

D.2.4 Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. Do not rely on a geotechnical engineering report whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

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1 Geoprofessional Business Association, 1300 Piccard Drive, LL14, Rockville, MD 20850
Telephone: 301/565-2733: www.geoprofessional.org

D.2.5 Most Geotechnical Findings Are Professional Opinions
Site exploration identified subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

D.2.6 A Report's Recommendations Are Not Final
Do not over rely on the construction recommendations included in your report. Those recommendations are not final, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

D.2.7 A Geotechnical Engineering Report Is Subject to Misinterpretation
Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

D.2.8 Do Not Redraw the Engineer's Logs
Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable but recognizes that separating logs from the report can elevate risk.

D.2.9 Give Contractors a Complete Report and Guidance
Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In the letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might you be able to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

D.2.10 Read Responsibility Provisions Closely
Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their report. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

D.2.11 Geoenvironmental Concerns Are Not Covered
The equipment, techniques, and personnel used to perform a geoenvironmental study differ significantly from those used to perform a geotechnical study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated environmental problems have led to numerous project failures. If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. Do not rely on an environmental report prepared for someone else.