



FEASIBILITY REPORT FOR

33RD STREET AND 82ND AVENUE ROAD IMPROVEMENTS

Prepared For: City of Princeton, MN



March 3, 2020

Loucks Project No. 20091.0

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

A handwritten signature in black ink that reads "Todd McLouth". The signature is written in a cursive style and is positioned above a horizontal line.

Todd McLouth, P.E.
Minnesota Registration No. 20383
March 3, 2020

TABLE OF CONTENTS

Conclusion And Recommendations	1
Introduction / Project Area	2
Exiting Conditions	2
Proposed Improvements	3
Estimated Project Schedule	4
Estimated Costs	4
Appendix A – Cul-de-sac Detail	
Appendix B – Detailed Cost Estimate	
Appendix C – Preliminary Assessment Roll	
Appendix D – Soil Borings	

33rd STREET AND 82ND AVENUE ROAD IMPROVEMENTS

CONCLUSIONS AND RECOMMENDATIONS

Conclusions from the report and investigations are:

1. Construction of the proposed street improvements are feasible and cost effective.
2. The proposed improvements will improve the overall safety and efficiency of the following roads:
 - 33rd Street between 82nd Avenue to the easterly dead end.
 - 82nd Avenue between the northerly City limits and 33rd Street.

Based upon these conclusions we recommend:

1. The proposed 33rd Street and 82nd Avenue road improvements be constructed at an estimated project cost of \$81,467.
2. The cost of these improvements be paid through special assessments. Special assessments will be in accordance with the City's assessment policies.

INTRODUCTION / PROJECT AREA

The purpose of this report is to determine the proposed improvements for portions 33rd Street and 82nd Avenue (4th Ave. N.). In particular:

- 33rd St. – approximately 900 feet west of 82nd Ave. to the dead end.
- 82nd Ave. – approximately 846 feet south of 33rd St.

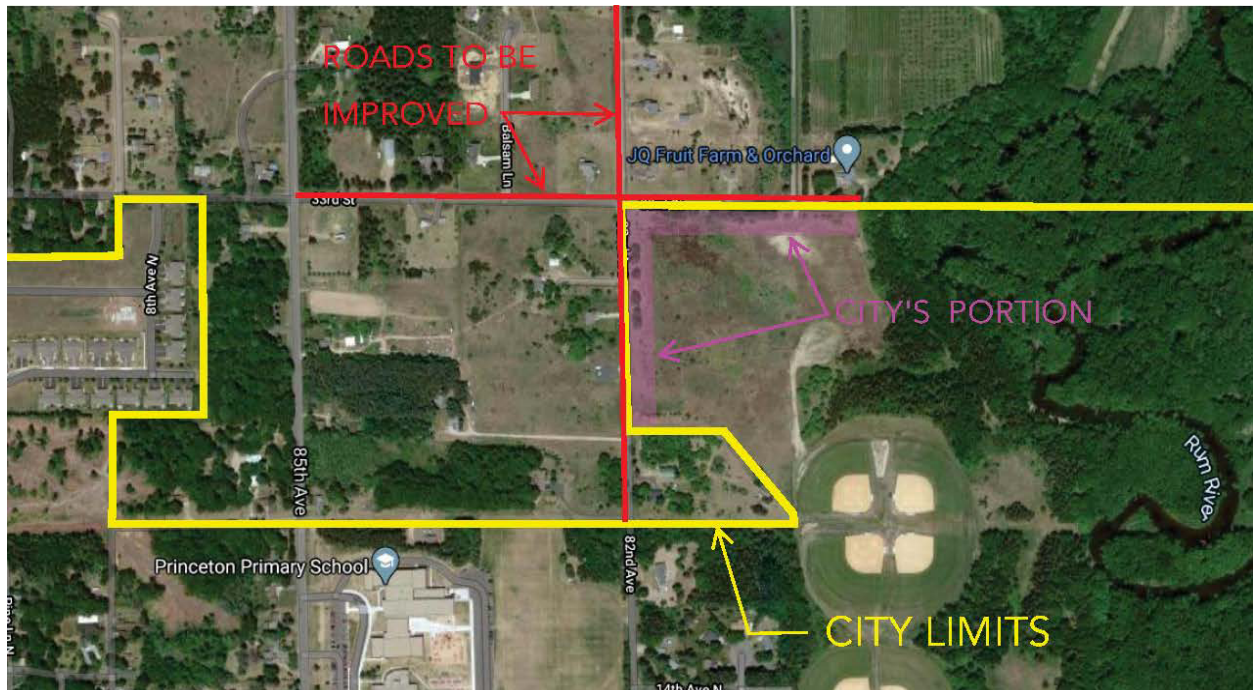


Figure 1 – Project Location

EXISTING CONDITIONS

Currently 33RD St. and 82nd Ave. are gravel roads ranging from 21-22 feet in width. Soil borings taken within the roads show an average of 7.5 inches of gravel over a silty sand and poorly graded sand subgrade. See Appendix D. Road ditches along the sides of the road provide drainage typical of rural roads.

PROPOSED IMPROVEMENTS

The gravel roads shall be widened to a full gravel width of 24 feet. The outside edge of the road shall be excavate to remove any shoulder vegetation. Class 5 aggregate will be added to the shoulder area to bring the existing road bed to the 24 foot width.

Three inches of class 5 aggregate will be placed on top of the existing gravel surface to bring the total average gravel depth to 10 inches. A 22 foot wide bituminous surface, consisting of two lifts of bituminous are proposed over the gravel road bed. Crushed concrete shouldering completes the pavement surfacing. The bituminous lift thickness is proposed as follows:

- 33rd St. - 1.5 inches of bituminous wear course
 - 2.0 inches of bituminous non-wear course
- 82nd Ave. - 2.0 inches of bituminous wear course
 - 2.0 inches of bituminous non-wear course

It is anticipated that 82nd Ave. will receive a higher average daily traffic (ADT) from heavy commercial loading being in close proximity to the middle school. Therefore, a thicker bituminous section is proposed.

The strength of the road section is determined by MnDOT's Gravel Equivalency (GE) method. Figure 2 shows a proposed GE of 24.5 which will classify 33rd St. and 82nd Ave. as 9-Ton roads.

	Depth of Bituminous-in	GE Value	Subtotal GE
Bituminous Non-Wear Course	2	2.25	4.5
Bituminous Wear Course	2	2.0	4.0
Class 5 Aggregate Base	10	1.0	10.0
12 Inch Sand Subgrade	12	0.5	6.0
		TOTAL ROAD GE	24.5

Figure 2 – Road Section GE

The far east end of 33rd St. is a dead end. Currently, snowplows, buses and other traffic is required to back into private driveways to turn around. This is an undesirable situation. It is recommended that a cul-de-sac be included in the proposed improvements. A detail of the cul-de-sac area is shown in appendix A.

Costs for a cul-de-sac were separated and are shown on the detailed cost estimate in Appendix B. The cul-de-sac would need to be placed towards the south side of the road so as to not encroach into the front yard areas of the residential lots along the north side. The property to the south is owned by Princeton School District #477 and is vacant. An easement for road purposes will need to be negotiated with the School District.

ESTIMATED PROJECT SCHEDULE

Council Orders Feasibility Study	February 27, 2020
Council Approves Feasibility Study, Calls for Public Hearing, Approves Plans and Specifications	March 5, 2020
Public Improvement Hearing, Approves Bids, Prepares Assessment Role	March 26, 2020
Begin Construction	May 15, 2020
Construction Completion, Finalize Assessment Costs	August 3, 2020

ESTIMATED COSTS

33rd Street

All costs for 33rd St. are split 50/50 between the Township and the City.

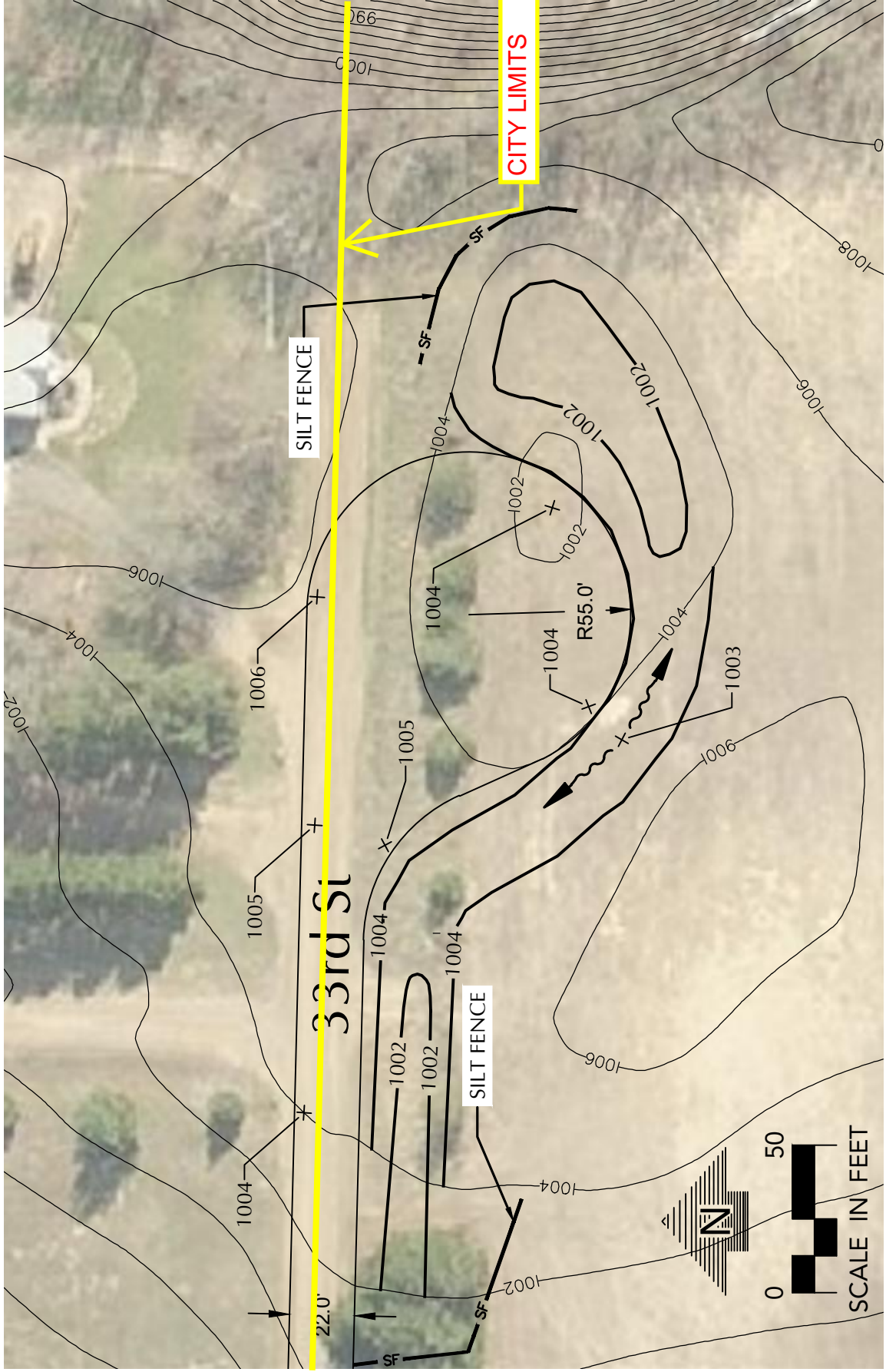
82nd Avenue

All costs for 82nd Ave. are split 50/50 between the Township and the City. The City's 50% portion is then split to 65% since the southern 35% of the road is totally within the Township. Therefore, the City's cost is 32.5% of the total cost.

A detailed cost estimate for improving 33rd St. and 82nd Ave. is included in Appendix B. All costs are based upon bids received by the Township on February 6, 2020. Indirect costs for engineering and surveying are included as a portion of the approved fee cost from the Township. Legal and Administrative costs are shown as an additional 5%. Right-of-way or easement costs are not included.

The city property which abuts the project's area along 33rd St. and 82nd Ave. is owned by Princeton School District #477. The School District is the only property included in the assessment area. Therefore, the School District will be assessed for 100% of the project costs. A preliminary Assessment Roll is shown in Appendix C.

The total estimated assessed cost is \$81,467.



33rd Street Turn-Around
GRADING DETAIL

 LOUCKS

APPENDIX B - DETAILED ESTIMATED COSTS

Owner: City of Princeton

Project: 33rd Street and 82nd Avenue Road Improvements

No.	ITEM	UNIT	ESTIMATED QUANTITY	UNIT BID PRICE	TOTAL COST	ASSESSMENT COSTS
SCHEDULE B - 33rd STREET - East of 82nd Avenue						
1	Shoulder Reconstruction	LF	1,800	\$ 0.85	\$ 1,530.00	\$ 765.00 °
2	Subgrade Preparation	LF	900	\$ 1.70	\$ 1,530.00	\$ 765.00 °
3	3" Class 5 Aggregate	TN	720	\$ 12.90	\$ 9,288.00	\$ 4,644.00 °
4	2" Bituminous Non-Wear course	TN	295	\$ 64.85	\$ 19,130.75	\$ 9,565.38 °
5	1-1/2" Bituminous Wear course	TN	220	\$ 64.85	\$ 14,267.00	\$ 7,133.50 °
6	Crushed Concrete Shouldering	TN	135	\$ 17.60	\$ 2,376.00	\$ 1,188.00 °
7	Tack - Shoulder Stabilization	Gal	100	\$ 3.35	\$ 335.00	\$ 167.50 °
8	Traffic Control	LS	1	\$ 2,800.00	\$ 2,800.00	\$ 1,400.00 °
Subtotal					\$ 51,256.75	\$ 25,628.38 °
Turn-Around at East End						
9	Clear & Grub	LS	1	\$ 3,000.00	\$ 3,000.00	\$ 1,500.00 °
10	Silt Fence	LF	120	\$ 5.00	\$ 600.00	\$ 300.00 °
11	Site Grading	LS	1	\$ 6,500.00	\$ 6,500.00	\$ 3,250.00 °
12	8" Class 5 Aggregate	TN	380	\$ 12.90	\$ 4,902.00	\$ 2,451.00 °
13	2" Bituminous Non-Wear course	TN	110	\$ 64.85	\$ 7,133.50	\$ 3,566.75 °
14	1-1/2" Bituminous Wear course	TN	80	\$ 64.85	\$ 5,188.00	\$ 2,594.00 °
15	Crushed Concrete Shouldering	TN	25	\$ 17.60	\$ 440.00	\$ 220.00 °
16	Seed, Mulch & Fertilizer	AC	0.3	\$ 9,900.00	\$ 2,970.00	\$ 1,485.00 °
17	Traffic Control	LS	1	\$ 600.00	\$ 600.00	\$ 300.00 °
Subtotal					\$ 31,333.50	\$ 15,666.75 °
SCHEDULE B - 33rd STREET - East of 82nd Ave.					\$ 82,590.25	\$ 41,295.13 °
SCHEDULE C - 82nd AVENUE - South of 33rd Street						
1	Shoulder Reconstruction	LF	2,040	\$ 0.85	\$ 1,734.00	\$ 563.55 *
2	Subgrade Preparation	LF	1,020	\$ 1.70	\$ 1,734.00	\$ 563.55 *
3	3" Class 5 Aggregate	TN	735	\$ 12.90	\$ 9,481.50	\$ 3,081.49 *
4	2" Bituminous Non-Wear course	TN	330	\$ 64.85	\$ 21,400.50	\$ 6,955.16 *
5	2" Bituminous Wear course	TN	430	\$ 64.85	\$ 27,885.50	\$ 9,062.79 *
6	Bituminous Tack Coat	Gal	30	\$ 4.30	\$ 129.00	\$ 41.93 *
7	Crushed Concrete Shouldering	TN	195	\$ 17.60	\$ 3,432.00	\$ 1,115.40 *
8	Tack - Shoulder Stabilization	Gal	100	\$ 3.35	\$ 335.00	\$ 108.88 *
9	Traffic Control	LS	1	\$ 2,800.00	\$ 2,800.00	\$ 910.00 *
SCHEDULE C - 82nd AVENUE - South of 33rd St.					\$ 68,931.50	\$ 22,402.74 *
ESTIMATED CONSTRUCTION COST					\$ 151,521.75	\$ 63,697.86
PREPARE BID DOCUMENTS AND OBTAIN BIDS					\$ 5,000.00 ^	\$ 1,700.00 ^
ENG./SURVEY/CONST. ADMIN. - 33rd ST.					\$ 14,500.00 ^	\$ 7,250.00 °
ENG./SURVEY/CONST. ADMIN. - 82nd AVE.					\$ 15,200.00 ^	\$ 4,940.00 *
City Legal & Admin. Costs (5%)						\$ 3,879.39
TOTAL ASSESSED COST					\$	\$ 81,467.26

° The City's portion is 50% of total quantities

* The City's portion of 82nd Ave. is 32.5% of total quantities

^ City's portion of total road length = 5186'/1746' = 34%

^ Township's Fee Cost for Eng., Surveying, Const. Admin.

APPENDIX C

PRELIMINARY ASSESSMENT ROLL

35th Street and 82nd Avenue Road Improvements

<u>Parcel ID</u>	<u>Owner</u>	<u>Owner Address</u>	<u>City</u>	<u>State</u>	<u>Zip</u>	<u>Preliminary Assessment Amount</u>
24-021-0800	Princeton School District #477	701 1st St.	Princeton	MN	55371	\$81,467.26



Independent Testing Technologies, Inc.

JANUARY 7, 2020

**PROJECT 19-424
REPORT OF GEOTECHNICAL EXPLORATIONS**

For

**33rd STREET & 82nd AVENUE IMPROVEMENTS
PRINCETON TOWNSHIP, MINNESOTA**

Prepared For:

PRINCETON TOWNSHIP

(APPENDIX D)



Independent Testing Technologies, Inc.

January 7, 2020

Mr. Bill Whitcomb
Princeton Township
10039 55th Street
Princeton, MN 55371

RE: 19-424 Report of Geotechnical Exploration
 33rd Street and 82nd Avenue Improvements
 Princeton Township, Minnesota

Dear Mr. Whitcomb:

Independent Testing Technologies, Inc. is pleased to submit the results of our subsurface investigation program for this project in Princeton Township, Minnesota. This report represents our work for this project as authorized by you. It includes our recommendations regarding earthwork, fill and compaction, subgrade preparation, and pavement design. An electronic copy is enclosed.

The soils encountered were mostly fine grained, silty sand (SM), poorly graded sand (SP) with highly plastic clays (CH), silty lean clays (CL-ML) on the north end of 82nd Avenue. Some sandy (SM) fill was observed near the surface in a few borings. Groundwater was only observed in boring SB-7 at a depth of 9.5 feet during our investigation.

Mr. Whitcomb, it has been our pleasure to work with you on this project. Independent Testing appreciated the opportunity to perform this geotechnical evaluation and look forward to continuing our participation during the construction phase of this project. Please contact Patrick Johnson if you have any questions regarding this report. Please contact Tyler Burkes if you would like a proposal for the materials testing services that may be needed.

Sincerely,

A handwritten signature in blue ink that reads "Tyler T. Burkes".

Tyler Burkes, EIT

A handwritten signature in blue ink that reads "Patrick Johnson".

Patrick A. Johnson, P.E.
Minnesota License #22037

CERTIFICATION

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



Patrick A. Johnson

Date: January 7, 2020 License No.: 22037

TABLE OF CONTENTS

A. Introduction	1
Purpose.....	1
Scope of Services.....	1
General Site Conditions	2
Available Subsurface Information.....	2
B. Exploration Program.....	2
Exploration Results.....	3
Penetration Test Results.....	3
Water Level Observations	3
Lab Testing	4
C. Engineering Review.....	4
Discussion.....	4
D. Recommendations	5
Embankment/ Road Fill	5
E. Pavement Recommendations	6
F. Closing	7
Boring Location Plan.....	Appendix 1
Soil Boring Logs.....	Appendix 2

**GEOTECHNICAL EXPLORATIONS
PRINCETON TOWNSHIP
33RD STREET & 82ND AVENUE IMPROVEMENTS
PRINCETON TOWNSHIP, MINNESOTA
PROJECT 19-424**

A. Introduction

This report is being prepared for use by our client on this specific project. We intend to present this report and our findings in the same logical manner that led us to arrive at our recommendations. This report is based on some general assumptions regarding the anticipated construction based on experience with similar projects. These assumptions and the entire report should be reviewed immediately upon receipt.

Purpose:

The purpose of our investigation was to evaluate the existing soil and water conditions on this site for the purpose of constructing and paving the existing roadways northeast of the City of Princeton. The existing gravel surfaced roads will be paved with bituminous. Very little widening is planned. In accordance with your written authorization, we have conducted a subsurface exploration program for the proposed project.

Scope of Services:

Our authorized scope of services included the following:

1. To investigate the subsurface soil and water conditions encountered at nine (9) split-spoon soil boring locations. The boring depths were planned to be ten (10) feet at each location. Boring SB-4 was not conducted.
2. To provide a report of our findings including a summary of our findings with recommendations regarding earthwork, soil correction, fill and compaction, subgrade preparation and pavement design with an estimated design R-value.

General Site Conditions:

The project is located in a rural area just northeast of the City of Princeton. Both roadways are straight approaching the intersection, with 33rd street heading east- west and 82nd Avenue heading north- south. The site is relatively flat, with slopes of 2-6 percent.

Available Subsurface Information:

According to the Geologic Map of Minnesota, Quaternary Geology, prepared by Howard C. Hobbs and Joseph E. Goebel (1982, Minnesota Geological Survey), this site lies within an outwash unit not associated with a particular moraine. It is associated with the Des Moines glaciation of Pleistocene, Late Wisconsinan age. The drift is derived from parent material in North Dakota and Manitoba.

According to the Soil Survey of Mille Lacs County prepared by the Soil Conservation Service, the site lies mostly within Zimmerman fine sands and Cantlin loamy fine sands. However, the north ¼ mile of 82nd Avenue lies within Grasston silts and Foglake silt loams. The fine sands and loamy fine sands mapped on this site are sandy and have slight limitations for development of local roads and streets. However the silt and silt loam soils have severe limitations for development of local roads and streets due to severe frost heave and shrink swell potential.

B. Exploration Program

Nine (9) split-spoon soil borings were planned on this project. One boring location could not be performed because of utility locating difficulty. The borings were advanced to depths of 10 feet using a 3 ¼ inch I.D. hollow stem auger. Samples were obtained every 2 ½ feet using a 2-inch O.D. split-spoon sampler in accordance with the American Society for Testing and Materials (ASTM D1586). Standard penetration values (N-values) were obtained at each sample interval by driving the sampler into the soil using a 140-pound hammer falling 30 inches. After an initial set of 6 inches, the number of blows required to drive the sampler 12 inches is known as the standard penetration resistance or N-value. Where the sampler cannot be driven at least 6 inches by 50 blows of the hammer, the total number of blows as well as the distance driven is reported on the boring logs.

Groundwater levels were noted during drilling and immediately after completion. The holes were backfilled with the auger cuttings. Some settlement of the bore holes may be expected. All of the borings were conducted with a truck mounted rig.

Exploration Results:

The borings were conducted in the existing gravel surfaced roadways and encountered 4.0 to 9.0 inches of aggregate surfacing material.

Below the aggregate, borings SB-1 and SB-2 encountered fine grained, silty sand (SM) fill to 2.0 feet, followed by poorly graded sand (SP) to termination at 11.5 feet. Below the aggregate, boring SB-3 encountered fine grained, silty sand (SM) fill to 3.5 feet, followed by native, fine grained, silty sand (SM) to termination at 11.5 feet. Below the pavement, boring SB-5 encountered highly plastic clay (CH) to 5.0 feet, followed by silty lean clay (CL-ML) to termination at 11.5 feet.

Below the aggregate, boring SB-6 encountered native, silty lean clay (CL-ML) to 10.0 feet, followed by highly plastic clay (CH) to termination at 11.5 feet. Below the aggregate, boring SB-7 encountered fine grained, silty sand (SM) to 5.0 feet, followed by highly plastic clay (CH) to 7.5 feet and silty lean clay (CL-ML) to termination at 11.5 feet. Below the aggregate, boring SB-8 encountered fine grained, poorly graded sand (SP) to 7.0 feet, followed by fine, grained, silty sand (SM) to termination at 11.5 feet. Below the aggregate, boring SB-9 encountered fine grained, poorly graded sand (SP) to 3.5 feet, followed by silty sand (SM) to 5.0 feet and then poorly graded sand (SP) to termination at 11.5 feet.

Penetration Test Results:

The blow counts in the sandy fill (SM) soils were 16 which are moderate, indicating they are in a medium dense condition. The blow counts in the native sandy soils (SM, SP) ranged from 1 to 16, which are very low to moderate, indicating they are in a very loose to medium dense condition. The blow counts in the native clay soils (CH, CL-ML) ranged from 3 to 9, which are low to moderate, indicating they are in a soft to rather stiff condition. Refusal of the spoon or auger did not occur. Drilling was relatively easy in all of the locations.

Water Level Observations:

Observations of the subsurface water conditions were made during drilling operations. Groundwater was only encountered in boring SB7 at a depth of 9' 6" feet during our investigation.

The moisture contents of the native sand soils indicates they are not saturated. It should be noted that the water levels were observed over a very short period of time. However, we feel that the water levels are a fairly accurate representation of the actual water levels on this project because of the high permeability of the sand soils on the site. The water level in the clay soils may not be an accurate representation of the true water levels due to the low permeability of the clay soils.

Mottled soils were observed. Mottled native soils are a historical indication of a temporarily or seasonally saturated soil condition. Grey soils were not observed. Grey native soils are an indication of a permanently saturated soil condition.

Laboratory Testing

Moisture Content Tests- Moisture content tests were performed on every split spoon sample in accordance with ASTM method D2216; *Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass*. Individual test results are shown on the boring logs adjacent to the sample that was tested.

C. Engineering Review

Discussion:

The soils encountered near the surface on most of this site are predominantly fine grained, sands consisting of silty sands (SM), poorly graded sands (SP) and poorly graded sands with silt (SP-SM). They appear to mostly be outwash type material. The fine grained, sandy outwash soils are considered excellent material for use as roadway subgrade material and for bituminous pavement support.

Clay soils (CH, CL-ML) were encountered on the north quarter mile of 82nd Avenue. These soils are not well suited for roadway subgrade material and pavement support. They are weak and highly frost susceptible. Highly plastic clays (CH) are also very susceptible to shrink swell with changes in moisture content. We recommend a 2 foot layer of select granular borrow be used in the pavement section over the clay soils on this project.

D. Recommendations

The following recommendations are based on our understanding of the proposed project. If our understanding of the project is not accurate or if changes are made to the project scope, please inform us so that our recommendations can be amended, if necessary. We have included recommendations regarding earthwork and construction that may help in cost estimates and aid in design. We should be allowed to review the proposed construction plans to provide further detailed recommendations, if necessary. Without the opportunity to review the final construction plans, the recommendations made in this report may no longer be valid.

Embankment/ Road Fill:

The on-site soils consisting of fine grained, silty sands (SM), poorly graded sands (SP) and poorly graded sands with silt (SP-SM) are considered good to excellent material for use as structural fill. These soils are easy to work with and are easily compacted using vibratory compaction equipment when near their optimum moisture contents.

The on-site soils consisting of silty lean clay (CL-ML) and highly plastic clays are considered very poor for use as structural fill. These soils are very susceptible to moisture changes and are very weak. We recommend a minimum of a two foot subcut and placement of at least 2 feet of select granular borrow for pavements built over these soils. In addition, we recommend a geotextile fabric or geogrid to allow construction over the weak soils.

We recommend that any imported fill and utility trench backfill material consist of mineral soils meeting the requirements specified below. No organic soils, roots, stumps, logs, brush, etc. should be used as structural fill below any utility structure or pavement section. We recommend that all fill and utility trench backfill material be free of soft, wet or frozen soils, highly expansive soils, rubble, debris and rocks in excess of 6 inches in diameter. The fill material should be as uniform as possible both in composition and moisture content.

No organic soils with organic content in excess of 3.0% by weight should be used as roadway embankment fill or as subgrade material. Some of the fill was dark brown to black. However, none appeared to be organic. It is our opinion that most of the dark silty sand fill will be suitable for use as pavement subgrade.

We recommend that all embankment fill material be placed in 12-inch loose lifts and compacted to a minimum of 95% of standard proctor maximum density (ASTM D698). Any fill placed in the top 3 feet of the road subgrade should be compacted to at least 100% of standard proctor maximum density. All fill material should be compacted at a moisture content within plus or minus 2% of the optimum moisture as determined by a standard proctor. We recommend compaction tests be taken at a minimum rate of one test per two feet of fill per 200 linear feet of roadway subgrade, and aggregate base material.

E. Pavement Recommendations

The expected subgrade soils will likely consist of fine grained silty sand (SM), poorly graded sands (SP) and poorly graded sands with silt (SP-SM) outwash soils. The sandy outwash soils on this site are classified as A-3 soils in accordance with the American Association of State Highway Transportation Officials (AASHTO) classification system. A-3 soils are rated as excellent material for use as roadway subgrade material. Without benefit of a laboratory R-value determination and based on MnDot guidelines and our experience with similar soils, we recommend an R-value of 70 be assumed for the onsite soils.

Based on an assumed R-value of 70, we recommend the following bituminous pavement section for a 9-ton roadway with less than 150 HCADT for the sandy subgrade soils:

<u>Thickness</u>	<u>Course/Description</u>	<u>G.E.</u>
3.5"	MnDot 2360 SPWEB240 Bituminous	7.9"
6.0"	MnDot 3138 Class 5 or 6 Aggregate Base	6.0"
9.5"	TOTAL	13.9"

The expected subgrade soils on the north end of 82nd Avenue will likely consist of silty lean clay and highly plastic clay. The clayey soils on this site are classified as A-7 soils in accordance with the American Association of State Highway Transportation Officials (AASHTO) classification system. A-7 soils are rated as poor material for use as roadway subgrade material. Without benefit of a laboratory R-value determination and based on MnDot guidelines and our experience with similar soils, we recommend an R-value of 12 be assumed for the onsite soils.

Based on an assumed R-value of 12, we recommend the following bituminous pavement section for a 9-ton roadway with less than 150 HCADT for the north ¼ mile of 82nd Avenue:

<u>Thickness</u>	<u>Course/Description</u>	<u>G.E.</u>
3.5"	MnDot 2360 SPWEB240 Bituminous	7.9"
6.0"	MnDot 3138 Class 5 or 6 Aggregate Base	6.0"
24.0"	MnDot 3147 Select Granular Borrow	12.0"***
33.5"	TOTAL	25.9"

*** Placed on geofabric Type 5 or geogrid

In using the above R-value for bituminous pavement design, it is essential that the subgrade be constructed of uniform soils at a moisture content and density in accordance with MnDot specification 2105 and capable of passing a test roll in accordance with MnDot specification 2111. The native, undisturbed soils may need preparation (drying and compacting) to pass a proof roll. If the subgrade is not compacted, uniform and capable of passing a test roll, then we recommend the subgrade be scarified and recompacted or subcut and geotextile fabric placed along with select granular material meeting MnDot specification 3149. The top of subgrade should be compacted to a minimum of 100% of standard proctor maximum density. The subgrade should be sloped towards the edges to provide drainage.

F. Closing

Our work was performed for geotechnical purposes only and not to document the presence or extent of any contamination on the site. We can note that our crew did not detect any obvious contamination by sight or smell during drilling operations. However, human senses are limited in terms of contamination detection and, therefore, the lack of detection through human sensing does not preclude the possibility of the presence of contamination of the site.

This report represents the result of our subsurface investigation and is based on information gathered at specific locations. Subsurface conditions can change a great deal over short horizontal distances. Also, the actual interface between strata will likely be a gradual transition rather than an abrupt change as represented on the boring logs.

Geotechnical engineering is based extensively on opinion. Therefore, the data contained in this report should be used as a guide, and we recommend that construction monitoring be performed by a qualified geotechnical engineer or technician. Any changes in the subsurface conditions from those found during this geotechnical exploration should be brought to the attention of a soils engineer.

c:19424rpt

APPENDIX 1

BORING LOCATION PLAN

19-424
82nd Avenue & 33rd Street
Princeton Township, MN



APPENDIX 2

SOIL BORING LOGS

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 19-424 PRINCETON TOWNSHIP
33RD STREET & 82 AVENUE IMPROV.
PRINCETON TOWNSHIP, MINNESOTA

DATE: 11/18/19 BORING #: SB-1
START TIME: 10:30 END TIME: 10:50

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: BH/ AR

LOCATION: See Boring Location Plan

ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
6.0"	GP	GRAVEL, brown.				
	SM	SILTY SAND, fine grained, brown, FILL				
2.0						
	SP	POORLY GRADED SAND, fine grained, brown.				
			1	4	6.3	
5.0			2	2	5.4	
			3	1	5.8	
10.0			4	3	7.2	
11.5						
		Boring complete to 11.5 feet. No water encountered during drilling. No water measured at 4' 11" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 19-424 PRINCETON TOWNSHIP
33RD STREET & 82 AVENUE IMPROV.
PRINCETON TOWNSHIP, MINNESOTA

DATE: 11/18/19 BORING #: SB-2
START TIME: 10:55 END TIME: 11:20

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: BH/ AR

LOCATION: See Boring Location Plan

ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
5.0"	GP	GRAVEL, brown.				
	SM	SILTY SAND, fine grained, brown, FILL				
2.0						
	SP	POORLY GRADED SAND, fine grained, brown.				
			1	6	8.1	
5.0			2	6	14.0	
			3	8	19.7	
10.0			4	8	8.7	
11.5						
		Boring complete to 11.5 feet. No water encountered during drilling. No water measured at 5' 4" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 19-424 PRINCETON TOWNSHIP
33RD STREET & 82 AVENUE IMPROV.
PRINCETON TOWNSHIP, MINNESOTA

DATE: 11/18/19 BORING #: SB-3
START TIME: 11:25 END TIME: 11:50

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: BH/ AR

LOCATION: See Boring Location Plan

ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
9.0"	GP	GRAVEL, brown.				
	SM	SILTY SAND, fine grained, dark brown. FILL				
3.5			1	4	24.6	
5.0	SM	SILTY SAND, fine grained, brown.				
			2	5	12.6	
			3	9	22.5	
10.0						
11.5		very fine grained	4	10	14.4	
		Boring complete to 11.5 feet. No water encountered during drilling. No water measured at 5' 7" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 19-424 PRINCETON TOWNSHIP
33RD STREET & 82 AVENUE IMPROV.
PRINCETON TOWNSHIP, MINNESOTA

DATE: 11/18/19 BORING #: SB-5
START TIME: 12:40 END TIME: 1:10

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: BH/ AR

LOCATION: See Boring Location Plan

ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
6.0"	GP CH	GRAVEL, brown. HIGHLY PLASTIC CLAY, brown, mottled.	1	9	28.9	
5.0	CL-ML	SILTY LEAN CLAY, reddish brown, mottled. brown, mottled.	2	4	32.9	
10.0			3	6	32.1	
11.5			4	9	34.4	
		Boring complete to 11.5 feet. No water encountered during drilling. No water measured at 3' after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 19-424 PRINCETON TOWNSHIP
33RD STREET & 82 AVENUE IMPROV.
PRINCETON TOWNSHIP, MINNESOTA

DATE: 11/18/19 BORING #: SB-6
START TIME: 1:05 END TIME: 1:30

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: BH/ AR

LOCATION: See Boring Location Plan

ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
6.0"	GP	GRAVEL, brown.				
	CL-ML	SILTY LEAN CLAY, brown, mottled.				
5.0			1	7	27.6	
			2	3	36.8	
			3	7	32.5	
10.0						
	CH	HIGHLY PLASTIC CLAY, brown.	4	6	38.4	
11.5		Boring complete to 11.5 feet. No water encountered during drilling. No water measured at 3' 9" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 19-424 PRINCETON TOWNSHIP
33RD STREET & 82 AVENUE IMPROV.
PRINCETON TOWNSHIP, MINNESOTA

DATE: 11/18/19 BORING #: SB-7
START TIME: 1:35 END TIME: 2:05

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: BH/ AR

LOCATION: See Boring Location Plan

ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
6.0"	GP SM	GRAVEL, brown. SILTY SAND, fine grained, brown.	1	3	17.3	
5.0	CH	HIGHLY PLASTIC CLAY, brown, mottled.	2	3	34.2	
7.5	CL-ML	SILTY LEAN CLAY, brown, mottled.	3	4	30.8	V water encountered at 9.5' during drilling.
10.0			4	6	32.2	
11.5		Boring complete to 11.5 feet. Water encountered at 9.5' during drilling. No water measured at 4' 7" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 19-424 PRINCETON TOWNSHIP
33RD STREET & 82 AVENUE IMPROV.
PRINCETON TOWNSHIP, MINNESOTA

DATE: 11/18/19 BORING #: SB-8
START TIME: 2:10 END TIME: 2:40

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: BH/ AR

LOCATION: See Boring Location Plan

ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
4.0"	GP SP	GRAVEL, brown. POORLY GRADED SAND, fine grained, brown.				
5.0			1	8	11.0	
7.0			2	8	6.1	
10.0	SM	SILTY SAND, very fine grained, tan.	3	2	14.5	
11.5			4	12	7.9	
		Boring complete to 11.5 feet. No water encountered during drilling. No water measured at 5' 4" after completion.				

INDEPENDENT TESTING TECHNOLOGIES, INC. LOG OF SOIL BORING

PROJECT: 19-424 PRINCETON TOWNSHIP
33RD STREET & 82 AVENUE IMPROV.
PRINCETON TOWNSHIP, MINNESOTA

DATE: 11/18/19 BORING #: SB-9
START TIME: 2:50 END TIME: 3:15

METHOD: 3 1/4" I.D. Hollow Stem Auger
CREW: BH/ AR

LOCATION: See Boring Location Plan

ELEVATION:

Depth (Feet)	ASTM Symbol	Soil Description	Sample #	N Value	W _n	Notes
6.0"	GP	GRAVEL, brown.				
	SP	SILTY SAND, fine grained, dark brown. FILL			6.6	
3.5			1	16	12.8	
5.0	SM	SILTY SAND, fine grained, dark brown.				
5.0	SP	POORLY GRADED SAND, fine grained, brown.				
			2	4	6.1	
			3	11	4.7	
10.0						
			4	16	5.5	
11.5						
		Boring complete to 11.5 feet. No water encountered during drilling. No water measured at 4' 11" after completion.				

Unified Soil Classification (USC) System (from ASTM D 2487)

Major Divisions		Group Symbol	Typical Names	
Course-Grained Soils More than 50% retained on the 0.075 mm (No. 200) sieve	Gravels 50% or more of course fraction retained on the 4.75 mm (No. 4) sieve	Clean Gravels	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		Gravels with Fines	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	Sands 50% or more of course fraction passes the 4.75 mm (No. 4) sieve	Clean Sands	SW	Well-graded sands and gravelly sands, little or no fines
		Sands with Fines	SP	Poorly graded sands and gravelly sands, little or no fines
			SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
Fine-Grained Soils More than 50% passes the 0.075 mm (No. 200) sieve	Silts and Clays Liquid Limit 50% or less	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands	
		CL	Inorganic clays of low to medium plasticity, gravelly/sandy/silty/lean clays	
		OL	Organic silts and organic silty clays of low plasticity	
	Silts and Clays Liquid Limit greater than 50%	MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts	
		CH	Inorganic clays or high plasticity, fat clays	
		OH	Organic clays of medium to high plasticity	
Highly Organic Soils		PT	Peat, muck, and other highly organic soils	

Prefix: G = Gravel, S = Sand, M = Silt, C = Clay, O = Organic

Suffix: W = Well Graded, P = Poorly Graded, M = Silty, L = Clay, LL < 50%, H = Clay, LL > 50%