INITIAL NOTIFICATION OF INTENT TO CONSTRUCT UTILITY CROSSING/ENCROACHMENT

Complete this form and return it along with a non-refundable preparation fee of $1350 made out to CN.

Date: 10/20/2023

1. **Owner/Applicant Information**
   - A. Name: City of Aurora, IL
   - B. Address: 44 East Downer Place, Aurora, IL 60507
   - C. Authorized Representative: Ken Schroth
   - D. Title: Director of Public Works / City Engineer
   - E. Phone Number: 630-256-3201 F. Fax Number:
   - G. Email Address: schrothk@aurora.il.us

2. **Engineer/Consultant Information**
   - A. Name: City of Aurora
   - B. Address: 77 South Broadway, Aurora, IL 60505
   - C. Authorized Representative: Nadia Schweisthal
   - D. Title: Professional Engineer
   - E. Phone Number: 630-256-3231 F. Fax Number:
   - G. Email Address: schweisthaln@aurora.il.us

3. **Location Description (Attach a Copy of a Sketch Showing Location)**
   - A. ____ ¼ ____ ¼ Sec. 32, Township 38 NORTH, Range 9 EAST
   - B. Nearest Public Road Crossing Name: Keating Drive
   - C. Nearest Public Road Crossing DOT Number: 2 6 0 5 6 3 T
     (Number on Blue Sign at Crossing, e.g. 123456L)
   - D. (City) / Village /Township: Aurora
     (Circle One)
   - E. County: Dupage F. State: Illinois
   - G. Utility Location – Railroad Mile Post: 17 plus 3,679 ft
     (Start Railroad Mile Post of Segment if Longitudinal)
   - H. Utility Location – Railroad Mile Post: ____ plus ____ ft
     (End Railroad Mile Post of Segment if Longitudinal)
   - I. Latitude: 41.725000°, Longitude: -88.235550°

Nadia L. Schweisthal	Nadia L. Schweisthal	630-256-3231	10/20/2023
Name of Submitter	Signature	Telephone #	Date

INITIAL NOTIFICATION OF INTENT TO CONSTRUCT UTILITY CROSSING/ENCROACHMENT
WIRE/FIBER/CABLE CONSTRUCTION INFORMATION

4. Indicate Type of Utility/Facility

- A. Power Line _____
- B. Telephone
  - • Fiber Optic _____
  - • Copper Pair _____
- C. Cable TV
  - • Fiber Optic _____
  - • Coaxial _____
- D. Other X

5. Desired Method of Installation/Construction

- A. Underground X
- B. Overhead _____
- C. Crossing _____
- D. Longitudinal _____
- E. Copper Pairs
  - • # of Wires _____
- F. Fiber Optic
  - • # of Strands _____
- G. Other _____

6. Wire/Cable Data

A.	Number of Poles/Towers on Property	N/A
B.	Number of Guys/Anchors on Property	N/A
C.	Cross arm Overhang	N/A ft
D.	Maximum Voltage	N/A
E.	Number of Wires/Cables/Pairs/Strands (circle one)	N/A
F.	Depth of Top of Wire/Cable/Casing below base of Rail or Top of Ground	6 ft
G.	Clearance Over Railroad Company's Wires	N/A ft
H.	Clearance Over Railroad Company's Tracks	N/A ft
I.	Casing Length (Property Line to Property Line)	100 ft
J.	Size & Kind of Pipe or Duct	16" Class 52 Ductile Iron
K.	Method: How is Pipe or Duct to be installed under the track (dry bore & jack, directional, tunnel, other – specify)	Bore & Jack
L.	Size and Type of Wire/Cable	N/A
M.	Insulated	N/A
N.	Bare/Open Wire	N/A
O.	Stranded	N/A
P.	Solid	N/A
Q.	Angle of Crossing	90
R.	Length of Span Crossing Tracks (unsupported length if above tracks)	100 ft

7. Location References and Clearances of Facility (Encroachment)

A.	Width of Public Road (crossing track)	30
B.	Distance From Each Facility (Encroachment) to Center Line of Main Track	50 ft
C.	Distance From Each Facility (Encroachment) to Center Line of any Adjacent Track	N/A ft
D.	Side Clearance from Railroad Company's Wire to Nearest Pole/Tower	N/A ft
E.	Distance and Direction From Bridge Abutment, Culvert, Switch, Road Crossing, etc.	N/A ft

Nadia L. Schweisthal	Nadia L. Schweisthal	630-256-3231	10/20/2023
Name of Submitter	Signature	Telephone #	Date

INITIAL NOTIFICATION OF INTENT TO CONSTRUCT PIPE CROSSING/ENCROACHMENT
PIPE CONSTRUCTION INFORMATION

8. Commodity to be transmitted in pipe: Water
(Steam, air, water, gasoline or other petroleum products, chemical-specify: natural or artificial gas. If sewer, identify as to force or gravity line, sanitary, storm or chemical waste – specify)

9. Pipe Data

		CARRIER PIPE	CASING PIPE
A.	Inside Diameter:	16"	29.188"
B.	Outside Diameter:	17.40"	30"
C.	Wall Thickness:	.30"	.406
D.	Pipe Material:	DUCTILE IRON	STEEL
E.	Specification/Grade or class:	CL 52	E80
F.	Min. Yield Point of Material	42,000 PSI	35,000 PSI
G.	Process of Manufacture	TBD	TBD
H.	Name of Manufacturer	TBD	TBD
I.	Type of Joint	PUSH IN	WELDED
J.	Working Pressure	51	N/A

K.	Maximum operating pressure (by gauge)	55 psi
L.	Length of Casing pipe:	100 ft
M.	Casing pipe/uncased carrier pipe cathodically protected?	Y / N
N.	Hydrostatic pressure carrier pipe test pressure	250 psi
O.	Will casing pipe be vented?	Y / N
P.	Pipe Vent Size:	N/A in
Q.	Will casing pipe/uncased carrier pipe have a protective coating?	Y / N
R.	Protective Coating Type	N/A
S.	Depth of top of casing or uncased carrier pipe below base of rail or top of ground. (Closest point of utility to any base of rail or ground)	6 ft
T.	Method of installing casing pipe /uncased carrier pipe *(Dry bore & jack, directional, tunnel, other – specify)*	BORE & JACK
U.	Depth of pipe below the ground. (not beneath tracks)	6 ft
V.	Depth of pipe below ditches.	6 ft
W.	Distance from centerline of track to face of jacking/receiving pits.	50 and 64 ft
X.	Depth from base of rail to bottom of jacking /receiving pits.	10 ft

Nadia L. Schweisthal	Nadia L. Schweisthal	630-256-3231	10/20/2023
Name of Submitter	Signature	Telephone #	Date

Revised: 3/29/2018

CN – City of Aurora Specifications

SP G.6 – TRENCH BACKFILL, PIPE BEDDING, AND COVER

All select granular material shall meet IDOT gradation specifications and shall be either crushed limestone, crushed concrete or crushed gravel. Material excavated as part of this project may be processed on site for re-use with approval from the Engineer at an agreed upon unit price.

Pipe Bedding
Pipe bedding shall consist of over-excavation of the trench bottom and refilling to proper grade in accordance with the trench backfill details included in the plans.

The cost of supplying and installing the aggregate bedding shall not be paid for separately, but shall be considered incidental to the project.

Haunching
Pipe Haunching shall consist of compacted aggregate for the full width of the trench to the spring line for the reinforced concrete pipe or ductile iron pipe and to one foot (1') above the top of the pipe for PVC pipe in accordance with the details included in these plans.

The cost of supplying and installing the aggregate haunching shall not be paid for separately, but shall be considered incidental to the cost of the pipe.

Trench Backfill
Trench backfill shall be placed in accordance with the Standard Specifications for Water and Sewer Main Construction in Illinois and the Trench Backfill Detail as shown on the plans.

Place Trench Backfill material to required elevations, for each area classification listed below:

Under grassed areas:
Satisfactory excavated or borrow material, approved by the Engineer.

Under pavements:
Select Trench Backfill of compacted CA-6 crushed limestone or CA-6 crushed gravel.

Place backfill materials evenly adjacent to structures or piping to required elevations. Take care to prevent wedging action of backfill against structures or displacement of piping by carrying material uniformly around structure of piping to approximately same elevation in each lift.

Compaction Jetting and Water Soaking
The holes through which the water is injected in the backfill shall be placed in a grid pattern at intervals of not more than four feet (4'). Additional holes shall be provided if deemed necessary by the Engineer to ensure adequate settlement. All holes shall be jetted and shall be carried to a point one foot (1') above the top of the pipe. Drilling the holes by means of augers or other mechanical means will not be permitted. Care shall be taken in jetting to prevent contact with or other disturbance to the pipe.

The water shall be injected at a pressure and rate sufficient to sink the holes at a moderate rate. After a hole has been jetted to the required depth, the water shall be injected until it begins to overflow the surface.

If the Contractor requests and receives approval to perform mechanical compaction in place of jetting all trenches, they shall be responsible for hiring and compensating a third party testing agency to verify that the minimum compaction requirements listed in the Standard Specifications for Water and Sewer Construction in Illinois and the Compaction Requirements special provision shall be met. Mechanical compaction shall be performed in accordance with the Standard Specifications for Water and Sewer Construction in Illinois.

Surface depressions resulting from backfill subsidence caused by compaction shall be filled and re-compacted by tamping or rolling to the satisfaction of the Engineer.

Measurement and Payment

The cost of supplying and installing the aggregate bedding and haunching shall not be paid for separately, but shall be considered incidental to the contract.

The cost of supplying and installing the initial and final Select Granular Trench Backfill shall be paid for at the contract unit price per CUBIC YARD (CY) for SELECT GRANULAR TRENCH BACKFILL. Section 20 of the Standard Specifications for Water and Sewer Main Construction in Illinois shall be used to determine the quantity of Select Trench Backfill that will be eligible for payment. The depth used for the purposes of calculating the quantity of trench backfill that is eligible for payment shall be from the top of the haunching to the bottom of the bituminous pavement patch.

SP G.7 – COMPACTION REQUIREMENTS

The Contractor shall control soil compaction during construction in order to provide the minimum percentage of maximum or relative density as specified for each area of classification indicated below:

Percentage of Maximum Density Requirements

Compact soil to not less than the following percentages of maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM D 1557; and not less than the following percentages of relative density, determined in accordance with ASTM D 2049, for soils which will not exhibit a well-defined moisture-density relationship (cohesionless soils).

Pavement, Drives, and Sidewalks

Compact the top twelve inches (12”) of sub-grade and each layer of backfill material at 95% of the materials maximum density at optimum moisture content as determined by the modified proctor test.

Lawn or Unpaved Areas

Compact the top six inches (6”) of sub-grade and each layer of backfill material at 85% maximum density for cohesive soils and 90% relative density for cohesionless soils.

Moisture Control

Where sub-grade and each layer of soil material must be moisture conditioned before compaction, uniformly apply water to surface of sub-grade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.

SP R.3 – HOT MIX ASPHALT PAVEMENT REMOVAL AND REPLACEMENT

This work shall consist of saw cutting, removing, and disposing of the existing roadway pavement and replacement with Hot Mix Asphalt pavement and aggregate base course in accordance with the IDOT Specifications, and as shown on the plan details. This work shall be performed after the successful completion of a proof roll.

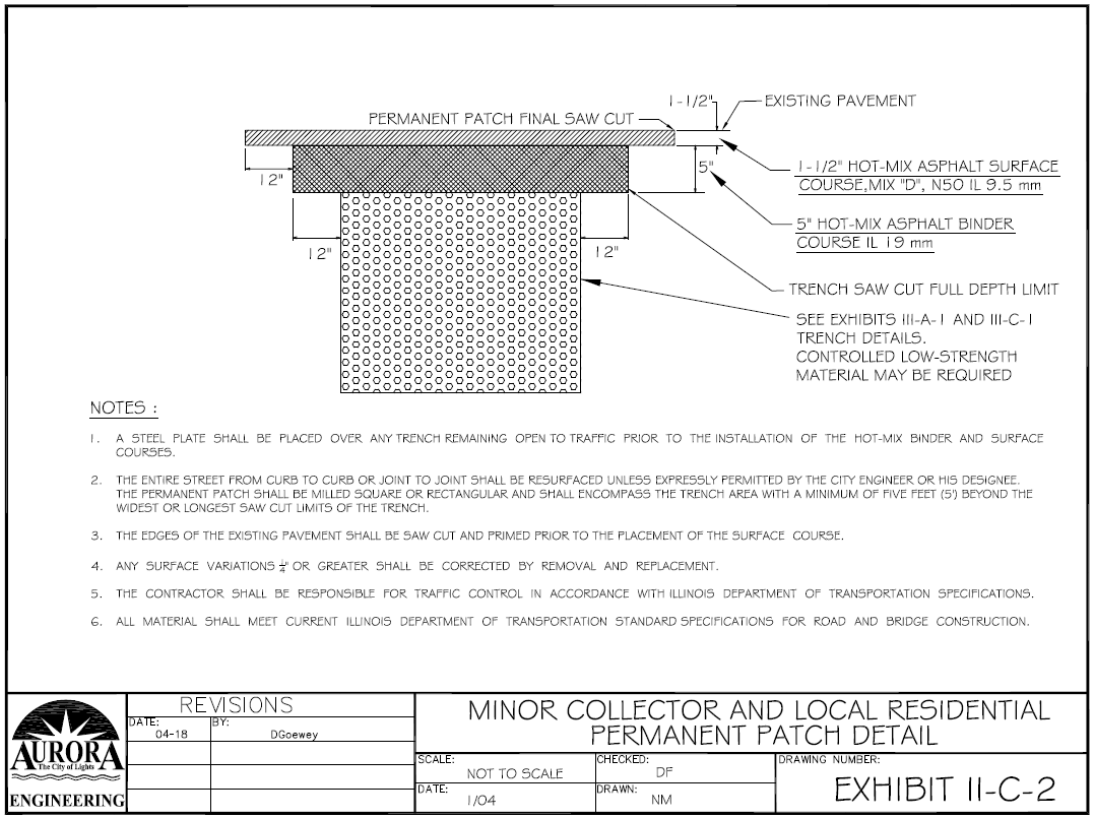
The cut faces of the existing pavement shall be primed in accordance with the IDOT Specifications.

Damages to existing pavement due to construction traffic and track machinery shall be repaired according to these specifications, to the limits dictated by the Engineer. The repair of damages to existing pavement due to construction traffic and track machinery shall **not** be paid for, but shall be fully repaired at the Contractor's expense.

Prior to the placement of any permanent pavement, the Contractor shall perform a proof roll in accordance with the latest addition of the IDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION.

Measurement and Payment

This work shall be paid for at the contract unit price per SQUARE YARD (SY) for CLASS D PATCHING of the thickness specified, which price shall be payment in full for all labor, materials including aggregate base, and equipment necessary to perform this work in accordance with the plans, details, and specifications.



SP R.10 – SEEDING - AURORA MIX: (THERE WILL NOT BE ANY SEEDING BEING PLACED WITHIN CN ROW DUE TO PROPOSED WATER MAIN BEING INSTALLED WITHIN THE PAVEMENT OF THE ROADWAY)

This work shall consist of re-establishing swales and ditch lines, furnishing and placing 6" of pulverized top soil, fine grading, fertilizer, sowing of "Aurora Mix" grass seed by hand raking, and installing loose straw mulch stabilized with hydraulic mulch at the locations designated by the Engineer in accordance with the applicable portions of Section 250 and 251 of the Standard Specifications for Road and Bridge Construction.

Fertilizer nutrients shall be applied to the prepared areas at a 9:18:9 ratio at a rate of 200 pounds per acre.

Aurora Mix:
The City of Aurora grass seed mixture consists of:
24.93% ASAP Perennial Ryegrass
24.46% Caddieshack Perennial Ryegrass
24.33% Goalkeeper Perennial Ryegrass
12.37% Geronimo Kentucky Bluegrass
12.29% Kentucky Bluegrass (variety not stated)
1.34% Inert Matter, 0.28% Crop, 0.00% weed

This mixture shall be sown in such a manner as to produce a growth of grass similar in quality and appearance to the grass of adjoining areas. Grass seed mix shall be proportioned by weight and planted at a minimum rate of eight (8) pounds per thousand (1,000) square feet. Seeds furnished shall be first grade in quality, high in germination, and free from weeds. Seed shall not be sown in high wind, foul weather conditions, or when ground conditions are not proper in the opinion of the Engineer.

Within twenty-four (24) hours from the time seeding has been performed, the seeded area shall be covered with loose straw mulch and immediately stabilized in accordance with Method 2, Procedure 2 of Article 251.03 of the Standard Specifications.

The Contractor shall notify the Engineer a minimum of 48 hours prior to performing any landscape restoration. The Contractor shall demonstrate to the Engineer seeding and fertilizer applications rates prior to performing this work. Documentation regarding seed mixtures and fertilizer concentrations shall be provided to the Engineer prior to performing this work. In the event that the Contractor fails to adhere to these requirements, the work shall not be eligible for payment.

This work shall not be considered complete until a mowable weed-free stand of grass is obtained.

Measurement and Payment: The work specified herein shall be paid for by the contract unit price per SQUARE YARD (SY) for SEEDING – AURORA MIX, which price shall be payment in full for all labor, materials, and equipment necessary, including pulverized top soil, loose straw mulch covered with hydraulic mulch, and all other appurtenances required to perform this work in accordance with the plans, details, and specifications.

City of Aurora

Law Department | Division of Risk Management
44 E Downer Pl | Aurora, IL 60507
Phone: (630) 256-3060 | Fax: (630) 256-3069 | Web: www.aurora-il.org

2023

City of Aurora Letter of Self-Insurance

You are hereby advised that the City of Aurora ("the City"), pursuant to Illinois Statues, Chapter 745 et. al., has been self-insured since October 1, 1976 for General Liability purposes. In addition, for workers compensation purposes, the City of Aurora has been self-insured since 1969. Thus, there is no commercial insurance certificate for submission.

The City of Aurora supplements its self-insurance program with commercially purchased excess liability insurance policies totaling $35,000,000 with a self-insured retention or deductible of $2,000,000.

Through its Division of Risk Management and Law Department, the City of Aurora responds to and defends all matters regarding any liability claims.

Please call Jennifer G. Jordan in the City's Law Department at (630) 256-3067 should you have any questions regarding this matter.

Sincerely,

Alex G. Alexandrou
Chief Management Officer
City of Aurora, Illinois

AGA/dl

Cc: Kurt Muth – Engineering Coordinator Public Works
Jason Bauer – Assistant Director of Public Works
Nadia Schweisthal – Engineering Technician I Public Works

rubino
ENGINEERING INC.

REPORT TRANSMITTAL

August 8, 2023

To: Nadia Schweisthal, PE CPII
City of Aurora
77 S. Broadway
Aurora, Illinois 60505
O: 630.256.3231
C: 630.720.0902

Re: **Geotechnical Engineering Services Report**
Keating Drive Water Main Installation
Keating Drive
Aurora, Illinois

Rubino Report No. G23.071

Via email: schweisthaln@aurora.il.us

Dear Ms. Schweisthal,

Rubino Engineering, Inc. (Rubino) is pleased to submit our Geotechnical Engineering Services Report for the proposed Keating Drive Water Main Installation in Aurora, Illinois.

Report Description

Enclosed is the Geotechnical Engineering Services Report including results of field and laboratory testing, as well as recommendations for utility installation and general site development.

Authorization and Correspondence History

- Rubino Proposal No. Q23.184g dated April 28, 2023; Signed and authorized by Jolene Coulter from City of Aurora on May 4, 2023.

Closing

Rubino appreciates the opportunity to provide geotechnical services for this project and we look forward to continued participation during the design and in future construction phases of this project.

If you have questions pertaining to this report, or if Rubino may be of further service, please contact our office at (847) 931-1555.

Respectfully submitted,
RUBINO ENGINEERING, INC.

Michelle A. Lipinski, PE
President

michelle.lipinski@rubinoeng.com

MAL/file/ Enclosures

Geotechnical Engineering Services Report

KEATING DRIVE WATER MAIN INSTALLATION

KEATING DRIVE

AURORA, ILLINOIS

RUBINO PROJECT NO. G23.071

Drilling
Laboratory Testing
Geotechnical Analysis

PREPARED BY:
JONATHAN IGNARSKI

rubino ENGINEERING INC.

_____
Michelle A. Lipinski, PE
President
IL No. 062-061241, Exp. 11/30/23

PREPARED FOR:

CITY OF AURORA

77 S. BROADWAY

AURORA, ILLINOIS 60505

AUGUST 8, 2023

TABLE OF CONTENTS

PROJECT INFORMATION

Rubino understands that the City of Aurora is planning to install at 16-inch water main along the north side of Keating Drive, west of Normantown Road in Aurora, Illinois. The water main will be installed at a depth of approximately 8 feet below existing grade underneath the CN railroad that runs north-south at the east end of the site. Rubino anticipates that the construction methodologies may include jack-and-bore (J & B), horizontal direction drilling (HDD), or open cut excavations.

Documents received:

- "Location Map-Keating Dr WM – RR" prepared by City of Aurora
- "Utility-Crossing-Encroachment-Application-Packet" prepared by CN Southern Region

Project Correspondence:

- RFP email from Nadia Schweisthal, PE of City of Aurora on April 13, 2023.

The geotechnical recommendations presented in this report are based on the available project information and the subsurface materials described in this report. If any of the information on which this report is based is incorrect, please inform Rubino in writing so that we may amend the recommendations presented in this report (if appropriate, and if desired by the client). Rubino will not be responsible for the implementation of our recommendations if we are not notified of changes in the project.

Purpose / Scope of Services

The purpose of this study was to explore the subsurface conditions at the site in order to prepare geotechnical recommendations for utility installation and general site development for the proposed construction. Rubino's scope of services included the following drilling program:

Table 1: Drilling Scope

NUMBER OF BORINGS	DEPTH (FEET BEG*)	LOCATION
2	30	See Boring Location Plan

*BEG = below existing grade

Representative soil samples obtained during the field exploration program were transported to the laboratory for additional classification and laboratory testing.

This report briefly outlines the following:

- *Summary of client-provided project information and report basis*
- *Overview of encountered subsurface conditions*
- *Overview of field and laboratory tests performed including results*
- *Geotechnical recommendations pertaining to:*
  - *Subgrade preparation and stability recommendations*
  - *Utility Installation and backfill recommendations*
  - *Trench box lateral earth pressures*
  - *Dewatering*
- *Construction considerations, including temporary excavation and construction control of water*

DRILLING, FIELD, AND LABORATORY TEST PROCEDURES

Rubino selected the number of borings and the boring depths. Rubino located the borings in the field by measuring distances from known fixed site features. The borings were advanced utilizing 2 ¼ inch inside-diameter, hollow stem auger drilling methods and soil samples were routinely obtained during the drilling process.

Selected soil samples were tested in the laboratory to determine material properties for this report. Drilling, sampling, and laboratory tests were accomplished in general accordance with ASTM procedures. The following items are further described in the Appendix of this report.

- *Field Penetration Tests and Split-Barrel Sampling of Soils (ASTM D1586)*
- *Field Water Level Measurements*

- *Laboratory Determination of Water (Moisture) Content of Soil by Mass (ASTM D2216)*
- *Laboratory Organic Content by Loss on Ignition (ASTM D2974)*

The laboratory testing program was conducted in general accordance with applicable ASTM specifications. The results of these tests are to be found on the accompanying boring logs located in the Appendix.

SUMMARY OF GEOTECHNICAL CONSIDERATIONS

The main geotechnical design and construction considerations at this site are:

- **Subgrade soils** generally consisted of undocumented fill, brown, black and/or gray silty clay, gray sand, and gray silt soils. See *Subsurface Conditions* and *Undocumented Fill Discussion* sections for more detailed information.
    - **Undocumented fill / black silty clay soils** were encountered above the proposed invert elevation. These soils may be problematic at the time of construction. See *Undocumented Fill Discussion*, *Trenchless Construction Alternatives*, *Utility Installation Recommendations* sections for more detailed information.
- **Free groundwater was observed** within the borings during drilling operations. See *Groundwater Conditions* section for more information.
- **Subgrade soils at proposed bearing elevations may be unsuitable** to support the proposed construction. See *Utility Installation Considerations* for more detailed information.
- **Internally Braced Trench Boxes, sheet pile, or shoring** will be needed to support the open cut excavations or receiving pits. See the *Open Trench and Trench Box Excavation Recommendations* and *Lateral Earth Pressures* sections for more information.
- **Trenchless alternatives such as Horizontal Directional Drilling (HDD) and Jack & Bore (J & B)** methods may be possible options at this site. See the *Trenchless Construction Alternatives* and *Utility Installation Considerations* sections for more information.

The geotechnical-related recommendations in this report are presented based on the subsurface conditions encountered and Rubino's understanding of the project. Should changes in the project criteria occur, a review must be made by Rubino to determine if modifications to our recommendations will be necessary.

SITE AND SUBSURFACE CONDITIONS

Site Location and Description

The project is located along Keating Drive between Middlebury Drive and Normantown Road in Aurora, Illinois.

The midpoint of the project site has an approximate latitude and longitude of 41.724948° and -88.237098°, respectively.

Surface Conditions

Borings were taken within existing paved areas and the surface conditions are as follows:

Table 2: Existing Pavement Section Summary

BORING NO.	TOTAL OBSERVED PAVEMENT THICKNESS	TOTAL OBSERVED SUB-BASE THICKNESS
B-01	6 INCHES OF ASPHALT	6 INCHES OF GRAVEL FILL
B-02	6 INCHES OF ASPHALT	6 INCHES OF GRAVEL FILL

Please note that the above referenced thicknesses are considered approximate and based on visual observations in the borehole. Pavement and sub-base type and thickness may vary between boring locations. More specific pavement thickness would need to be determined by obtaining a physical pavement core.

Subsurface Conditions

Beneath the existing surficial pavement and undocumented fill soils, subsurface conditions generally consisted of brown, black, and/or gray silty clay, gray sand, and gray silt.

- The **undocumented fill** soils were both granular and cohesive in nature
- The native **silty clay** soils were generally medium stiff to very stiff in consistency
- The native **silt** soils were generally medium stiff to stiff in consistency
- The **granular** soils were generally loose to medium dense in apparent density

Table 3: Subsurface Conditions Summary

DEPTH RANGE (FEET BEG*)	SOIL DESCRIPTION	SPT N-VALUES (BLOWS PER FOOT)	MOISTURE CONTENT (%)	ESTIMATED SHEAR STRENGTH
1 – 3 ½	FILL: gray sandy gravel *(B-02)*	27	5	---
1 – 6 ½	FILL: brown and black gravelly silty clay and silty clay, with gravel, concrete and brick pieces	3 – 15	15 – 23	---
6 - 8 ½	Black silty CLAY, trace sand and gravel *(B-02)* *Possible Buried Topsoil*	7	19 - 35	---

DEPTH RANGE (FEET BEG*)	SOIL DESCRIPTION	SPT N-VALUES (BLOWS PER FOOT)	MOISTURE CONTENT (%)	ESTIMATED SHEAR STRENGTH
8 ½ – 18 ½	Stiff to very stiff, brown and gray silty CLAY, trace sand and gravel	12 – 24	13 – 19	c = 1,500 – 3,600 psf
18 ½ - 28 ½	Loose to medium dense, gray poorly-graded SAND, trace gravel	9 – 25	16 – 27	ϕ = 29º – 35°
24 – 30	Medium stiff to stiff, gray SILT, trace sand and gravel	7 – 14	17 – 18	c = 560 – 1,120 psf

*BEG = Below existing grade

The native soils were visually classified as silty clay (CL), silt (ML), and poorly-graded sand (SP) according to the Unified Soil Classification System (USCS). The above table is a general summary of subsurface conditions. Please refer to the boring logs for more detailed information.

Estimated shear strength of clay soils is based on empirical correlations using N-values, moisture content, and unconfined compressive strength, as applicable.

Groundwater Conditions

Groundwater was encountered in the borings during drilling operations. The following table summarizes groundwater observations from the field:

Table 4: Groundwater Observation Summary

BORING NUMBER	GROUNDWATER LEVEL DURING DRILLING (FEET BEG*)	GROUNDWATER LEVEL UPON AUGER REMOVAL (FEET BEG*)
B-01	18 ½	15
B-02	23 ½	N/A

*BEG = below existing grade

It should be noted that fluctuations in the groundwater level should be anticipated throughout the year depending on variations in climatological conditions and other factors not apparent at the time the borings were performed. Additionally, discontinuous zones of perched water may exist within the soils. The possibility of groundwater level fluctuation should be considered when developing the design and construction plans for the project.

When bidding this project, the contractor should anticipate that groundwater will be present during excavation.

Undocumented Fill Discussion

Undocumented fill was observed in the borings to depths ranging from about 6 to 6 ½ feet below existing grade.

Undocumented fill is defined as fill that has been placed without being documented as to its placed density and moisture content.

Deleterious materials could include, but are not limited to, bricks, asphalt, concrete, metal, wood, or other building debris.

Deleterious materials, such as concrete and brick, were observed within the undocumented fill materials during the drilling operations. Deleterious materials could impede horizontal drilling equipment or excavation if encountered. Although deleterious materials were not encountered in all the undocumented fill materials, this does not eliminate the possibility that deleterious materials could be present within the undocumented fill materials at other locations along the project.

EVALUATION AND RECOMMENDATIONS

The geotechnical-related recommendations in this report are presented based on the subsurface conditions encountered and Rubino's understanding of the project. Should changes in the project criteria occur, a review must be made by Rubino to determine if modifications to our recommendations will be necessary.

Utility Installation Considerations

According to the information provided by the client, the proposed water main will bear at an approximate depth of 8 feet. Based on the findings in the borings in conjunction with the proposed depth, the soils encountered at the proposed invert depth in B-01 appear generally suitable for support of proposed water main. However, black silty clay (*possible buried topsoil*) in B-02 may have pockets of instability. In the event unstable or unsuitable soils (e.g., undocumented fill or black saturated silty clay) are encountered during open-cut installation, they should be removed and replaced with additional bedding stone for support.

Rubino recommends that the water main be supported by a granular bedding material similar to the gradation of an IDOT CA-07 stone. The thickness of the bedding material should be at least 6 inches.

The following geotechnical considerations should be taken into account when considering either trenching or trenchless techniques performed as part of this project:

Table 5: Geotechnical Considerations for Utility Installation

LOCATION	APPROXIMATE DEPTH RANGE (FEET)	SUBSURFACE CONSIDERATIONS
B-01 & B-02 (East & West of Railroad Tracks)	1 – 6 ½	UNDOCUMENTED FILL was observed at depths ranging from approximately 1 to 6 feet BEG. The gravel and deleterious debris may cause difficulty with HDD installation methods. If installed using open-cut methods, these soils may require an undercut and backfill replacement if encountered at the proposed invert elevations of the water main as determined by a representative of the engineer at the time of construction.
B-02 (West of Railroad Tracks)	6 ½ - 8 ½	Black silty CLAY *Possible Buried Topsoil* was observed at depths ranging from approximately 6 ½ to 8 ½ feet BEG. If installed using open-cut methods, these soils may require an undercut and backfill replacement if encountered at the proposed invert elevations of the water main as determined by a representative of the engineer at the time of construction.

Trench Box Excavation Recommendations

The undocumented fill in the upper 6 feet of B-01 and the undocumented fill / black silty clay soils in the upper 8 ½ feet of B-02 will likely need to be supported during open trench excavation and bore pits for trenchless alternatives.

Excavation for trenches and bore pits shall be performed in accordance with OSHA regulations as stated in 29 CFR Part 1926. Within those regulations, OSHA created a classification of soils in decreasing order of stability. According to the OSHA classification method of soils, Rubino expects that the soils located at the proposed excavation locations for the water main would classify as Type A, Type B, and Type C soils. The soil profile consisted of mainly silty clay overlying sand and silt.

Trench boxes should be used throughout the installation of the proposed water main, and lateral earth pressures should be considered for the excavations. In addition, lateral earth pressures should be considered for the support of connection point pit excavations (sheet pile walls or shoring).

Trenchless Construction Alternatives – HDD and Jack & Bore

Horizontal Directional Drilling (HDD) and Jack & Bore (J & B) methods are typically used when trenching or open excavation is not practical, such as water crossings, road/railway crossings, or in other sensitive crossings.

HDD and Jack & Bore methods are compatible with a wide range of soil conditions. However, deleterious materials in existing fill, very loose, soft, squeezing, collapsible, or flowing soils that are not self-supporting and highly permeable, large-grained cohesionless soils (cobbles or boulders) and fractured rock are problematic for HDD. These problematic soils could present some difficulties related to bore stability, settlement, and inadvertent drilling fluid returns, depending on the type of soil.

Some of the problematic soils listed above, such as deleterious materials in existing fill and silty clay soils that are not self-supporting, were observed within the borings taken on the project site and therefore HDD may not be a possibility. Please consult a qualified contractor to discuss means and methods.

Utility Installation and Backfill Recommendations

If granular material is used for the backfill of the utility trench, the **granular material should have a gradation that will filter protect the backfill material from the adjacent soils**. If this gradation is not available, a geosynthetic non-woven filter fabric should be used to reduce the potential for the migration of fines into the backfill material. Granular backfill material shall be compacted to meet the above compaction criteria.

Structural fill placed in utility trenches shall be evaluated in accordance with the following table:

MATERIAL TESTED	PROCTOR TYPE*-1	MIN % DRY DENSITY	PLACEMENT MOISTURE CONTENT RANGE	FREQUENCY OF TESTING*-2	MAXIMUM LOOSE LIFT HEIGHT
Utility Trench Backfill	Standard	95%	-2 to +2 %	1 per 200 LF of fill placed	4 – 6 inches

*-1 The test frequency for the laboratory reference shall be one laboratory Proctor test for each material used on the site. If the borrow or source of fill material changes, a new reference moisture/density test should be performed.

*-2A minimum of one test per lift is recommended unless otherwise specified.

In general, utility trench backfill materials should:

- Have a Standard Proctor maximum dry density greater than 100 pcf
- Be free of organic or other deleterious materials
- Have a maximum particle size no greater than 3 inches

- Each lift of compacted, engineered fill should be tested and documented by a representative of the geotechnical engineer prior to placement of subsequent lifts
- Soils classified as GP, GW, SP, and SW will generally be suitable for use as utility trench backfill.
- Soils classified as CL, ML, SC, SM, OL, OH, MH, CH, and PT should be considered unsuitable.
- If water must be added, it should be uniformly applied and thoroughly mixed into the soil

Tested fill materials that do not achieve either the required dry density or moisture content range shall be recorded, the location noted, and reported to the Contractor and Owner. A re-test of that area should be performed after the Contractor performs remedial measures. The above test frequencies should be discussed with the contractor prior to starting the work.

The geotechnical engineer of record can only certify work that was performed under their direct observation, or under the observation of a competent person under their specific direction.

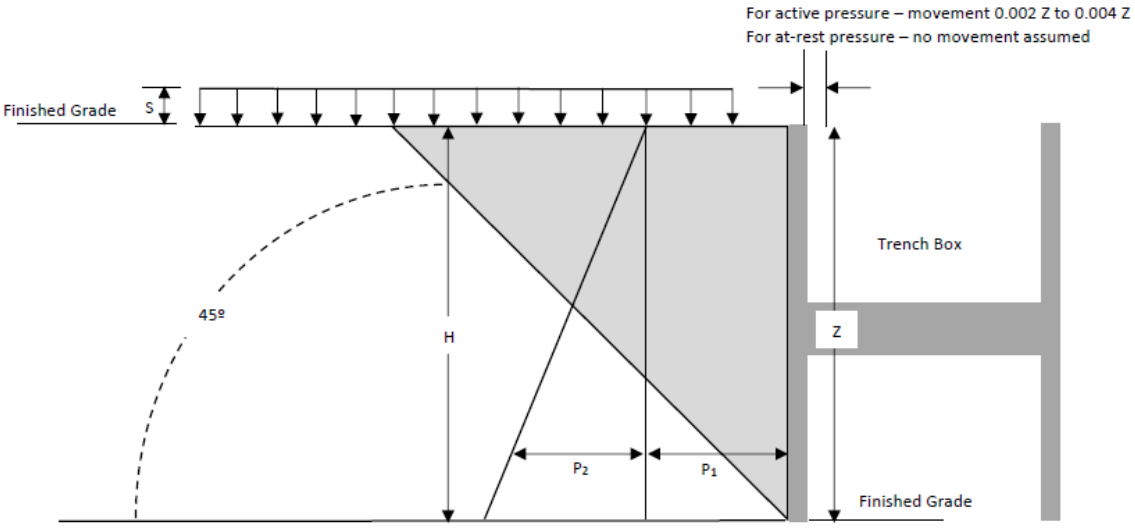
Lateral Earth Pressures

Lateral earth pressures will be influenced by the conditions of wall or support restraint, methods of construction and/or compaction and the strength of the materials being restrained.

Lateral earth pressure is developed from the soils present within a wedge formed by the vertical below-grade wall and an imaginary line extending up and away from the bottom of the wall at an approximate 45° angle.

The lateral earth pressures are determined by multiplying the vertical applied pressure by the appropriate lateral earth pressure coefficient K. Rubino recommends designing the bracing for the temporary excavation for the water main for the “at-rest” lateral earth pressure condition using K_o.

Earth Pressure Coefficients



The following table provides the recommended "at-rest" lateral earth pressure coefficients for the soils encountered. Also included are the "active" and "passive" lateral earth pressure coefficients if needed.

Table 6: "K-Factor" Lateral Earth Pressures

DEPTH RANGE (FEET BEG*)	SOIL TYPE	ESTIMATED TOTAL UNIT WEIGHT (LB/FT^3)	FRICTION ANGLE (DEG)	K_O	K_A
1 - 6	Undocumented FILL	115 - 130	24º	0.59	0.42
6 – 21	Silty CLAY	120 – 130	26°	0.56	0.39
18 ½ - 28 ½	SAND	125 – 130	29°	0.50	0.33
24 – 30	SILT	120 – 130	28°	0.53	0.36

*BEG = below existing grade

The following equations were used to calculate the earth pressure coefficients "k".

At-Rest:	$k_o = 1 - \sin\phi$	If the walls are rigidly attached to the structure and not free to rotate or deflect at the top such as shallow tunnels
Active:	$k_a = \tan^2(45 - \frac{\phi}{2})$	Walls that are permitted to rotate and deflect at the top

Conditions applicable to the above conditions include:

- For active earth pressure, wall must rotate about base, with top lateral movements 0.002Z to 0.004Z, where Z is the wall height
- For passive earth pressure, wall must move horizontally to mobilize resistance
- Uniform surcharge, where S is surcharge pressure
- Hydrostatic Pressure designed to elevations as recommended herein
- No safety factor included

Dewatering Recommendations

Dewatering may be necessary during excavation of soils due to the presence of groundwater at the site. Other factors that may affect dewatering are; precipitation, surficial runoff, and the presence of sand seams or other conditions not apparent at the time of drilling. Shoring or trench boxes may be required where the soils are granular, saturated, or have low shear strengths.

Please reference the anticipated groundwater levels on the attached boring logs and in the *Groundwater Conditions* section of this report.

Recommendations for Additional Testing

During construction, Rubino recommends that one of our representatives be onsite for typical **observations and documentation** of exposed subgrade for trench excavation, including penetrometer testing and trench backfill compaction testing, as necessary.

CLOSING

The recommendations submitted are based on the available subsurface information obtained by Rubino Engineering, Inc. and design details furnished by City of Aurora for the proposed project. If there are any revisions to the plans for this project or if deviations from the subsurface conditions noted in this report are encountered during construction, Rubino should be notified immediately to determine if changes in the recommendations are required. If Rubino is not retained to perform these functions, we will not be responsible for the impact of those conditions on the project.

The scope of services did not include an environmental assessment to determine the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, groundwater or air on, below, or around this site. Any statements in this report and/or on the boring logs regarding odors, colors, and/or unusual or suspicious items or conditions are strictly for informational purposes.

After the plans and specifications are more complete, the geotechnical engineer should be retained and provided the opportunity to review the final design plans and specifications to check that our engineering recommendations have been properly incorporated into the design documents. At this time, it may be necessary to submit supplementary recommendations. This report has been prepared for the exclusive use of City of Aurora and their consultants for the specific application to the proposed Keating Drive Water Main Installation in Aurora, Illinois.

Appendix A – Drilling, Field, and Laboratory Test Procedures

ASTM D1586 Penetration Tests and Split-Barrel Sampling of Soils

During the sampling procedure, Standard Penetration Tests (SPT's) were performed at regular intervals to obtain the standard penetration (N-value) of the soil. The results of the standard penetration test are used to estimate the relative strength and compressibility of the soil profile components through empirical correlations to the soils' relative density and consistency. The split-barrel sampler obtains a soil sample for classification purposes and laboratory testing, as appropriate for the type of soil obtained.

Water Level Measurements

Water level observations were attempted during and upon completion of the drilling operation using a 100-foot tape measure. The depths of observed water levels in the boreholes are noted on the boring logs presented in the appendix of this report. In the borings where water is unable to be observed during the field activities, in relatively impervious soils, the accurate determination of the groundwater elevation may not be possible even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table and volumes of water will depend on the permeability of the soils.

Ground Surface Elevations

At this time, no site-specific elevations were available to Rubino. The depths indicated on the attached boring logs are relative to the existing ground surface for each individual boring at the time of the exploration. Copies of the boring logs are located in the Appendix of this report.

ASTM D2216 Water (Moisture) Content of Soil by Mass (Laboratory)

The water content is an important index property used in expressing the phase relationship of solids, water, and air in a given volume of material and can be used to correlate soil behavior with its index properties. In fine grained cohesive soils, the behavior of a given soil type often depends on its natural water content. The water content of a cohesive soil along with its liquid and plastic limits as determined by Atterberg Limit testing are used to express the soil's relative consistency or liquidity index.

ASTM D2974 Standard Test Method for Organic Soils using Loss on Ignition (Laboratory)

These test methods cover the measurement of moisture content, ash content, and organic matter in peats and other organic soils, such as organic clays, silts, and mucks. Ash content of a peat or organic soil sample is determined by igniting the oven-dried sample from the moisture content determination in a muffle furnace at 440°C (Method C) or 750°C (Method D). The substance remaining after ignition is the ash. The ash content is expressed as a percentage of the mass of the oven-dried sample. 2.4 Organic matter is determined by subtracting percent ash content from 100.

Appendix B – Report Limitations

Subsurface Conditions:

The subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in the appendix should be reviewed for specific information at individual boring locations. These records include soil descriptions, stratifications, penetration resistances, locations of the samples and laboratory test data as well as water level information. The stratifications shown on the boring logs represent the conditions only at the actual boring locations. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition between layers may be gradual. The samples, which were not altered by laboratory testing, will be retained for up to 60 days from the date of this report and then will be discarded.

Geotechnical Risk:

The concept of risk is an important aspect of the geotechnical evaluation. The primary reason for this is that the analytical methods used to develop geotechnical recommendations do not comprise an exact science. The analytical tools that geotechnical engineers use are generally empirical and must be used in conjunction with engineering judgment and experience. Therefore, the solutions and recommendations presented in the geotechnical evaluation should not be considered risk-free, and more importantly, are not a guarantee that the interaction between the soils and the proposed structure will perform as planned. The engineering recommendations, presented in the preceding section, constitute Rubino's professional estimate of the necessary measures for the proposed structure to perform according to the proposed design based on the information generated and reference during this evaluation, and Rubino's experience in working with these conditions.

Warranty:

The geotechnical engineer warrants that the findings, recommendations, specifications, or professional advice contained herein have been made in accordance with generally accepted professional geotechnical engineering practices in the local area. No other warranties are implied or expressed.

Federal Excavation Regulations:

In Federal Register, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, part 1926, Subpart P". This document was issued to better ensure the safety of workmen entering trenches or excavations. This federal regulation mandates that all excavations, whether they be utility trenches, basement excavation or footing excavations, be constructed in accordance with the new OSHA guidelines. It is our understanding that these regulations are being strictly enforced and if they are not closely followed, the owner and the contractor could be liable for substantial penalties.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor's "responsible person," as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. Rubino is providing this information solely as a service to our client. Rubino is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

Appendix C – Soil Classification General Notes

DRILLING & SAMPLING SYMBOLS:

SS:	Split Spoon - 1 3/8" I.D., 2" O.D., unless otherwise noted	PS:	Piston Sample
ST:	Thin-Walled Tube - 3" O.D., Unless otherwise noted	WS:	Wash Sample
PM:	Pressuremeter	HA:	Hand Auger
RB:	Rock Bit	HS:	Hollow Stem Auger
DB:	Diamond Bit - 4", N, B	BS:	Bulk Sample

Standard "N" Penetration: Blows per foot of a 140-pound hammer falling 30 inches on a 2-inch O.D. split spoon sampler (SS), except where noted.

WATER LEVEL MEASUREMENT SYMBOLS:
Water levels indicated on the boring logs are the levels measured in the borings at the times indicated. In pervious soils, the indicated levels may reflect the location of groundwater. In low permeability soils, the accurate determination of ground water levels is not possible with only short-term observations.

DESCRIPTIVE SOIL CLASSIFICATION:
Soil Classification is based on the Unified Soil Classification System as defined in ASTM D-2487 and D-2488. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; they are described as: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are described as: clays, if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse grained soils are defined on the basis of their relative in-place density and fine-grained soils on the basis of their consistency. Example: Lean clay with sand, trace gravel, stiff (CL); silty sand, trace gravel, medium dense (SM).

CONSISTENCY OF FINE-GRAINED SOILS:

Unconfined Compressive Strength, Qu (tsf)			N-Blows/ft.			Consistency
	<	0.25	< 2			Very Soft
0.25	-	0.5	2	-	4	Soft
0.5	-	1	4	-	8	Medium Stiff
1	-	2	8	-	15	Stiff
2	-	4	15	-	30	Very Stiff
4	-	8	30	-	50	Hard
>	-	8	> 50			Very Hard

RELATIVE DENSITY OF COARSE-GRAINED SOILS

N-Blows/ft.			Relative Density
0	-	3	Very Loose
4	-	9	Loose
10	-	29	Medium Dense
30	-	49	Dense
50	-	80	Very Dense
		80+	Extremely Dense

RELATIVE PROPORTIONS OF SAND & GRAVEL

Descriptive Term	% of Dry Weight		
Trace		<	15
With	15	-	29
Modifier		>	30

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% of Dry Weight		
Trace		<	5
With	5	-	12
Modifier		>	12

*Descriptive Terms apply to components also present in sample

GRAIN SIZE TERMINOLOGY

Major Component	Size Range
Boulders	Over 12 in. (300mm)
Cobbles	12 in. To 3 in. (300mm to 75mm)
Gravel	3 in. To #4 sieve (75mm to 4.75mm)
Sand	#4 to #200 sieve (4.75mm to 0.75mm)

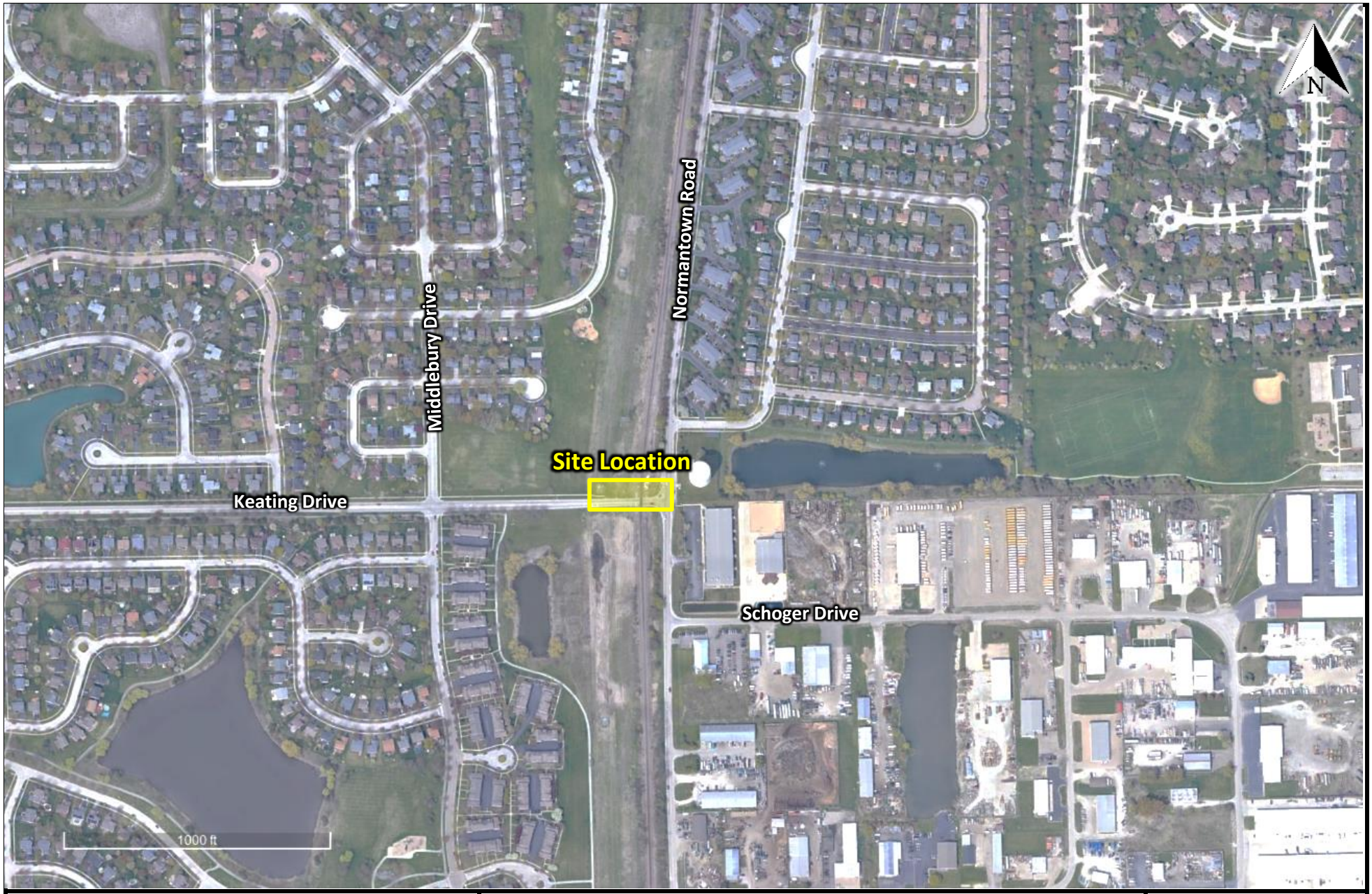
Appendix D – Soil Classification Chart

SOIL CLASSIFICATION CHART

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

MAJOR DIVISIONS			SYMBOLS: GRAPH	SYMBOLS: LETTER	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS — MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS — MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS — MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, 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 SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

Appendix E – Site Vicinity Map & Boring Location Plan



rubino ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

Project Name:	**Keating Drive Water Main Installation**
Project Location:	Keating Drive and Railroad Tracks Aurora, Illinois
Client:	**City of Aurora**
Rubino Project # :	G23.071

Site Vicinity Map

rubino ENGINEERING INC.

425 Shepard Drive
Elgin, Illinois 60123

Project Name:	**Keating Drive Water Main Installation**
Project Location:	Keating Drive and Railroad Tracks Aurora, Illinois
Client:	**City of Aurora**
Rubino Project # :	G23.071

Boring Location Plan

Appendix F – Borings Logs

Rubino Engineering, Inc.
425 Shepard Drive
Elgin, IL 60123
Telephone: 847-931-1555
Fax: 847-931-1560

LOG OF BORING B-01

Rubino Job No.: G23.071
Project: Keating Drive Water Main Installation
Location: Keating Drive
City, State: Aurora, Illinois
Client: City of Aurora

Drilling Method: 2 ¼ Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: Automatic
Boring Location: WB lane of Keating Drive, east of railroad tracks

WATER LEVELS***
While Drilling 18.5 ft
Upon Completion 15 ft
Delay N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	Classification	SPT Blows per 6-inch	Moisture, %	Additional Remarks
	0			1	18	Approximately 6 inches of ASPHALT Approximately 6 inches of GRAVEL FILL FILL: black gravelly silty clay, with concrete and brick		6-5-10 N=15	19	
				2	16			1-1-2 N=3	23	Qp=1.5 tsf
	5			3	10	Medium stiff to stiff, brown and gray silty CLAY, trace sand and gravel		3-3-4 N=7	19	Qp=3.3 tsf
				4	8		CL	4-5-7 N=12	19	Qp=2.8 tsf
	10			5	18	Very stiff, brown and gray silty CLAY, trace sand and gravel		8-10-14 N=24	16	>> Qp=4.5 tsf
				6	18			8-9-12 N=21	16	
	15						CL			
				7	18	Loose, gray poorly-graded SAND, trace gravel		4-5-4 N=9	27	2% Organic Content
	20						SP			
				8	18	Medium stiff to stiff, gray SILT, trace sand and gravel		4-3-4 N=7	18	Qp=1.3 tsf
	25						ML			
				9	18			4-5-6 N=11	17	Qp=2.8 tsf
	30					End of boring at approximately 30 feet below existing grade.				

STANDARD PENETRATION TEST DATA
Moisture, PL, LL
0 25 50
STRENGTH, tsf
Qu (Rimac) Qp/Qr
0 2.0 4.0

Completion Depth: 30.0 ft
Date Boring Started: 5/30/23
Date Boring Completed: 5/30/23
Logged By: J.K.
Drilling Contractor: Rubino Engineering, Inc.

Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Pressuremeter
Shelby Tube
Grab Sample
No Recovery

Latitude: 41.7249528
Longitude: -88.2354974
Drill Rig: Geoprobe 3126GT
Remarks: Hole collapse at ~16 ft BEG
Log Entry: J. Ignarski
Checked By: J. Ignarski

The stratification lines represent approximate boundaries. The transition may be gradual.
***Please reference the geotechnical report text for specific groundwater / dewatering recommendations.

Rubino Engineering, Inc.
425 Shepard Drive
Elgin, IL 60123
Telephone: 847-931-1555
Fax: 847-931-1560

LOG OF BORING B-02

Rubino Job No.: G23.071
Project: Keating Drive Water Main Installation
Location: Keating Drive
City, State: Aurora, Illinois
Client: City of Aurora

Drilling Method: 2 ¼ Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: Automatic
Boring Location: WB lane of Keating Drive, west of railroad tracks

WATER LEVELS***
While Drilling 23.5 ft
Upon Completion N/A
Delay N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	Classification	SPT Blows per 6-inch	Moisture, %	Additional Remarks
	0					Approximately 6 inches of ASPHALT				
				1	18	Approximately 6 inches of GRAVEL FILL *Fabric observed directly below gravel* FILL: gray sandy gravel		8-15-12 N=27	5	
				2	0	FILL: brown silty clay, with gravel *No recovery. Soils classified from auger cuttings*		7-5-5 N=10	15	
	5			3	16	Black silty CLAY, trace sand and gravel *Possible Buried Topsoil*	CL	2-2-5 N=7	35	Qp=1.3 tsf 7% Organic Content
				4	16	Stiff to very stiff, brown and gray silty CLAY, trace sand and gravel		6-5-8 N=13	17	>> Qp=4.5 tsf
	10			5	15			7-8-11 N=19	15	>> Qp=4.5 tsf
				6	18			5-7-10 N=17	17	>> Qp=4.5 tsf
	15						CL			
				7	18	*Color transitions from brown to gray at approximately 19 feet BEG*		4-5-11 N=16	13	>> Qp=4.5 tsf
	20			8	18	Medium dense, gray poorly-graded SAND, trace gravel *Heaving/Blow-in sands. N-values may be elevated.*	SP	9-10-15 N=25	16	
	25			9	12	Stiff, gray SILT, trace sand and gravel	ML	7-5-9 N=14	17	Qp=3.3 tsf
	30					End of boring at approximately 30 feet below existing grade.				

STANDARD PENETRATION TEST DATA
Moisture, PL, LL (0, 25, 50)
STRENGTH, tsf: Qu (Rimac), Qp/Qr (0, 2.0, 4.0)

Completion Depth: 30.0 ft
Date Boring Started: 5/30/23
Date Boring Completed: 5/30/23
Logged By: J.K.
Drilling Contractor: Rubino Engineering, Inc.

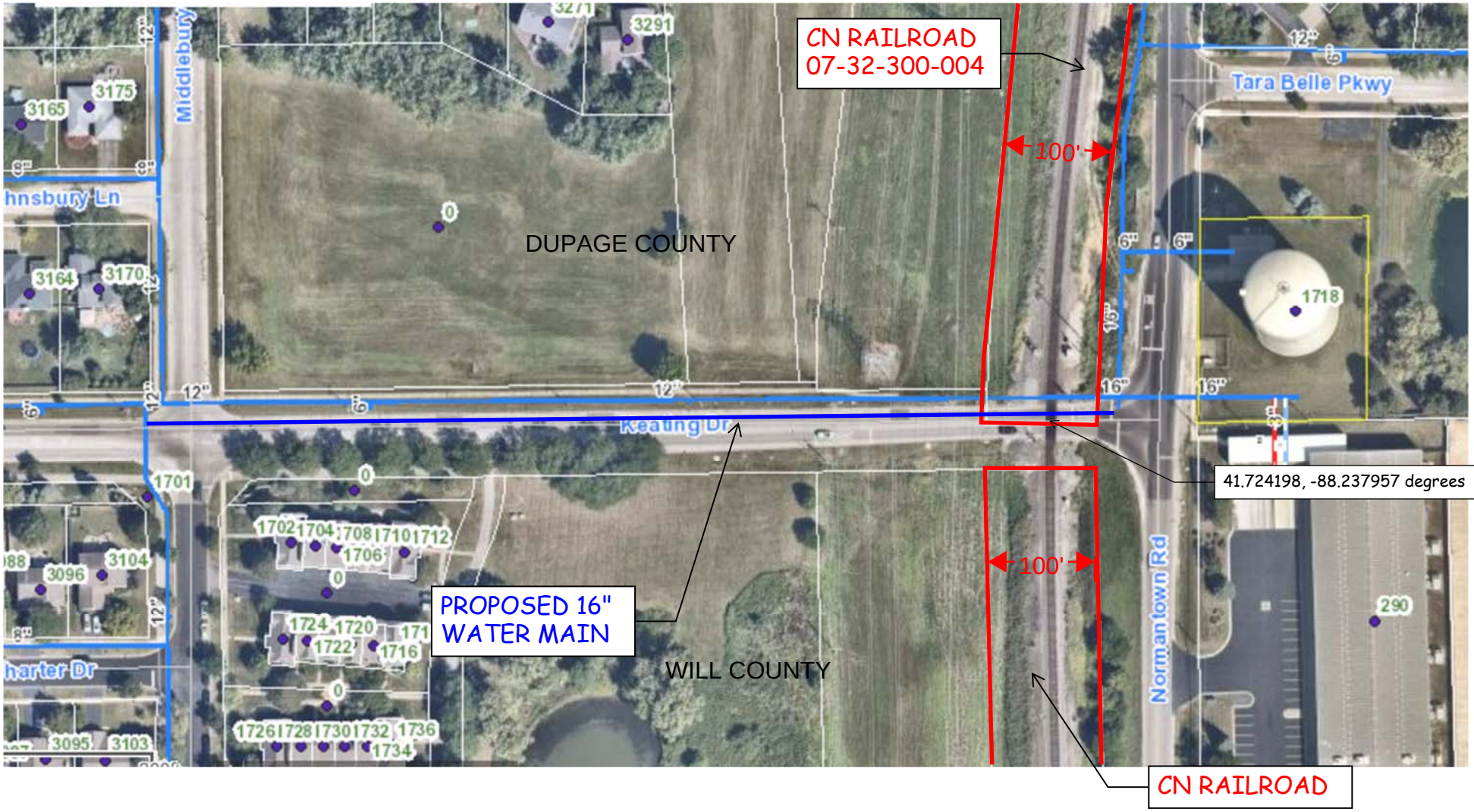
Sample Types:
Auger Cutting
Split-Spoon
Rock Core
Pressuremeter
Shelby Tube
Grab Sample
No Recovery

Latitude: 41.7249247
Longitude: -88.2358689
Drill Rig: Geoprobe 3126GT
Remarks: Hole collapse at ~16 ft BEG
Log Entry: J. Ignarski
Checked By: J. Ignarski

The stratification lines represent approximate boundaries. The transition may be gradual.
***Please reference the geotechnical report text for specific groundwater / dewatering recommendations.

Keating Drive – Historical Aerial (1939)

KEATING DRIVE
WATER MAIN IMPROVEMENTS
LOCATION MAP AURORA, IL



TRACK MONITORING

Description

This work shall consist of developing and implementing a Track Monitoring Program to provide pre-construction and post-construction track surveys and daily monitoring of the WCL Railroad tracks for vertical and horizontal movements during all operations that may impact the existing railroad embankment. These operations shall include, but not be limited to:

1. Installation and removal of all TEMPORARY SOIL RETENTION SYSTEM (SPECIAL)
2. All backfilling operations

The Track Monitoring Program shall adhere to all guidelines and restrictions as set forth by the WCL Railroad. No construction activities impacting the existing WCL Railroad embankment shall be permitted prior to approval of the Track Monitoring Program by the Engineer and the WCL Railroad.

Submittals

A Track Monitoring Program to be implemented by the Contractor shall be prepared and sealed by a Professional Engineer licensed in the state of Illinois who is experienced in this type of construction and shall be submitted to the WCL Railroad and the Engineer for approval prior to the start of any survey work.

As part of the Track Monitoring Program, the following submittals, at a minimum, shall be provided to the Engineer and WCL Railroad:

1. Pre-Construction survey report
2. Post-Construction survey report
3. Weekly track condition reports
4. Contingency Plan

The Track Monitoring Program must be submitted for review at least 30 days before commencement of construction activities impacting the existing railroad embankment.

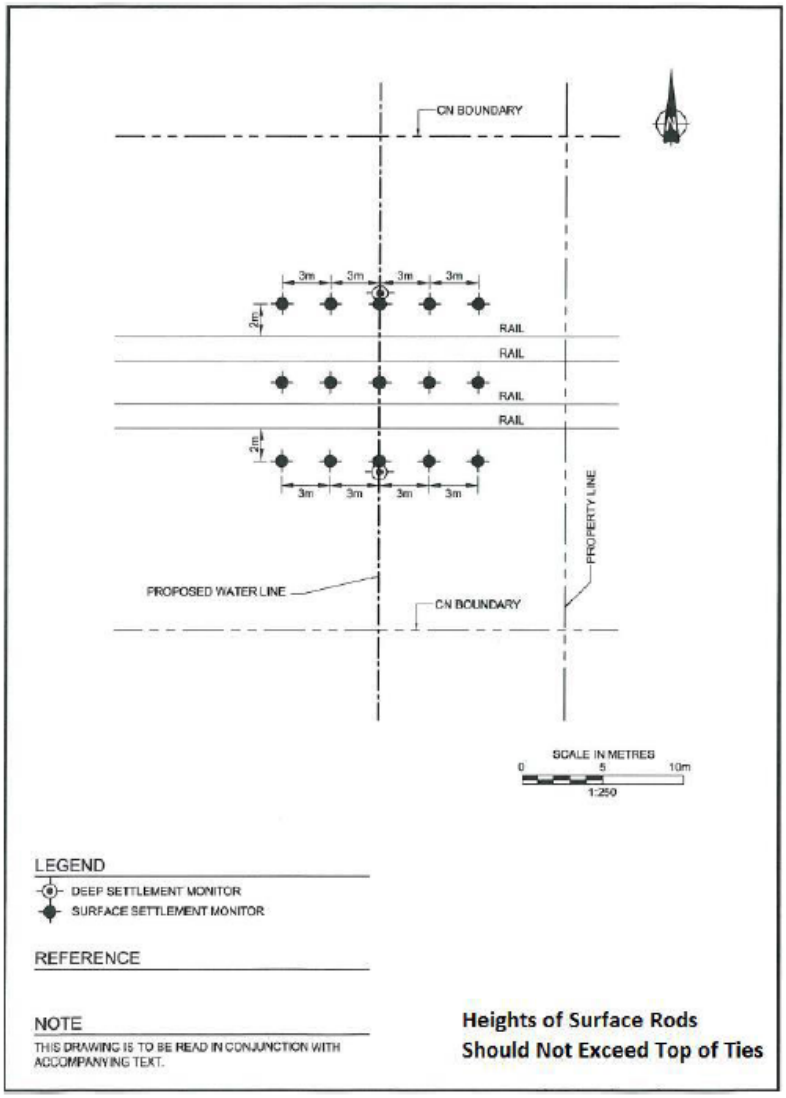
Construction

Prior to the start of any work on the WCL Railroad's right-of-way, the Contractor shall meet with the WCL Railroad Representative to determine their requirements for flaggers and all other necessary items related to the work activities on, over and next to the WCL Railroad facilities.

A pre-construction track survey and inspection shall be performed prior to any construction operations taking place which shall consist of the Contractor establishing a horizontal baseline and track elevations. The following track monitoring criteria, at a minimum, shall be met:

1. Each rail shall be monitored 20' north and 20' south of the proposed water main.
2. Establish at least ten (10) monitoring points and two (2) deep settlement monitoring points. See image below:

A-1. **Monitoring Points Requirements**



3. Baseline values shall be set a week prior to the construction of the TEMPORARY SOIL RETENTION SYSTEM (SPECIAL), or any alternate construction activity impacting the railroad embankment that may proceed earth retention elements.
4. Monitor horizontal and vertical ground and track displacements at least three (3) times daily for the first week and at least once daily thereafter. During Temporary Soil Retention System installation, ground displacements shall be monitored on a near continuous basis using a remote monitoring system capable of provided real-time data. Continue monitoring for at least two weeks after the completion of the construction operation.
5. The WCL Railroad shall be notified of any movement noticed during track monitoring, even when below the 1/8” threshold value. The Contractor’s Contingency Plan shall be enacted when movements reach the 1/8” threshold value.
6. If ground surface displacements are still occurring after two weeks, continue monitoring up to another four weeks until the displacement stabilizes, or as directed by the WCL Railroad or the Engineer.

The Contingency Plan shall be implemented if the track displacements exceed the threshold (1/8") movement value. Construction activities must be discontinued if track movements exceed the ¼" shutdown value as established by the pre-construction track survey. Permissible mitigation measures to correct excessive movement of the tracks may include, but are not limited to:

1. Compaction grouting through the embankment to raise the grade
2. Coordination with the WCL Railroad to re-level the tracks affected. Track re-leveling would be done by WCL Railroad forces at their earliest convenience.

Any mitigation measures shall be the responsibility of the Contractor, performed at the Contractor's expense prior to resuming construction operations. Construction shall not resume until mitigation measures are satisfactory to the WCL Railroad.

The Track Monitoring Program shall utilize a remote monitoring system that does not require fouling of the tracks to take the survey readings; fouling the tracks to survey movement is not acceptable other than to place any track monitoring targets. Monitoring targets should be placed such that monitoring is possible when a train is present. However, monitoring during the passing of a train is not required. The same targets should be maintained throughout the duration of the Track Monitoring Program. Targets should be removed once the monitoring phase is completed.

Track conditions shall be documented and tabulated for weekly submittal to the WCL Railroad and the Engineer.

The Contractor shall complete a post-construction track survey and inspection after completion of the operation. The post-construction track survey shall consist of the Contractor surveying the same points taken during the pre-construction track survey, taking horizontal and vertical measurements, for a period of fourteen (14) consecutive calendar days and as accepted by the WCL Railroad and the Engineer. If multiple operations are on-going concurrently, the post-construction track survey shall be performed based off the operation that is completed last. All pre-construction and post-construction track survey work shall be included in the cost of the daily track monitoring.

Method of Measurement

The track monitoring will be measured for payment per calendar day until the post-construction track survey is completed. Additional track monitoring that extends beyond the post-construction track survey due to continued ground surface displacements will not be measured for payment.

Basis of Payment

This work will be paid for at the contract unit price per calendar day for TRACK MONITORING.