



Line 5 Wisconsin Segment Relocation Project

Ashland, Bayfield, Douglas, and Iron Counties Wisconsin

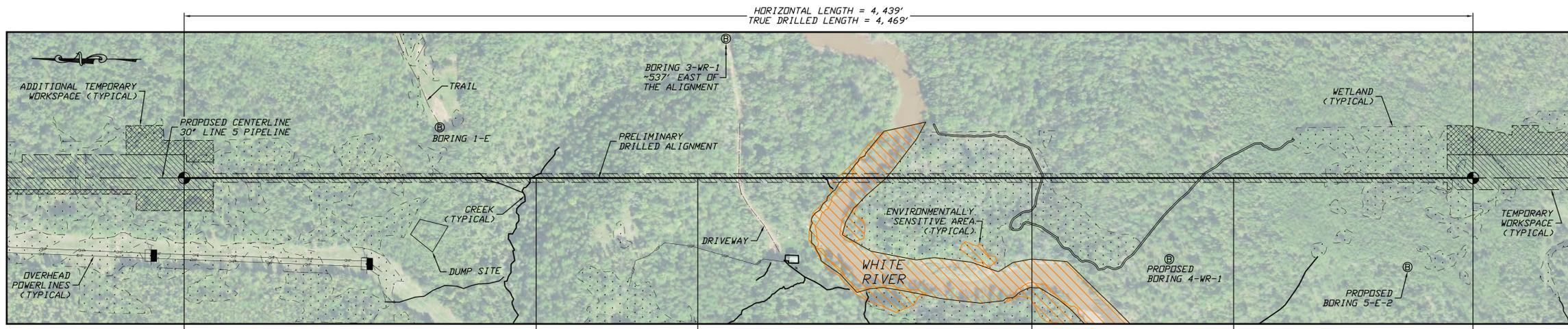
Water Resources Application for Project Permits

Environmental Impact Report

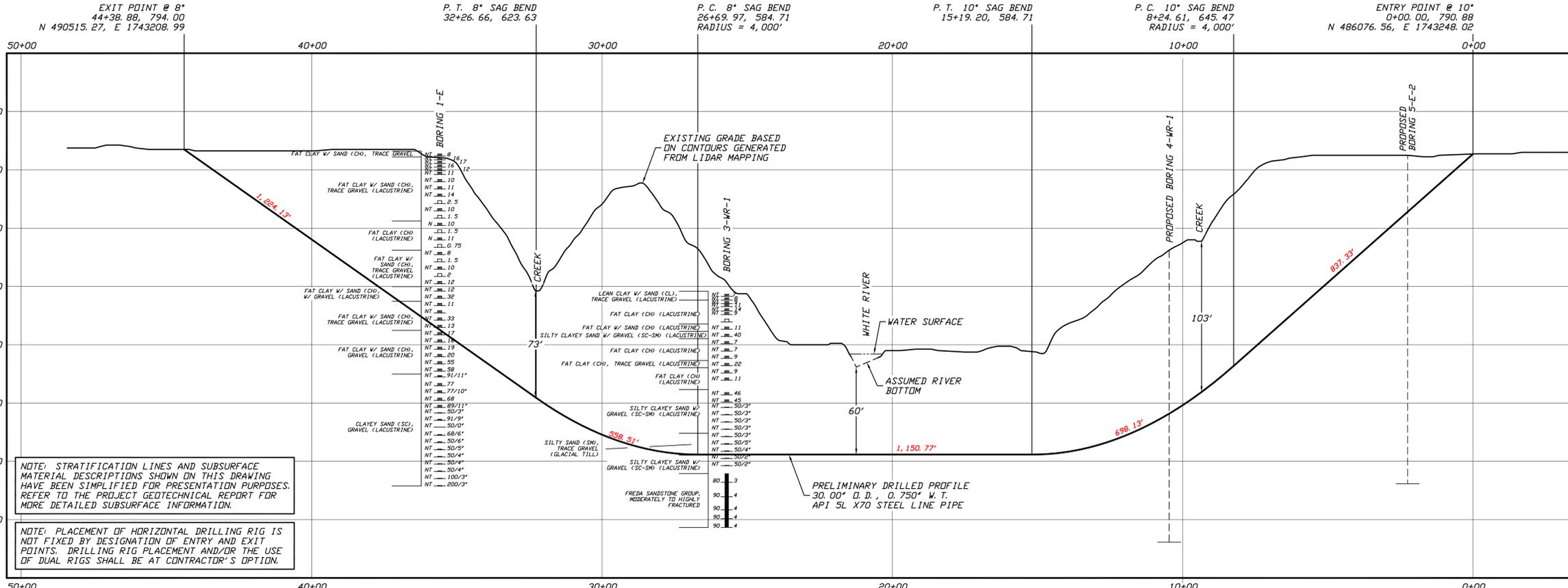
Revised August 2020

EIR Attachment M

HDD and Direct Pipe Site-Specific Drawings



PLAN
SCALE: 1"=200'



PROFILE
SCALE: 1"=200' HORIZONTAL
1"= 40' VERTICAL

- GENERAL LEGEND**
- DRILLED PATH ENTRY/EXIT POINT
- GEOTECHNICAL LEGEND**
- ⊙ BORING LOCATION
 - ⊕ THIN WALL SAMPLE
 - ⊖ SPLIT SPOON SAMPLE
 - ⊞ 1.5 — COMPRESSIVE STRENGTH (TSF)
 - ⊞ 23 — PENETRATION RESISTANCE IN BLDWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
 - ⊞ PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
 - ⊞ CORE BARREL SAMPLE
 - ⊞ UCS 6,250 — UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - ⊞ 53 — MOHS HARDNESS
 - ⊞ — ROCK QUALITY DESIGNATION (PERCENT)
- GEOTECHNICAL NOTES**
- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE PRELIMINARY BORING LOGS DATED MAY AND JULY 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
 - THE LETTER 'N' TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS 'NT' INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
 - THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.
- TOPOGRAPHIC SURVEY NOTES**
- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
 - NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
 - ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.
- DRILLED PATH NOTES**
- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
 - DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.
- PILOT HOLE TOLERANCES**
- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
- ENTRY POINT: AS STAKED BY COMPANY
 - EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 - ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)
- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 4 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF THE WHITE RIVER
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN

DATE	CHECKED	APPROVED	SCALE	DRAWING LABEL	REVISION
01/15/20	KWW	JSP	SHOWN FOR D-SIZED PLOT	WHITE RIVER	P1

DRAWN: DMP
DATE: 01/15/20
CHECKED: KWW
APPROVED: JSP
SCALE: SHOWN FOR D-SIZED PLOT
DRAWING LABEL: WHITE RIVER
REVISION: P1

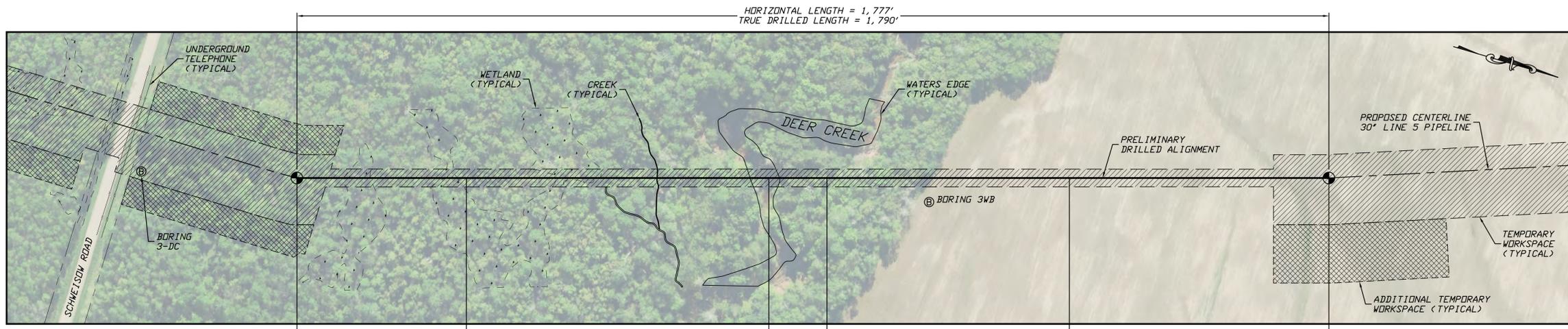
NO.	DATE	REVISION DESCRIPTION	BY	CHK'D APP.
P1	07/22/20	ADJUST ENDPOINTS, ADD GEOTECH, UPDATE BASE DATA	JSP	

J.D.Hair & Associates, Inc.
Consulting Engineers

2424 East 21st Street
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER
1



ENTRY POINT @ 10° 0+00.00, 828.00
N 477544.26, E 1742037.95

P.C. 10° SAG BEND 2+91.64, 776.58
RADIUS = 3,000'

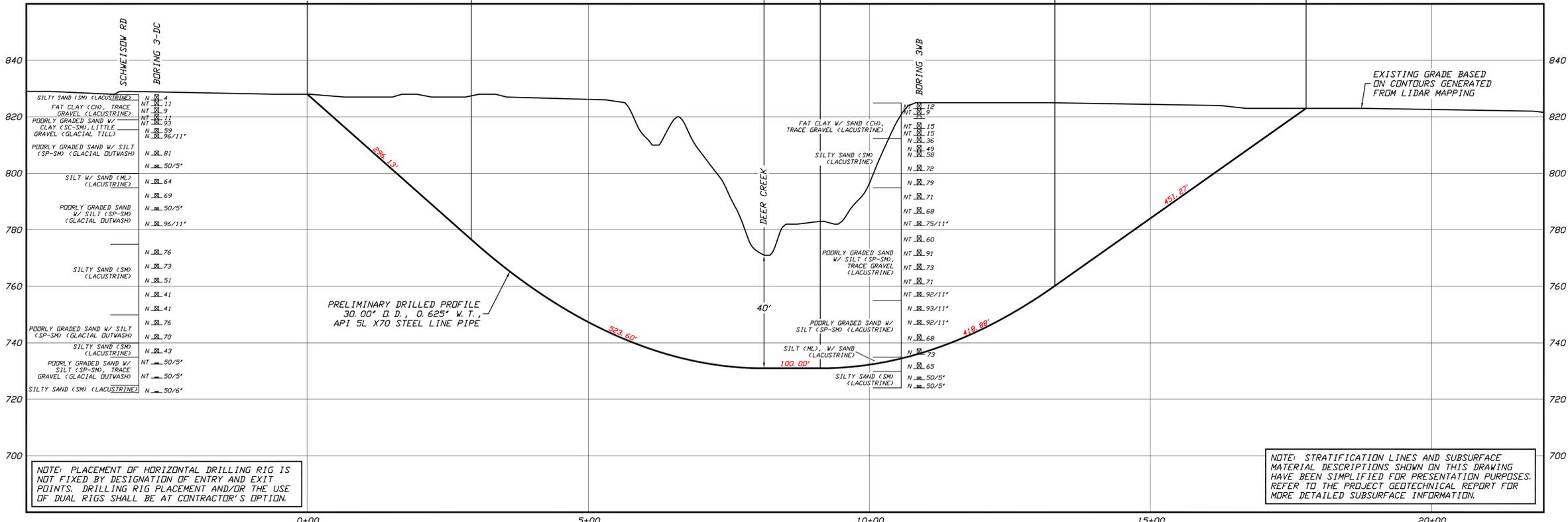
P.T. 10° SAG BEND 8+12.58, 731.00

P.C. 8° SAG BEND 9+12.58, 731.00
RADIUS = 3,000'

P.T. 8° SAG BEND 13+30.10, 760.20

EXIT POINT @ 8° 17+76.98, 823.00
N 479249.91, E 1741539.53

SCALE: 1"=100'



NOTE: PLACEMENT OF HORIZONTAL DRILLING RIG IS NOT FIXED BY DESIGNATION OF ENTRY AND EXIT POINTS. DRILLING RIG PLACEMENT AND/OR THE USE OF DUAL RIGS SHALL BE AT CONTRACTOR'S OPTION.

NOTE: STRATIFICATION LINES AND SUBSURFACE MATERIAL DESCRIPTIONS SHOWN ON THIS DRAWING HAVE BEEN SIMPLIFIED FOR PRESENTATION PURPOSES. REFER TO THE PROJECT GEOTECHNICAL REPORT FOR MORE DETAILED SUBSURFACE INFORMATION.

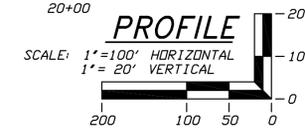
- GENERAL LEGEND**
- DRILLED PATH ENTRY/EXIT POINT
- GEOTECHNICAL LEGEND**
- ⊙ BORING LOCATION
 - ⊕ THIN WALL SAMPLE
 - SPLIT SPOON SAMPLE
 - ⊕ 15' — RECOVERY AMOUNT
 - 53.1.23 — PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
 - PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
 - UCS 6,250 — UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - 53.1.6 — MOHS HARDNESS
 - ROCK QUALITY DESIGNATION (PERCENT)

- GEOTECHNICAL NOTES**
1. GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE PRELIMINARY BORING LOGS DATED JULY 2020. FOR MORE DETAILED SUBSURFACE INFORMATION.
 2. THE LETTER 'N' TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS 'NT' INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
 3. THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

- TOPOGRAPHIC SURVEY NOTES**
1. TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
 2. NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
 3. ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.
- DRILLED PATH NOTES**
1. DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
 2. DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

- PILOT HOLE TOLERANCES**
- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
1. ENTRY POINT: AS STAKED BY COMPANY
 2. EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 3. ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 4. ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 5. CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
1. CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 2. POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 3. MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.



PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 6 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF DEER CREEK
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN

DRAWN	CHECKED	APPROVED	SCALE	DRAWING LABEL	REVISION
KWW	DLB	JSP	SHOWN FOR D-SIZED PLOT	DEER CREEK	P1
DATE	06/17/20				

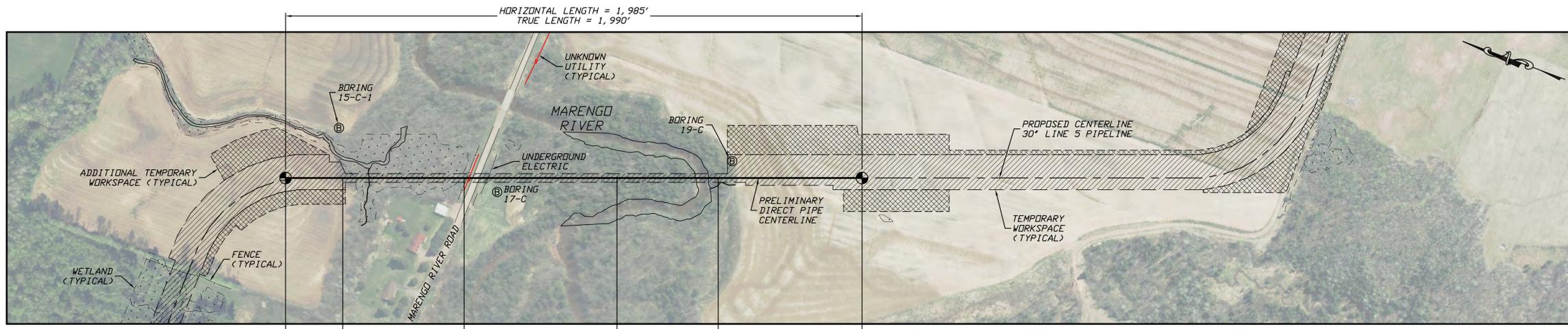
NO.	DATE	REVISION DESCRIPTION	BY	CHK'D APP.
P1	07/22/20	ADD GEOTECH, ADD LABELS, UPDATE BASE DATA	JDH	DMP
			JSP	JSP

J.D.Hair & Associates, Inc.
Consulting Engineers

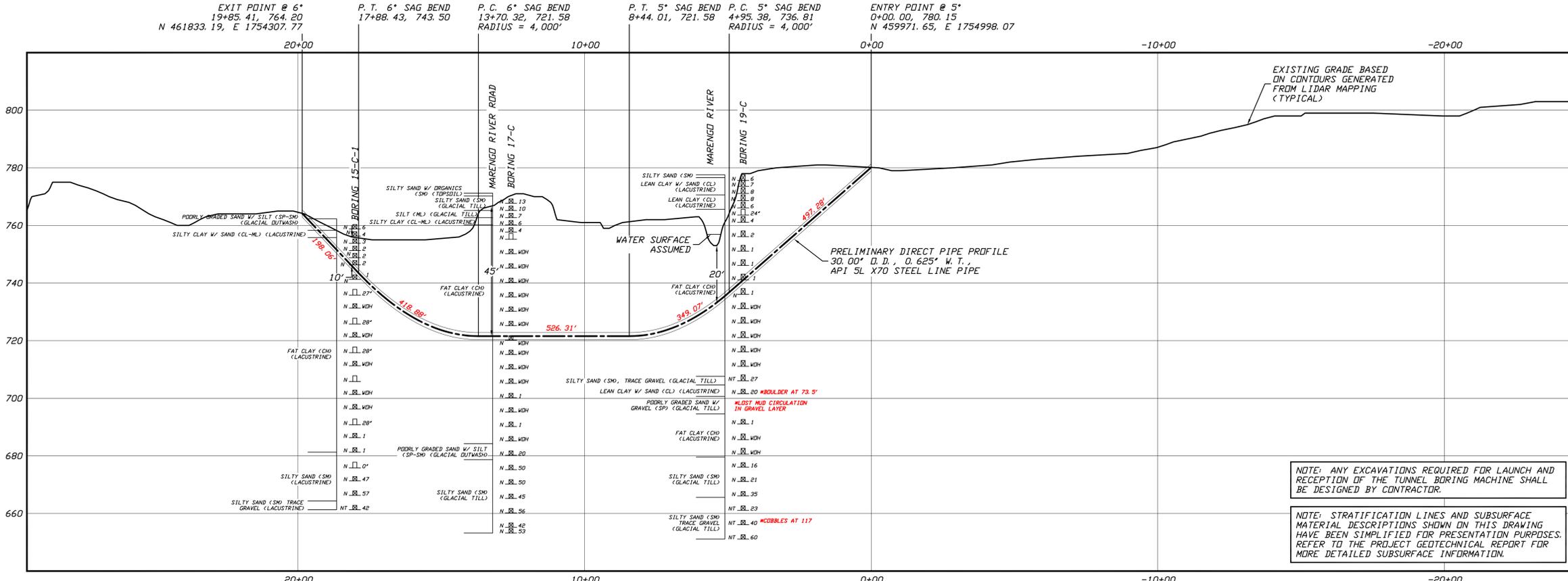
2424 East 21st Street
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER
1



PLAN
SCALE: 1"=200'



PROFILE
SCALE: 1"=200' HORIZONTAL
1"= 20' VERTICAL

- GENERAL LEGEND**
- DIRECT PIPE ENTRY/EXIT POINT
- GEOTECHNICAL LEGEND**
- ⊙ BORING LOCATION
 - ⊞ THIN WALL SAMPLE
 - SPLIT SPOON SAMPLE
 - ⊞ 15' — RECOVERY AMOUNT
 - 53.8.23 — PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
 - CORE BARREL SAMPLE
 - UCS 6,250 — UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - 53.6 — MOHS HARDNESS
 - ROCK QUALITY DESIGNATION (PERCENT)

- GEOTECHNICAL NOTES**
- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE DRAFT BORING LOGS DATED MAY 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
 - THE LETTER 'N' TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS 'NT' INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
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- TOPOGRAPHIC SURVEY NOTES**
- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
 - NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
 - ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.
- COORDINATE GEOMETRY NOTES**
- STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DIRECT PIPE SEGMENT.
 - COORDINATES REFER TO DIRECT PIPE CENTERLINE AS OPPOSED TO TOP OF INSTALLED PIPE.

- DIRECTIONAL TOLERANCES**
- THE CENTERLINE OF THE DIRECT PIPE INSTALLATION SHALL CONFORM TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
- ELEVATION: UP TO 2 FEET ABOVE AND 5 FEET BELOW THE DESIGNED PROFILE
 - ALIGNMENT: UP TO 10 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - CURVE RADIUS: NO LESS THAN 2,000 FEET

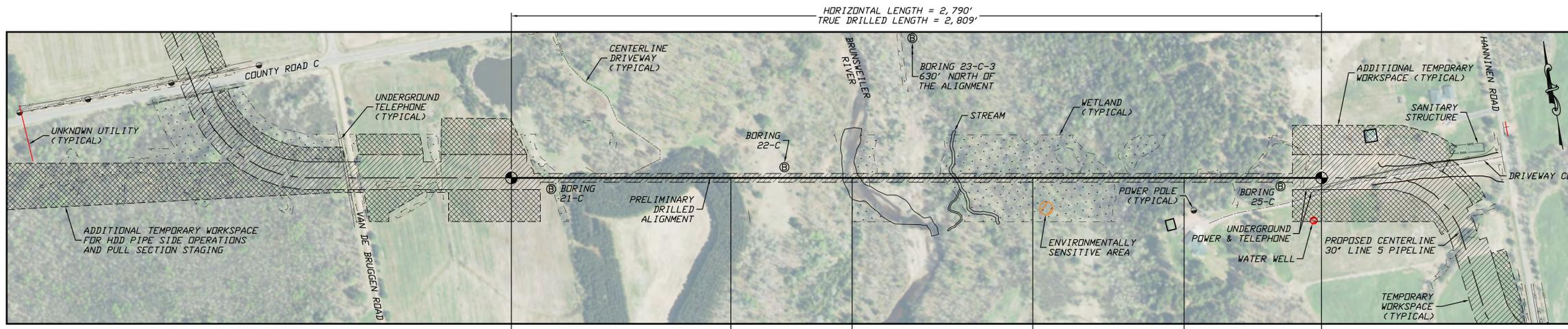
- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DIRECT PIPE OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DIRECT PIPE CENTERLINE SHALL BE EXPOSED.
 - MODIFY DIRECT PIPE OPERATIONS AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT		MP 11 - PLAN AND PROFILE				REVISION
		30-INCH PIPELINE CROSSING OF THE MARENGO RIVER				DRAWING LABEL
		BY THE DIRECT PIPE METHOD				MARENGO DP
LOCATION:	ASHLAND COUNTY, WISCONSIN	CHECKED:	LKB	APPROVED:	JSP	SCALE:
DRAWN:	DLB	DATE:	05/12/20	SHOWN FOR:	D-SIZED PLOT	P2

NO.	DATE	REVISION DESCRIPTION	BY	CHK'D APP.
P2	07/22/20	UPDATE BASE DATA, LABELS, & DESIGN RADIUS	DLB	JSP
P1	06/24/20	ADD BORING DATA, PRODUCE DIRECT PIPE DESIGN	DLB	JSP

J.D.Hair & Associates, Inc.
Consulting Engineers
2424 East 21st Street
Tulsa, Oklahoma 74114



PLAN
SCALE: 1"=200'

EXIT POINT @ 8°
27+89.85, 844.46
N 452839.95, E 1762415.17

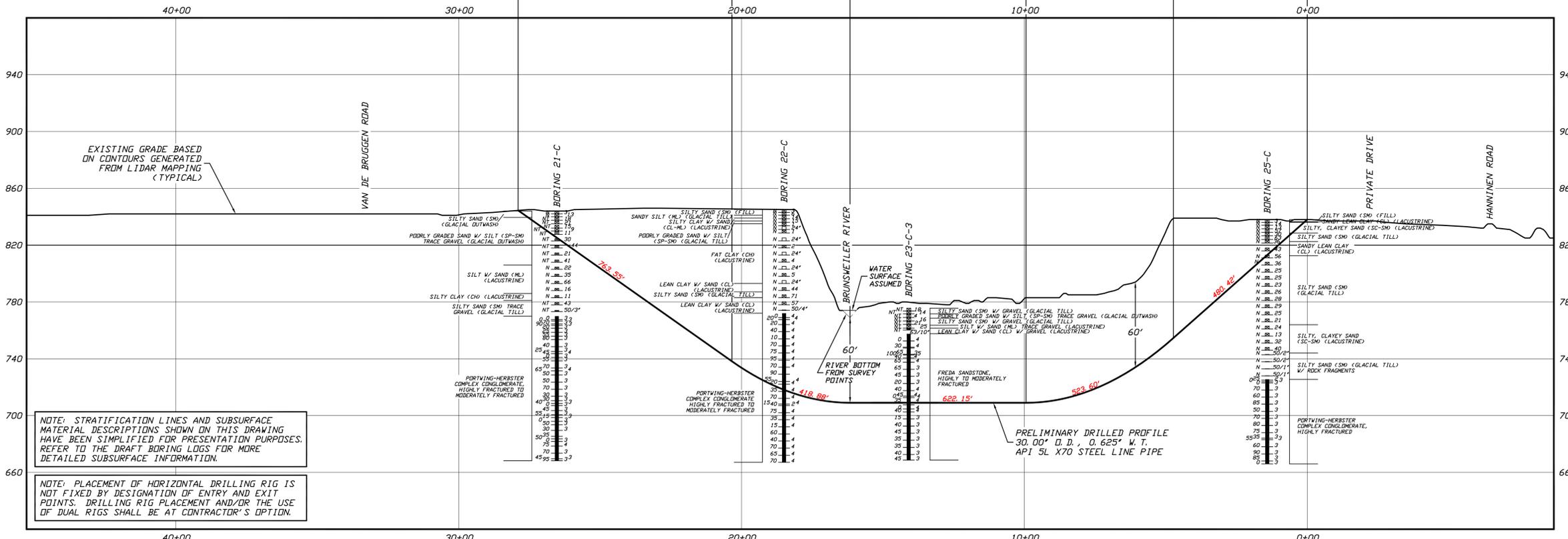
P. T. 8° SAG BEND
20+33.73, 738.20

P. C. 8° SAG BEND
16+16.21, 709.00
RADIUS = 3,000'

P. T. 10° SAG BEND
9+94.06, 709.00

P. C. 10° SAG BEND
4+73.12, 754.58
RADIUS = 3,000'

ENTRY POINT @ 10°
0+00.00, 838.00
N 452339.40, E 1765159.75



PROFILE
SCALE: 1"=200' HORIZONTAL
1"= 40' VERTICAL

GENERAL LEGEND

- DRILLED PATH ENTRY/EXIT POINT
- ⊙ BORING LOCATION
- ⊕ 15' — RECOVERY AMOUNT
- PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
- UNCONFINED COMPRESSIVE STRENGTH (PSI)
- MOHS HARDNESS
- ROCK QUALITY DESIGNATION (PERCENT)

GEOTECHNICAL NOTES

1. GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE DRAFT BORING LOGS DATED MAY & JUNE 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
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3. THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

TOPOGRAPHIC SURVEY NOTES

1. TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
2. NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
3. ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.

DRILLED PATH NOTES

1. DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
2. DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

PILOT HOLE TOLERANCES

- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
1. ENTRY POINT: AS STAKED BY COMPANY
 2. EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 3. ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 4. ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 5. CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

PROTECTION OF EXISTING FACILITIES

- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
1. CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 2. POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 3. MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 14 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF THE BRUNSWELLER RIVER
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN

DRAWN	DMP	CHECKED	KWW	APPROVED	JSP	SCALE	SHOWN FOR D-SIZED PLOT	DRAWING LABEL	BRUNSWELLER	REVISION	P2
DATE	12/17/19										

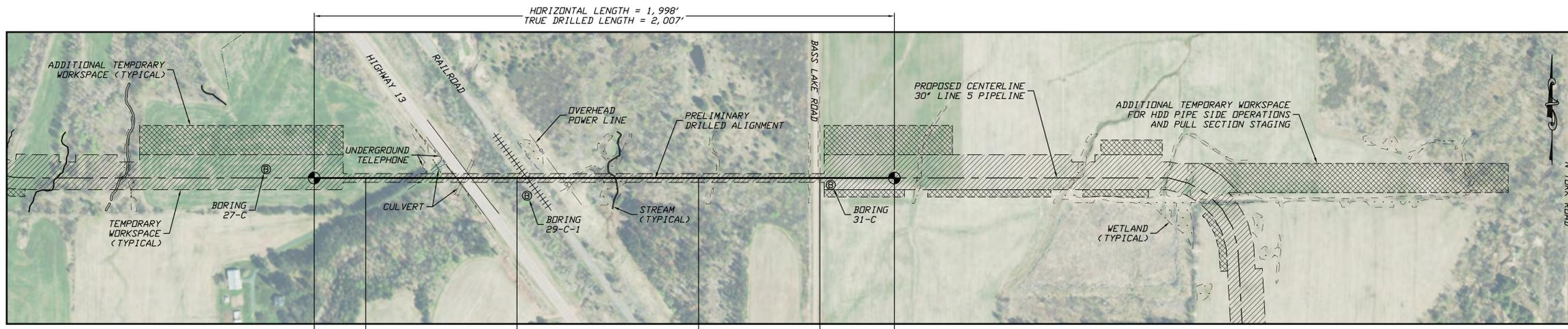
NO.	DATE	REVISION DESCRIPTION	BY	CHK'D APP.
P2	07/23/20	UPDATE BASE DATA AND LABELS	JSP	JSP
P1	07/01/20	ADD LABELS & GEOTECHNICAL DATA TO THE DRAWING	JDH, JDA, JSP	JSP

J.D. Hair & Associates, Inc.
Consulting Engineers

2424 East 21st Street
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER
1



PLAN
SCALE: 1"=200'

ENTRY POINT @ 10°
0+00.00, 835.85
N 450755.17, E 1767910.54

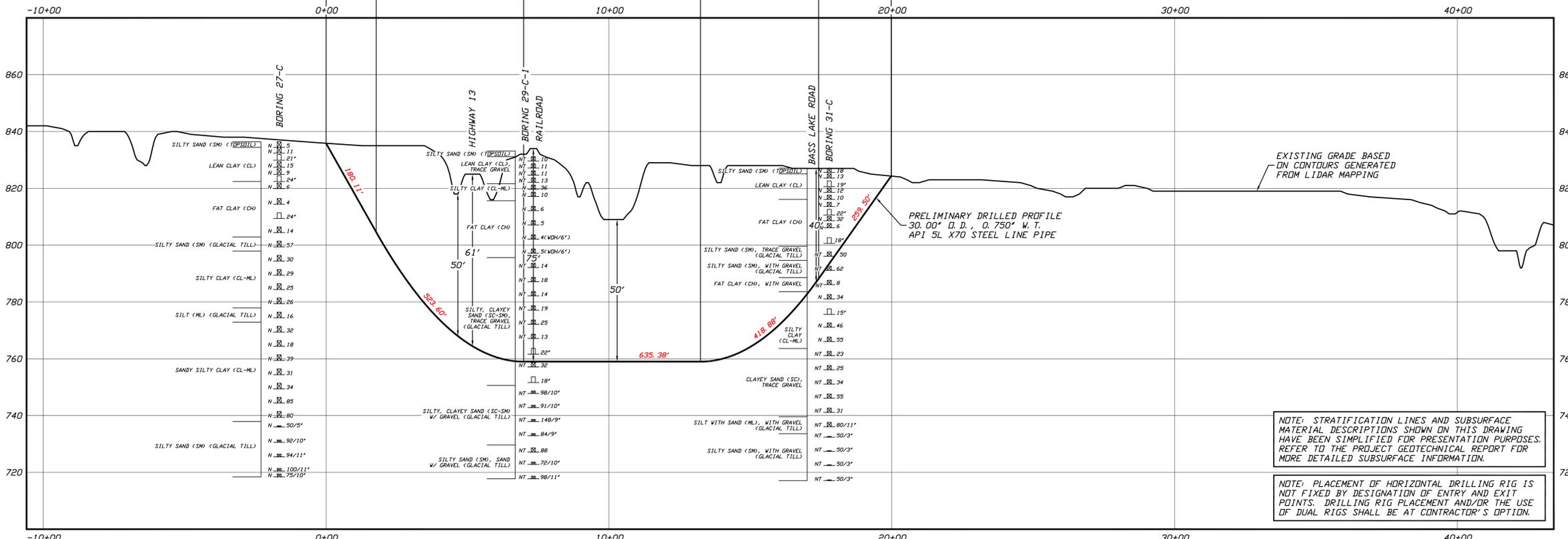
P.C. 10° SAG BEND
1+77.38, 804.58
RADIUS = 3,000'

P.T. 10° SAG BEND
6+98.32, 759.00

P.C. 8° SAG BEND
13+23.71, 759.00
RADIUS = 3,000'

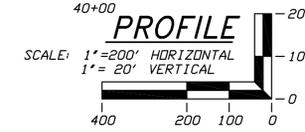
P.T. 8° SAG BEND
17+41.22, 788.20

EXIT POINT @ 8°
19+98.20, 824.31
N 450749.71, E 1769908.73



NOTE: STRATIFICATION LINES AND SUBSURFACE MATERIAL DESCRIPTIONS SHOWN ON THIS DRAWING HAVE BEEN SIMPLIFIED FOR PRESENTATION PURPOSES. REFER TO THE PROJECT GEOTECHNICAL REPORT FOR MORE DETAILED SUBSURFACE INFORMATION.

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GENERAL LEGEND

- DRILLED PATH ENTRY/EXIT POINT
- ⊙ BORING LOCATION
- ⊕ THIN WALL SAMPLE
- ⊖ RECOVERY AMOUNT
- SPILT SPOON SAMPLE
- 53.23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
- CORE BARREL SAMPLE
- UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
- 53.6 MOHS HARDNESS
- ROCK QUALITY DESIGNATION (PERCENT)

GEOTECHNICAL NOTES

1. GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE SUBSURFACE INVESTIGATION REPORT DATED 05/27/20 FOR MORE DETAILED SUBSURFACE INFORMATION.
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3. ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.

DRILLED PATH NOTES

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2. DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

PILOT HOLE TOLERANCES

- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
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 2. EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
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 4. ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 5. CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

PROTECTION OF EXISTING FACILITIES

- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
1. CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 2. POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 3. MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 15 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF HIGHWAY 13
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN

DRAWN	DMP	CHECKED	KWW	APPROVED	JSP	SCALE	SHOWN FOR D-SIZED PLOT	DRAWING LABEL	REVISION
								HIGHWAY 13	P4
DATE	12/18/19								

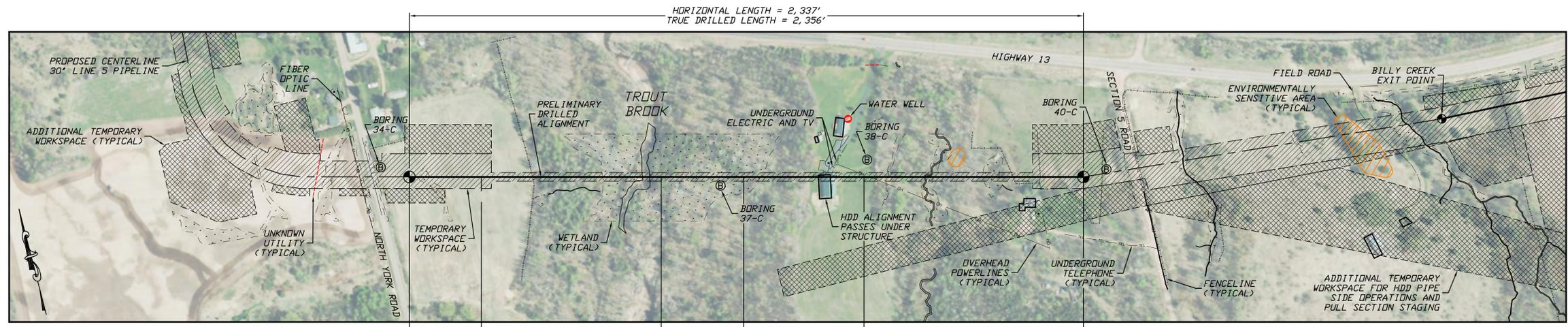
P4	07/23/20	UPDATE BASE DATA	JSP	KWW	JSP
P3	06/03/20	MINOR UPDATES, ISSUE FOR PERMIT	DLB	JSP	JSP
P2	05/20/20	ADD LABELS, ADD SECOND SHEET	JDA	JDA	JSP
P1	05/07/20	ENTER GEOTECH DATA & UPDATE THE DESIGN	DLB	KWW	JSP
NO.	DATE	REVISION DESCRIPTION	BY	CHK'D	APP.

J.D.Hair & Associates, Inc.
Consulting Engineers

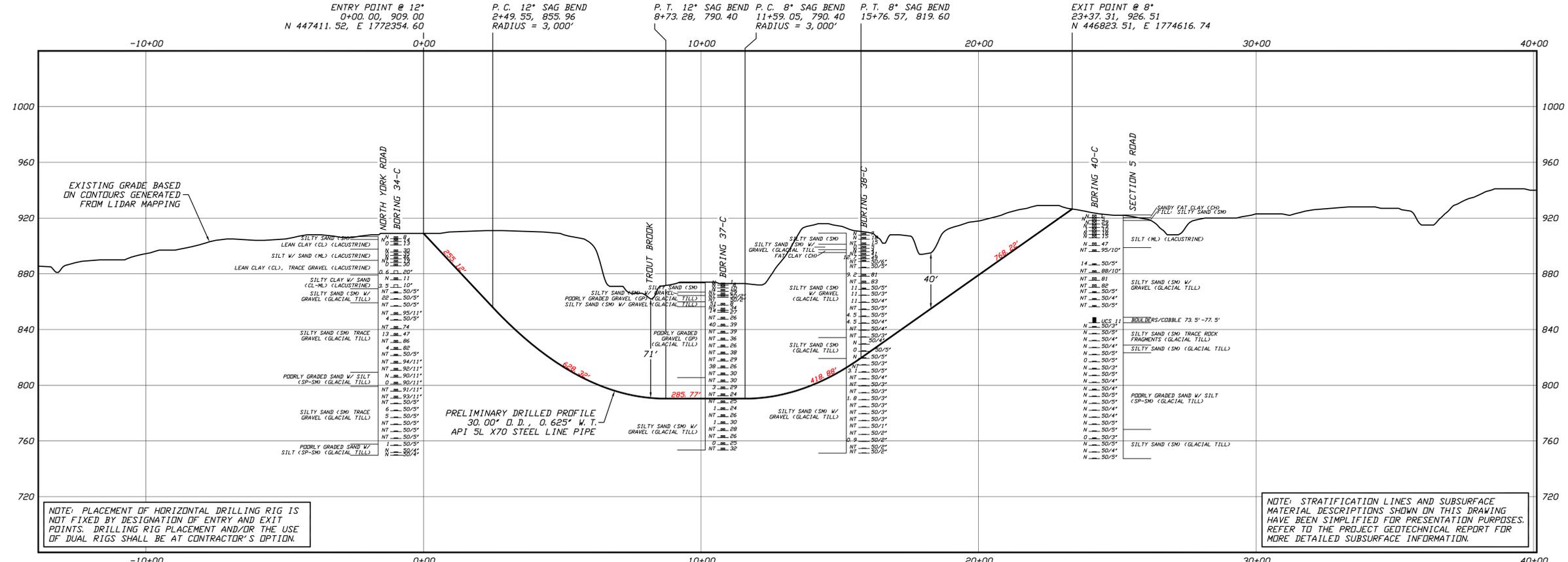
2424 East 21st Street
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER
1



PLAN
SCALE: 1"=200'



- GENERAL LEGEND**
- DRILLED PATH ENTRY/EXIT POINT
 - ⊙ BORING LOCATION
 - ⊞ 15" RECOVERY AMOUNT
 - 53.23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
 - UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - 53.16 MOHS HARDNESS
 - ROCK QUALITY DESIGNATION (PERCENT)

- GEOTECHNICAL NOTES**
- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE SUBSURFACE INVESTIGATION REPORT DATED 06/19/20 FOR MORE DETAILED SUBSURFACE INFORMATION.
 - THE LETTER "N" TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS "NT" INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
 - THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

- TOPOGRAPHIC SURVEY NOTES**
- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
 - NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
 - ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.
- DRILLED PATH NOTES**
- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
 - DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

- PILOT HOLE TOLERANCES**
- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
- ENTRY POINT: AS STAKED BY COMPANY
 - EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 - ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 16- PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF TROUT BROOK
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN

DRAWN	DATE	CHECKED	APPROVED	SCALE	SHOWN FOR	DRAWING LABEL	REVISION
KWW	01/15/20	DMP	JSP	JSP	D-SIZED PLOT	TROUT BROOK	P3

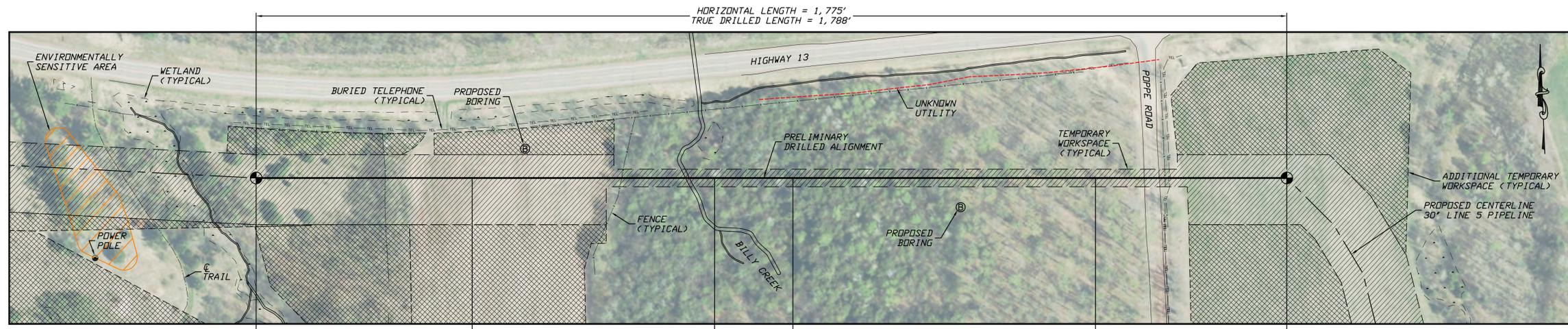
NO.	DATE	REVISION DESCRIPTION	BY	CHECKED	APP.
P3	07/23/20	UPDATE BASE DATA, ADD INFORMATION TO SHEET 2	JDHA	JDHA	JSP
P2	07/01/20	ADD LABELS & GEOTECHNICAL DATA TO THE DRAWING	JDHA	JDHA	JSP
P1	03/04/20	ADJUST THE DESIGN END POINTS	DLB	KWW	---

J.D.Hair & Associates, Inc.
Consulting Engineers

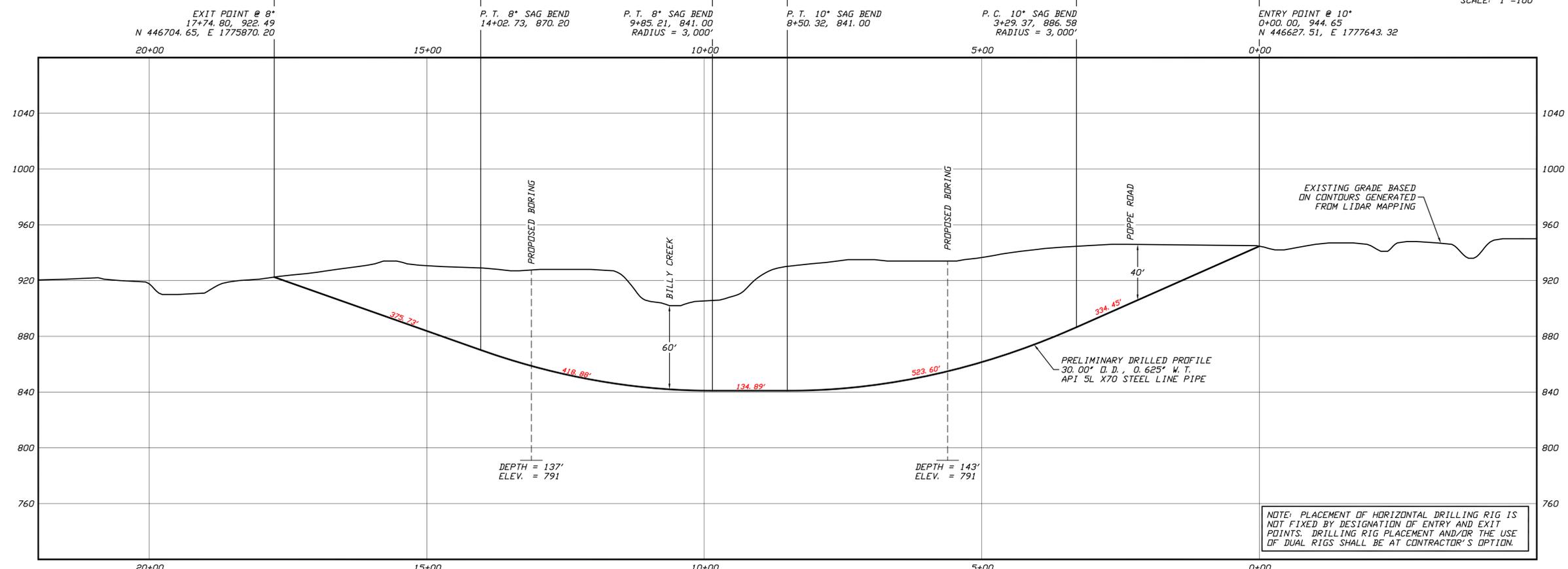
2424 East 21st Street
Suite 510
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER
1



PLAN
SCALE: 1"=100'



PROFILE
SCALE: 1"=100' HORIZONTAL
1"= 40' VERTICAL

NOTE: PLACEMENT OF HORIZONTAL DRILLING RIG IS NOT FIXED BY DESIGNATION OF ENTRY AND EXIT POINTS. DRILLING RIG PLACEMENT AND/OR THE USE OF DUAL RIGS SHALL BE AT CONTRACTOR'S OPTION.

GENERAL LEGEND
● DRILLED PATH ENTRY/EXIT POINT

- TOPOGRAPHIC SURVEY NOTES**
- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
 - NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
 - ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.

- DRILLED PATH NOTES**
- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
 - DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

- PILOT HOLE TOLERANCES**
- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
- ENTRY POINT: AS STAKED BY COMPANY
 - EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT, UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 - ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 17 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF BILLY CREEK
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: ASHLAND COUNTY, WISCONSIN

DRAWN	DMP	DATE	1/10/20	CHECKED	KWW	APPROVED	SCALE	SHOWN FOR D-SIZED PLOT	DRAWING LABEL	REVISION
							---		BILLY CREEK	P2

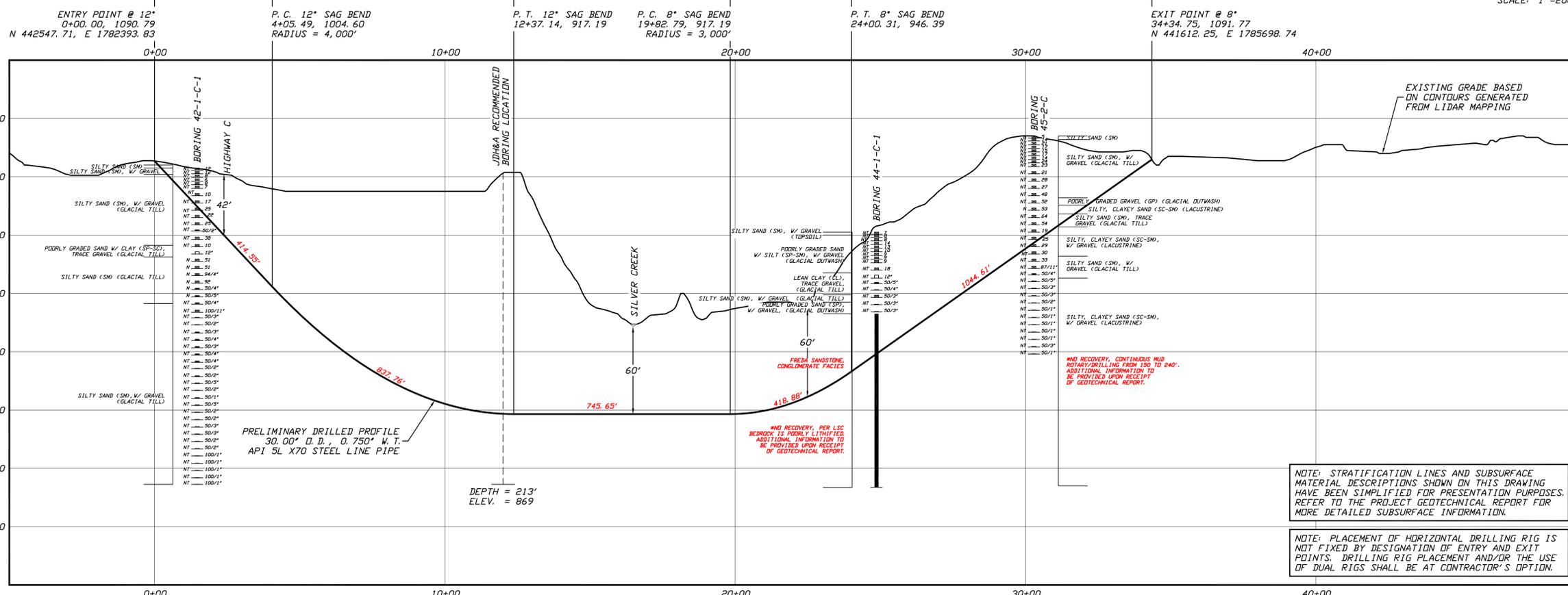
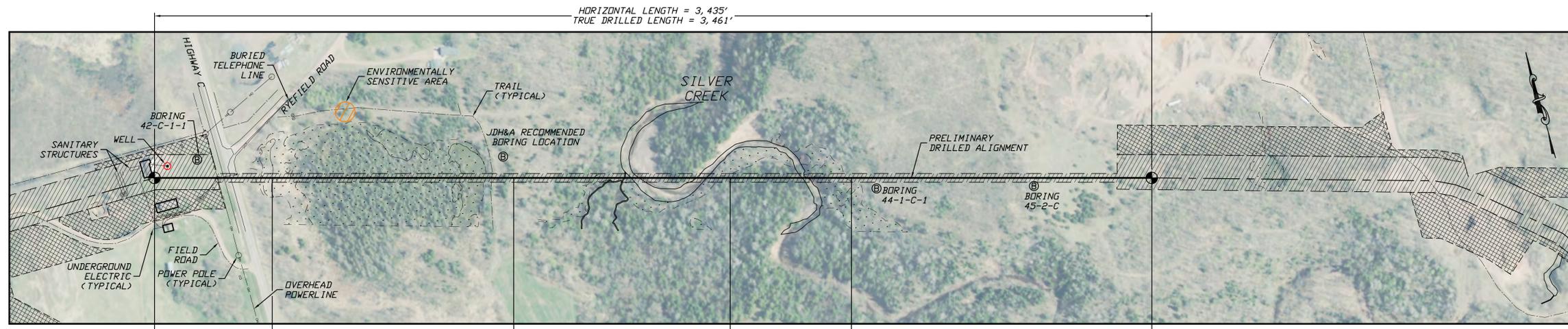
NO.	DATE	REVISION DESCRIPTION	BY	CHK'D	APP.
P1	07/01/20	SET UP DESIGN ON THE UPDATED ALIGNMENT	CDS	JSP	JSP
P2	07/24/20	UPDATE BASE DATA	KWW	JSP	JSP

J.D.Hair & Associates, Inc.
Consulting Engineers

2424 East 21st Street
Suite 510
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER
1



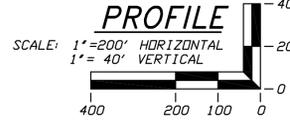
- GENERAL LEGEND**
- DRILLED PATH ENTRY/EXIT POINT
- GEOTECHNICAL LEGEND**
- ⊙ BORING LOCATION
 - ⊕ THIN WALL SAMPLE
 - ⊖ SPLIT SPOON SAMPLE
 - 53.1.23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
 - PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
 - UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - 53.1.6 MOHS HARDNESS
 - ROCK QUALITY DESIGNATION (PERCENT)

- GEOTECHNICAL NOTES**
- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE DRAFT BORING LOGS DATED 05/08/20 FOR MORE DETAILED SUBSURFACE INFORMATION.
 - THE LETTER "N" TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS "NT" INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
 - THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

- TOPOGRAPHIC SURVEY NOTES**
- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
 - NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
 - ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.
- DRILLED PATH NOTES**
- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
 - DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

- PILOT HOLE TOLERANCES**
- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
- ENTRY POINT: AS STAKED BY COMPANY
 - EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 - ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.



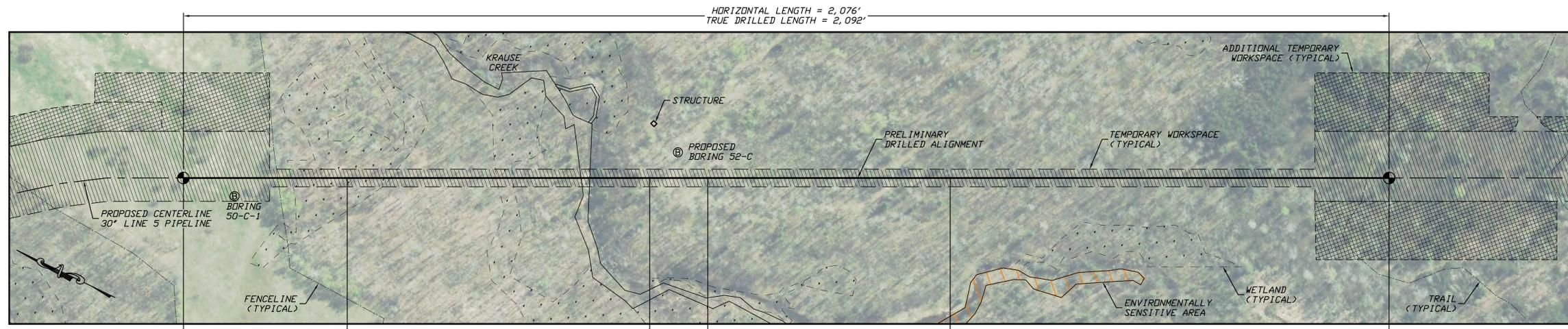
PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT		MP 19 - PLAN AND PROFILE		DRAWING LABEL		REVISION	
30-INCH PIPELINE CROSSING OF SILVER CREEK		BY HORIZONTAL DIRECTIONAL DRILLING		SHOWN FOR SILVER CREEK ALT		P1	
LOCATION:	ASHLAND COUNTY, WISCONSIN	CHECKED:	KWW	APPROVED:	JSP	SCALE:	D-SIZED PLOT
DRAWN:	DLB	DATE:	01/31/20				

NO.	DATE	REVISION DESCRIPTION	BY	CHECKED	APP.
P1	07/24/20	ADD UPDATED BASE & GEOTECH DATA & EDIT LABELS	JDA	DMP	JSP

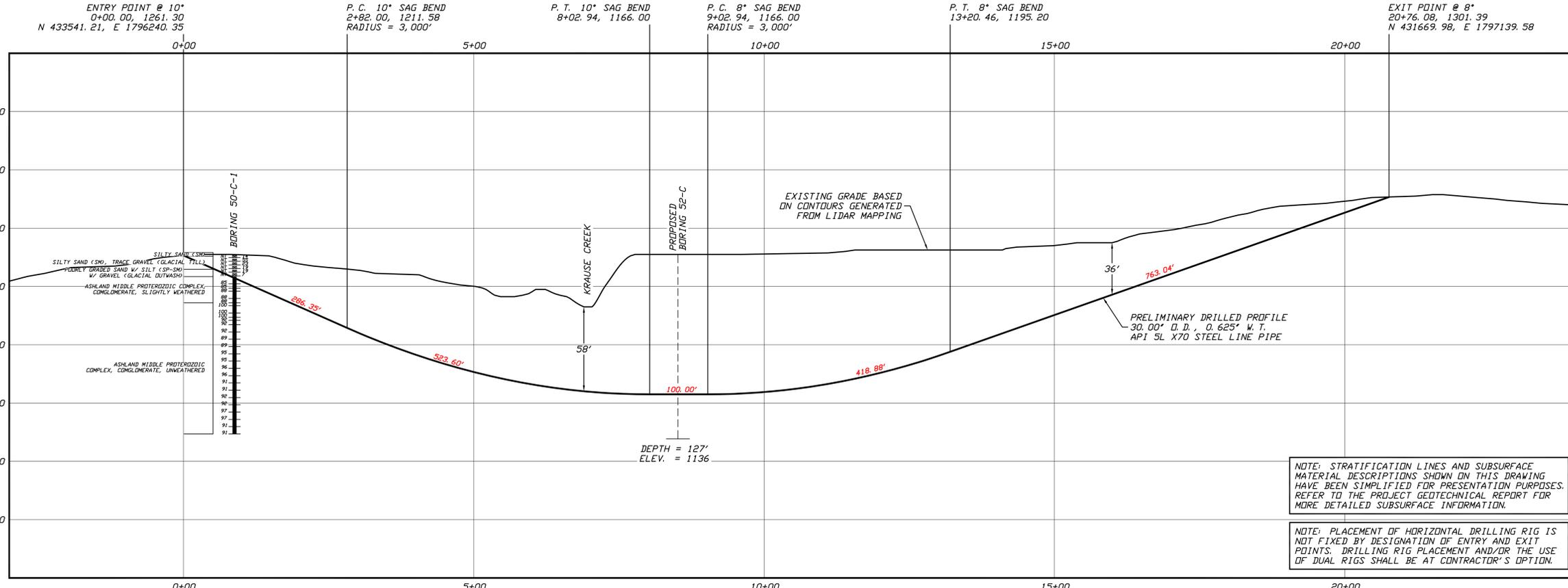
J.D.Hair & Associates, Inc.
Consulting Engineers
2424 East 21st Street
Suite 510
Tulsa, Oklahoma 74114

PROJECT NO.	Enbridge\1938
SHEET NUMBER	1



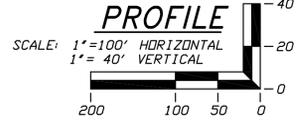
HORIZONTAL LENGTH = 2,076'
TRUE DRILLED LENGTH = 2,092'

PLAN
SCALE: 1"=100'



NOTE: STRATIFICATION LINES AND SUBSURFACE MATERIAL DESCRIPTIONS SHOWN ON THIS DRAWING HAVE BEEN SIMPLIFIED FOR PRESENTATION PURPOSES. REFER TO THE PROJECT GEOTECHNICAL REPORT FOR MORE DETAILED SUBSURFACE INFORMATION.

NOTE: PLACEMENT OF HORIZONTAL DRILLING RIG IS NOT FIXED BY DESIGNATION OF ENTRY AND EXIT POINTS. DRILLING RIG PLACEMENT AND/OR THE USE OF DUAL RIGS SHALL BE AT CONTRACTOR'S OPTION.



- GENERAL LEGEND**
- DRILLED PATH ENTRY/EXIT POINT
- GEOTECHNICAL LEGEND**
- ⊙ BORING LOCATION
 - THIN WALL SAMPLE
 - 15" RECOVERY AMOUNT
 - 53.23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
 - PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
 - CORE BARREL SAMPLE
 - UCS 6,290 UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - 53.6 MOHS HARDNESS
 - ROCK QUALITY DESIGNATION (PERCENT)

- GEOTECHNICAL NOTES**
1. GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MN. REFER TO THE DRAFT BORING LOG DATED 2/19/20 FOR MORE DETAILED SUBSURFACE INFORMATION.
 2. THE LETTER "N" TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS "NT" INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
 3. THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

- TOPOGRAPHIC SURVEY NOTES**
1. TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
 2. NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
 3. ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.
- DRILLED PATH NOTES**
1. DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
 2. DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

- PILOT HOLE TOLERANCES**
- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
1. ENTRY POINT: AS STAKED BY COMPANY
 2. EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 3. ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 4. ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 5. CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
1. CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 2. POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 3. MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

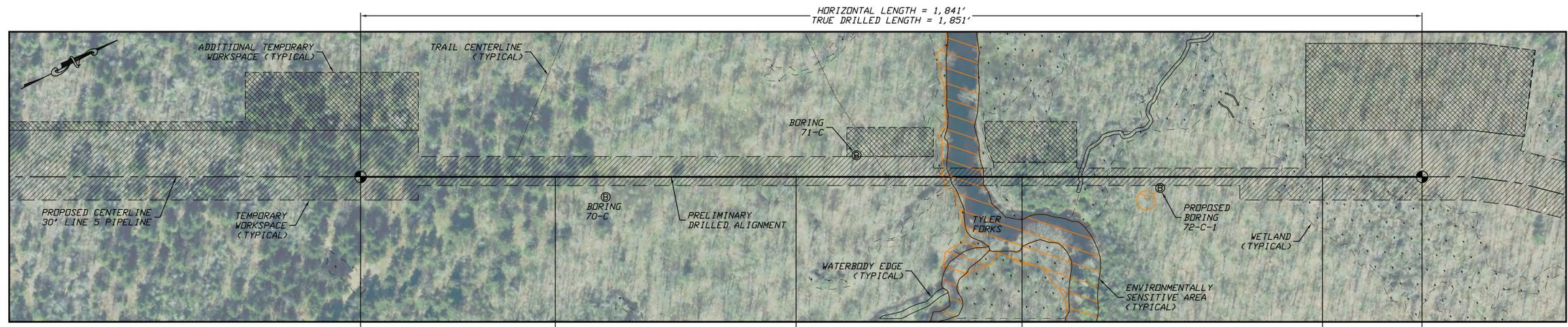
PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT		MP 22 - PLAN AND PROFILE		REVISION	
30-INCH PIPELINE CROSSING OF KRAUSE CREEK		BY HORIZONTAL DIRECTIONAL DRILLING		DRAWING LABEL	
LOCATION: ASHLAND COUNTY, WISCONSIN		SCALE: SHOWN FOR D-SIZED PLOT		KRAUSE CREEK	
DRAWN	CHECKED	APPROVED	JSP	DMP	P1
DATE	01/10/20				

NO.	DATE	REVISION DESCRIPTION	BY	CHECKED	APP.
P1	07/23/20	UPDATE BASE DATA, DESIGN, & ADD GEOTECH	DLB	DMP	JSP

J.D.Hair & Associates, Inc.
Consulting Engineers
2424 East 21st Street
Suite 510
Tulsa, Oklahoma 74114

PROJECT NO.	Enbridge\1938
SHEET NUMBER	1



PLAN
SCALE: 1"=100'

EXIT POINT @ 8°
18+40.54, 1168.64
N 457655.93, E 1837818.27

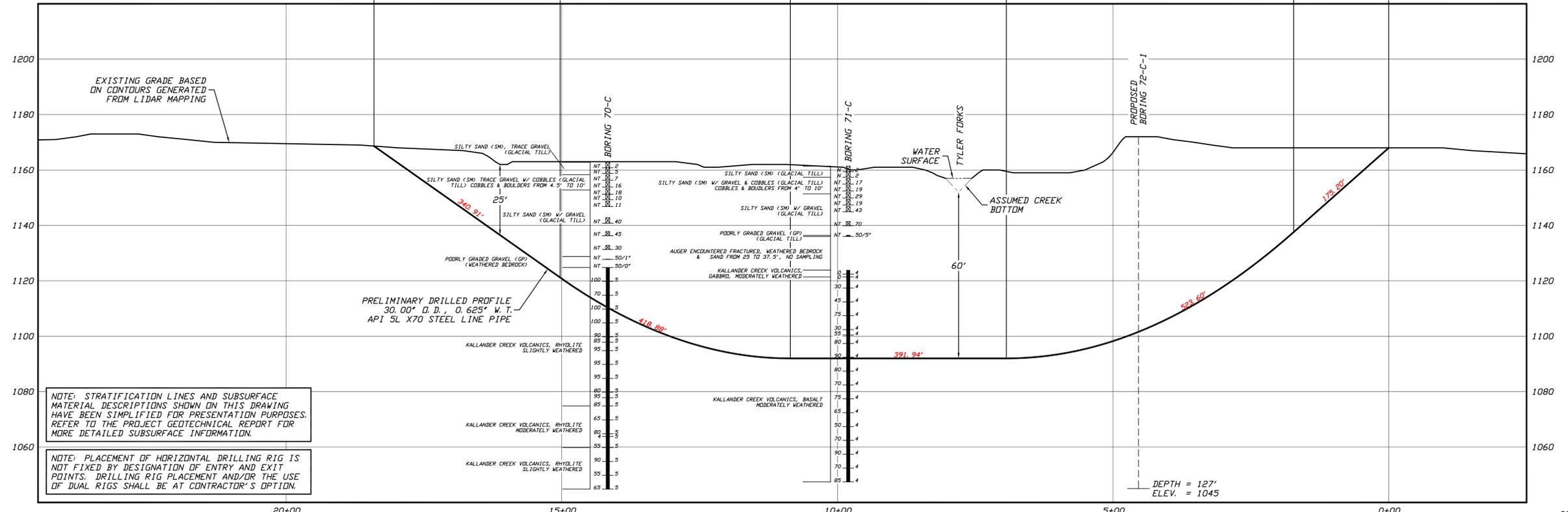
P. T. 8° SAG BEND
15+02.95, 1121.19

P. C. 8° SAG BEND
10+85.43, 1092.00
RADIUS = 3,000'

P. T. 10° SAG BEND
6+93.48, 1092.00

P. C. 10° SAG BEND
1+72.54, 1137.57
RADIUS = 3,000'

ENTRY POINT @ 10°
0+00.00, 1168.00
N 459300.41, E 1838644.86



PROFILE
SCALE: 1"=100' HORIZONTAL
1"= 20' VERTICAL

- GENERAL LEGEND**
- DRILLED PATH ENTRY/EXIT POINT
- GEOTECHNICAL LEGEND**
- ⊙ BORING LOCATION
- SPLIT SPOON SAMPLE**
- 53.1 23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
 - PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
- CORE BARREL SAMPLE**
- UCS 6, 250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - 53.1 6 MOHS HARDNESS
 - ROCK QUALITY DESIGNATION (PERCENT)

- GEOTECHNICAL NOTES**
- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MN. REFER TO THE PROJECT DRAFT BORING LOGS DATED JUNE 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
 - THE LETTER 'N' TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS 'NT' INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
 - THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

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- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
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 - ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.
- DRILLED PATH NOTES**
- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
 - DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

- PILOT HOLE TOLERANCES**
- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
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 - EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 - ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.

PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 34 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF TYLER FORKS
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: IRON COUNTY, WISCONSIN	CHECKED: DMP	APPROVED: JSP	SCALE: SHOWN FOR D-SIZED PLOT	DRAWING LABEL: TYLER FORKS	REVISION: P2
DRAWN: CDS	DATE: 01/14/19				

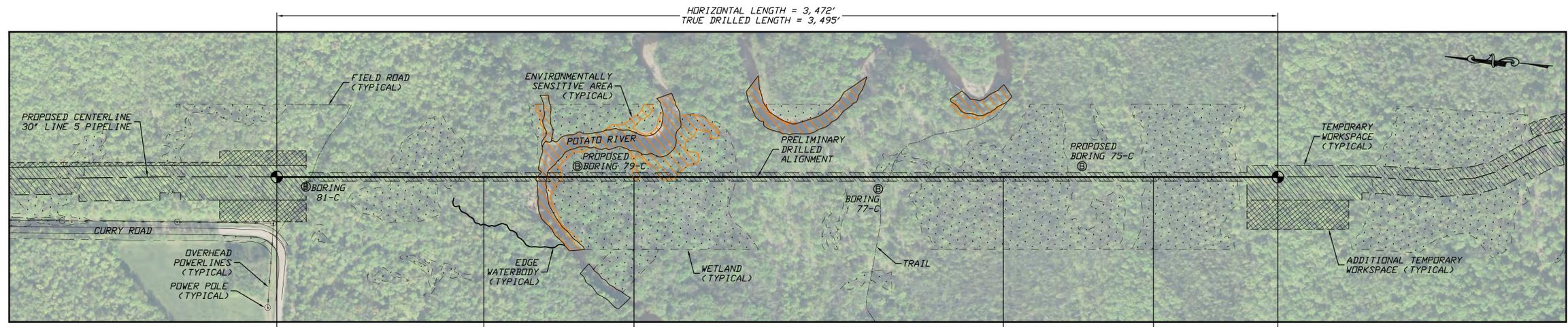
NO.	DATE	REVISION DESCRIPTION	BY	CHK'D	APP.
P1	07/08/20	UPDATE ENTRY POINT, ADD GEOTECHNICAL INFORMATION	DLB	KWW	JSP
P2	07/23/20	UPDATE BASE DATA	DLB	KWW	JSP

J.D.Hair & Associates, Inc.
Consulting Engineers

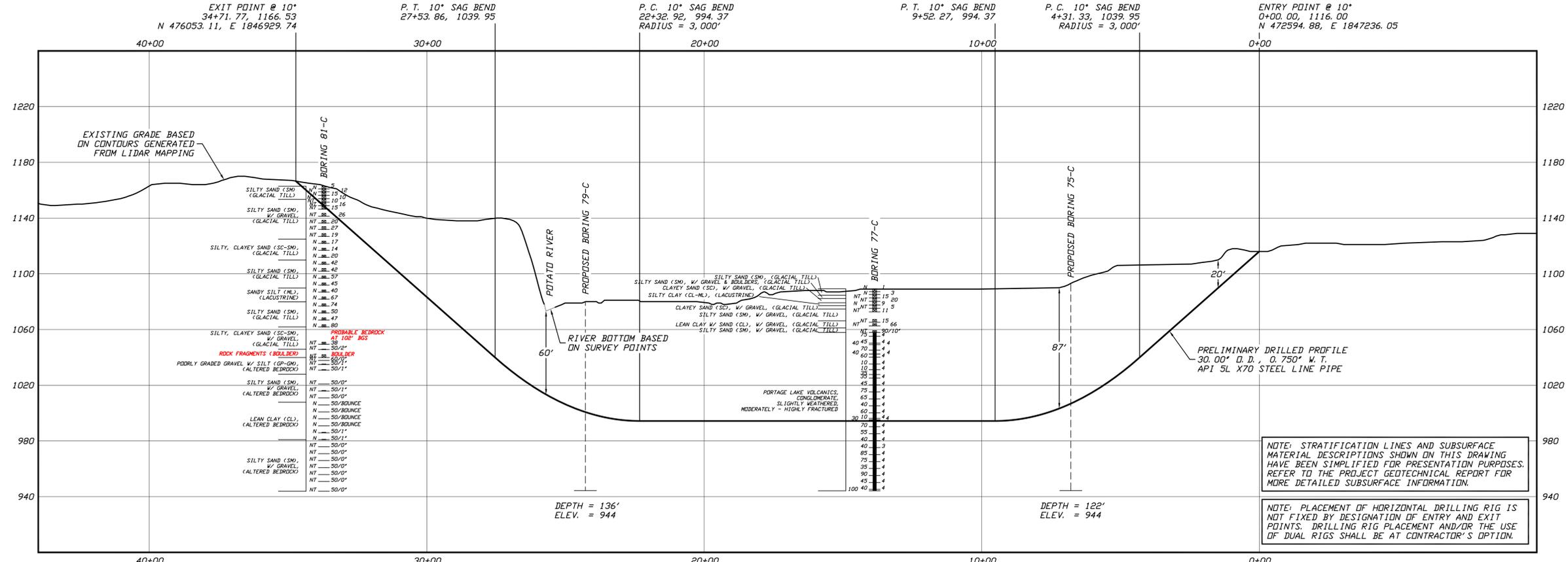
2424 East 21st Street
Suite 510
Tulsa, Oklahoma 74114

PROJECT NO.
Enbridge\1938

SHEET NUMBER
1



PLAN
SCALE: 1"=200'



NOTE: STRATIFICATION LINES AND SUBSURFACE MATERIAL DESCRIPTIONS SHOWN ON THIS DRAWING HAVE BEEN SIMPLIFIED FOR PRESENTATION PURPOSES. REFER TO THE PROJECT GEOTECHNICAL REPORT FOR MORE DETAILED SUBSURFACE INFORMATION.

NOTE: PLACEMENT OF HORIZONTAL DRILLING RIG IS NOT FIXED BY DESIGNATION OF ENTRY AND EXIT POINTS. DRILLING RIG PLACEMENT AND/OR THE USE OF DUAL RIGS SHALL BE AT CONTRACTOR'S OPTION.

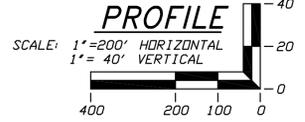
- GENERAL LEGEND**
- DRILLED PATH ENTRY/EXIT POINT
- GEOTECHNICAL LEGEND**
- ⊙ BORING LOCATION
- SPLIT SPOON SAMPLE**
- 53.1.23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES
 - PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
- CORE BARREL SAMPLE**
- UCS 6,250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - 53.1.6 MOHS HARDNESS
 - ROCK QUALITY DESIGNATION (PERCENT)

- GEOTECHNICAL NOTES**
- GEOTECHNICAL DATA PROVIDED BY BRAUN INTERTEC, DULUTH, MINNESOTA. REFER TO THE PRELIMINARY BORING LOGS DATED APRIL & MAY 2020 FOR MORE DETAILED SUBSURFACE INFORMATION.
 - THE LETTER 'N' TO THE LEFT OF A SAMPLE INDICATES THAT NO GRAVEL WAS OBSERVED IN THE SAMPLE. THE LETTERS 'NT' INDICATE THAT GRAVEL WAS OBSERVED BUT NO GRADATION TEST WAS PERFORMED.
 - THE GEOTECHNICAL DATA IS ONLY DESCRIPTIVE OF THE LOCATIONS ACTUALLY SAMPLED. EXTENSION OF THIS DATA OUTSIDE OF THE ORIGINAL BORINGS MAY BE DONE TO CHARACTERIZE THE SOIL CONDITIONS, HOWEVER, COMPANY DOES NOT GUARANTEE THESE CHARACTERIZATIONS TO BE ACCURATE. CONTRACTOR MUST USE HIS OWN EXPERIENCE AND JUDGMENT IN INTERPRETING THIS DATA.

- TOPOGRAPHIC SURVEY NOTES**
- TOPOGRAPHIC SURVEY DATA PROVIDED BY ENBRIDGE, DULUTH, MINNESOTA.
 - NORTHINGS AND EASTINGS ARE IN U.S. SURVEY FEET REFERENCED TO WISCONSIN STATE PLANE COORDINATES, NORTH ZONE, NAD 83.
 - ELEVATIONS ARE IN FEET REFERENCED TO NAVD 88.
- DRILLED PATH NOTES**
- DRILLED PATH STATIONING IS IN FEET BY HORIZONTAL MEASUREMENT AND IS REFERENCED TO CONTROL ESTABLISHED FOR THE DRILLED SEGMENT.
 - DRILLED PATH COORDINATES REFER TO CENTERLINE OF PILOT HOLE AS OPPOSED TO TOP OF INSTALLED PIPE.

- PILOT HOLE TOLERANCES**
- THE PILOT HOLE SHALL BE DRILLED TO THE TOLERANCES LISTED BELOW. HOWEVER, IN ALL CASES, RIGHT-OF-WAY RESTRICTIONS AND CONCERN FOR ADJACENT FACILITIES SHALL TAKE PRECEDENCE OVER THESE TOLERANCES.
- ENTRY POINT: AS STAKED BY COMPANY
 - EXIT POINT: UP TO 10 FEET SHORT OR 20 FEET LONG RELATIVE TO THE DESIGNED EXIT POINT; UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - ELEVATION: UP TO 2 FEET ABOVE AND 10 FEET BELOW THE DESIGNED PROFILE
 - ALIGNMENT: UP TO 5 FEET RIGHT OR LEFT OF THE DESIGNED ALIGNMENT
 - CURVE RADIUS: NO LESS THAN 2,000 FEET BASED ON A 3-JOINT AVERAGE (ASSUMING RANGE 2 DRILL PIPE)

- PROTECTION OF EXISTING FACILITIES**
- CONTRACTOR SHALL UNDERTAKE THE FOLLOWING STEPS PRIOR TO COMMENCING DRILLING OPERATIONS.
- CONTACT THE UTILITY LOCATION/NOTIFICATION SERVICE FOR THE CONSTRUCTION AREA.
 - POSITIVELY LOCATE AND STAKE ALL EXISTING UNDERGROUND FACILITIES. ANY FACILITIES LOCATED WITHIN 10 FEET OF THE DESIGNED DRILLED PATH SHALL BE EXPOSED.
 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.



PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 38 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF THE POTATO RIVER
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: IRON COUNTY, WISCONSIN

DATE	CHECKED	APPROVED	SCALE	DRAWING LABEL	REVISION
01/14/20	DMP	JSP	SHOWN FOR D-SIZED PLOT	POTATO RIVER	P1

DRAWN: KWW

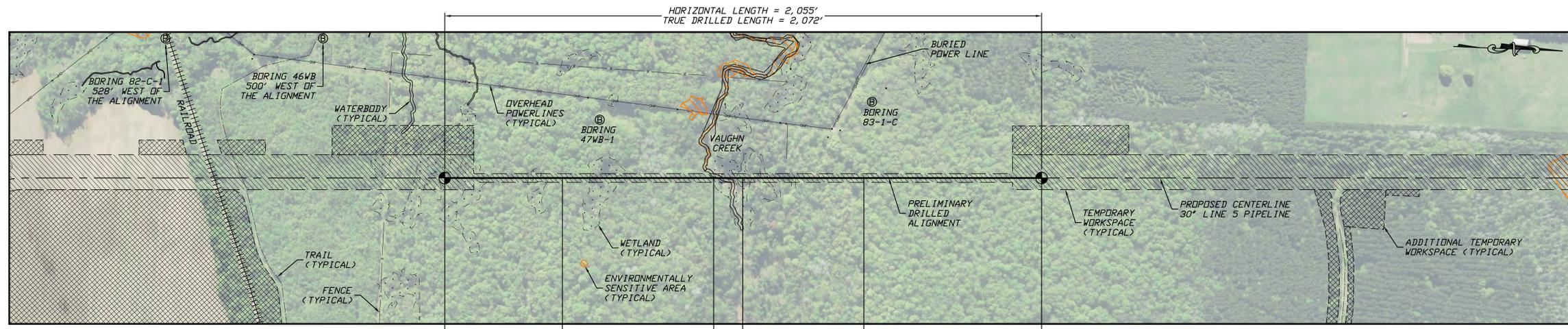
NO.	DATE	BY	REVISION DESCRIPTION
P1	07/24/20	DMP	ADD GEOTECH DATA & UPDATE BASE DATA
		JDA	JSP
		CHKD	APP.

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Consulting Engineers

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ENTRY POINT @ 10°
0+00.00, 1030.00
N 482808.89, E 1846043.21

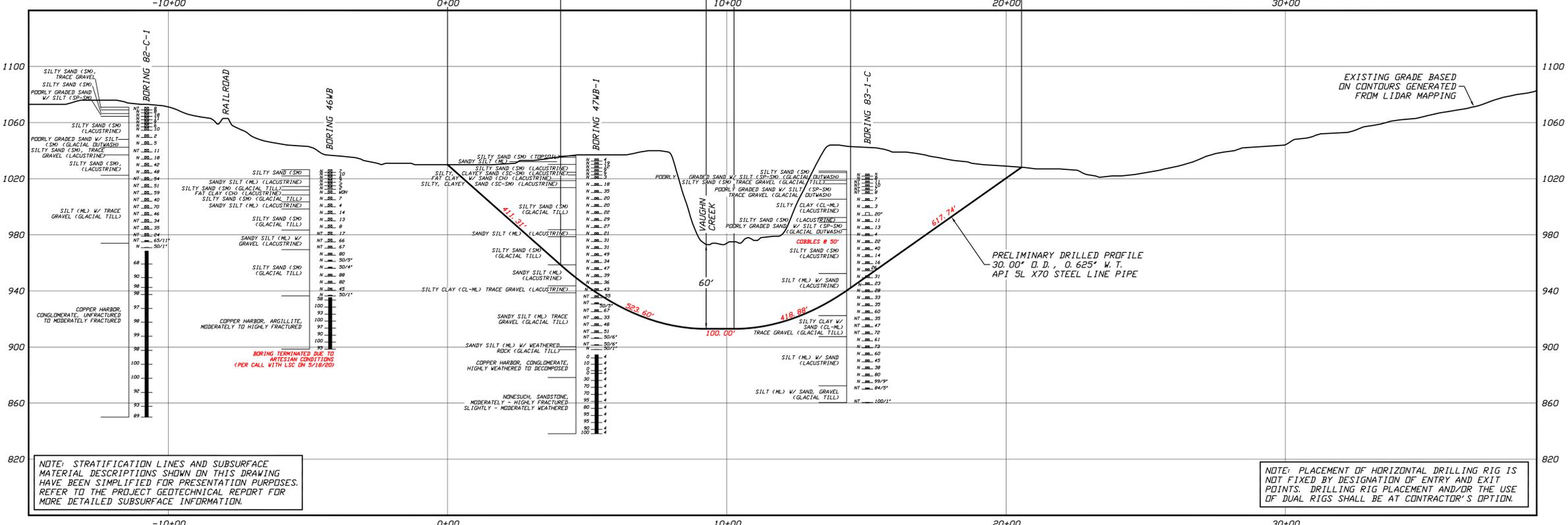
P. C. 10° SAG BEND
4+05.06, 958.58
RADIUS = 3,000'

P. T. 10° SAG BEND
9+26.01, 913.00

P. C. 8° SAG BEND
10+26.01, 913.00
RADIUS = 3,000'

P. T. 8° SAG BEND
14+43.53, 942.20

EXIT POINT @ 8°
20+55.25, 1028.17
N 484862.37, E 1845957.81



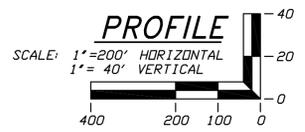
- GENERAL LEGEND**
- DRILLED PATH ENTRY/EXIT POINT
- GEOTECHNICAL LEGEND**
- ⊙ BORING LOCATION
 - THIN WALL SAMPLE
 - 15" RECOVERY AMOUNT
 - SPILT SPOON SAMPLE
 - 53. N 23 PENETRATION RESISTANCE IN BLOWS PER FOOT FOR A 140 POUND HAMMER FALLING 30 INCHES PERCENTAGE OF GRAVEL BY WEIGHT FOR SAMPLES CONTAINING GRAVEL
 - CORE BARREL SAMPLE
 - UCS 6, 250 UNCONFINED COMPRESSIVE STRENGTH (PSI)
 - 53. 6 MOHS HARDNESS
 - ROCK QUALITY DESIGNATION (PERCENT)

- GEOTECHNICAL NOTES**
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 - MODIFY DRILLING PRACTICES AND DOWNHOLE ASSEMBLIES AS NECESSARY TO PREVENT DAMAGE TO EXISTING FACILITIES.



PRELIMINARY - NOT FOR CONSTRUCTION

LINE 5 PIPELINE PROJECT

MP 39 - PLAN AND PROFILE
30-INCH PIPELINE CROSSING OF VAUGHN CREEK
BY HORIZONTAL DIRECTIONAL DRILLING

LOCATION: IRON COUNTY, WISCONSIN

DATE	CHECKED	APPROVED	SCALE	DRAWING LABEL	REVISION
01/30/20	KWW	JSP	SHOWN FOR D-SIZED PLOT	VAUGHN CREEK	P2

NO.	DATE	REVISION DESCRIPTION	BY	CHECK'D	APP.
P2	07/23/20	ADD GEOTECH & UPDATE BASE DATA	DLB	JDA	JSP
P1	06/24/20	ADJUST THE DESIGN TO THE NEW LINE 5 ALIGNMENT	DLB	CDS	JSP

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SHEET NUMBER
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