



Generated Output

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Project Summary

General:	CHPE HDD 59		
	P4A		
	Start Date: 06-07-2023		
	End Date: 06-07-2023		
Project Owner:	TDI		
Project Contractor:	Kiewit		
Project Consultant:	СНА		
Designer:	MDB		
	BCE		
	Amherst, MA		
Description:	HDD 59 Reversed Conduit 2 2-inch DR9		

Input Summary

Start Coordinate	(0.00, 0.00, 260.00) ft
End Coordinate	(1159.00, 0.00, 268.00) ft
Project Length	1159.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	2.375 in
Pipe DR	9.0
Pipe Thickness	0.26 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 2" (2.375") Pipe DR: 9 Pipe Length: 1170.00 ft Internal Pressure: 0 psi Borehole Diameter: 0.531000018119812 ft Silo Width: 0.531000018119812 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1200 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.5 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.3	23.2
Water Pressure	10.9	10.3
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.2	33.5
Deflection		
Earth Load Deflection	0.641	6.308
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.670	6.337
Compressive Stress [psi]		
Compressive Wall Stress	59.4	150.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1028.5	1028.5
Pullback Stress [psi]	587.6	587.6
Pullback Strain	1.022E-2	1.022E-2
Bending Stress [psi]	0.0	4.7
Bending Strain	0	8.247E-5
Tensile Stress [psi]	587.6	589.3
Tensile Strain	1.022E-2	1.033E-2

Net External Pressure = 24.1 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.670	7.5	11.2	OK
Unconstrained Collapse [psi]	23.5	130.1	5.5	OK
Compressive Wall Stress [psi]	59.4	1150.0	19.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	33.5	221.9	6.6	OK
Tensile Stress [psi]	589.3	1200.0	2.0	OK



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Project Summary

General:	CHPE HDD 59A P4A Start Date: 05-16-2023
	End Date: 05-16-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	MDB
	BCE
Description:	HDD 59A 8 -inch DR18 . Ballast Rollers PVC IPS pipe C1

Input Summary

Start Coordinate	(0.00, 0.00, 264.60) ft
End Coordinate	(1826.00, 0.00, 262.20) ft
Project Length	1826.00 ft
Pipe Type	PVC
OD Classification	IPS
Pipe OD	8.625 in
Pipe DR	18.0
Pipe Thickness	0.48 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 4

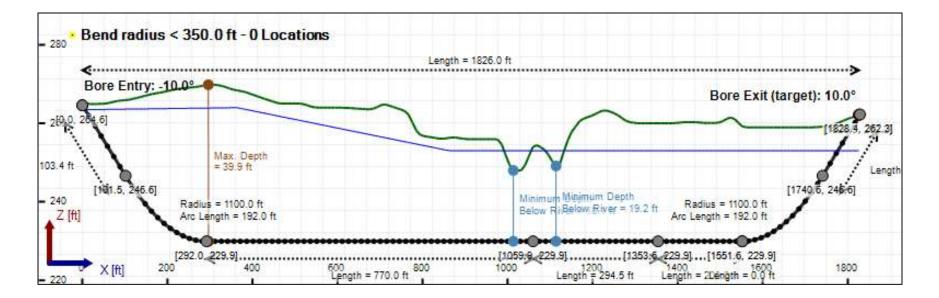
Soil Layer #1 USCS, Sand (S), SP From Assistant Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Clay (C), CL From Assistant Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 300.00, Coh: 5.10 [psi]

Soil Layer #3 USCS, Gravel (G), GM From Assistant Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

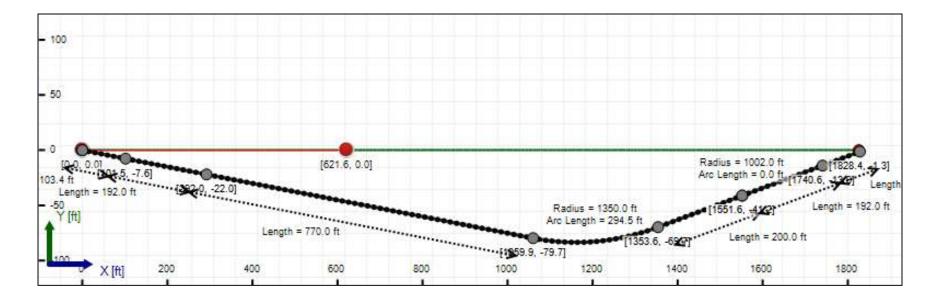
Soil Layer #4 Rock, Geological Classification, Sedimentary Rocks From Assistant Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 2000.00, Coh: 3000.00 [psi]

Bore Cross-Section View



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Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: PVC Classification: IPS Pipe OD: 8" (8.625") Pipe DR: 18 Pipe Length: 1845.00 ft Internal Pressure: 0 psi Borehole Diameter: 1.07799990971883 ft Silo Width: 1.07799990971883 ft Surface Surcharge: 0 psi Short Term Modulus: 400000 psi Long Term Modulus: 400000 psi Short Term Poisson Ratio: 0.38 Long Term Poisson Ratio: 0.38 Pipe Unit Weight: 87.40220 lb/ft3 Allowable Tensile Stress (Short Term): 2800 psi Allowable Tensile Stress (Long Term): 2800 psi Allowable Compressive Stress (Short Term): 3200 psi Allowable Compressive Stress (Long Term): 3200 psi Surface-pipe friction coefficient at entrance: 0.1 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	4.5	28.3
Water Pressure	14.8	14.7
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	19.3	43.0
Deflection		
Earth Load Deflection	0.857	5.208
Buoyant Deflection	0.060	0.060
Reissner Effect	0	0
Net Deflection	0.917	5.268
Compressive Stress [psi]		
Compressive Wall Stress	173.3	387.0

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	27818.0	27818.0
Pullback Stress [psi]	2268.6	2268.6
Pullback Strain	5.671E-3	5.671E-3
Bending Stress [psi]	0.0	143.5
Bending Strain	0	3.587E-4
Tensile Stress [psi]	2268.6	2391.0
Tensile Strain	5.671E-3	6.304E-3

Net External Pressure = 13.4 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 365.0 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.917	7.5	8.2	OK
Unconstrained Collapse [psi]	22.5	175.3	7.8	OK
Compressive Wall Stress [psi]	173.3	3200.0	18.5	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.060	7.5	125.5	OK
Unconstrained Collapse [psi]	17.5	141.2	8.1	OK
Tensile Stress [psi]	2391.0	2800.0	1.2	OK

Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	1998.702 psi	2018.341 psi
1	8.00 in	12.00 in	1996.917 psi	2017.976 psi
2	12.00 in	16.13 in	1994.331 psi	2017.447 psi

Note: The maximum bore pressures presented in this table are the maximum values along the length of the bore and not the maximum allowable at any point. The estimated maximum pressures should be compared to the estimated circulating pressures along the bore to determine potential locations of inadvertant returns.

Estimated Circulating Pressure Summary

Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

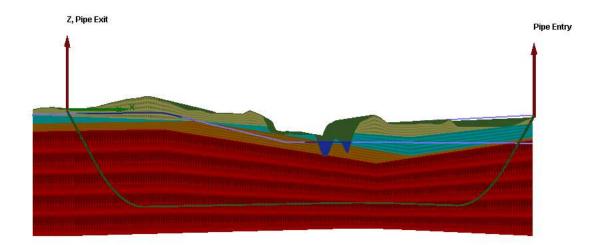
Flow Rate (Q): 40.00 US (liquid) gallon/min Drill Fluid Density: 68.700 lb/ft3 Rheological model: Power-Law

Fluid Consistency Index (K): 63.17

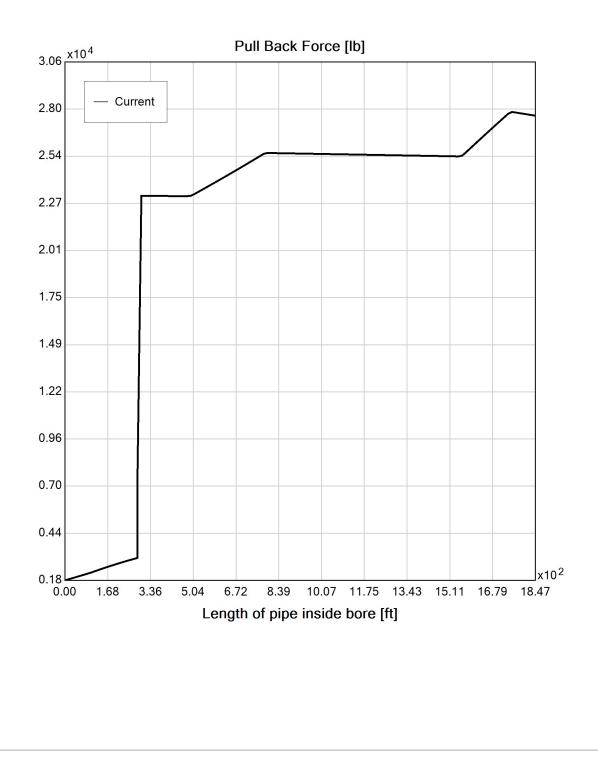
Power Law Exponent (n): 0.14

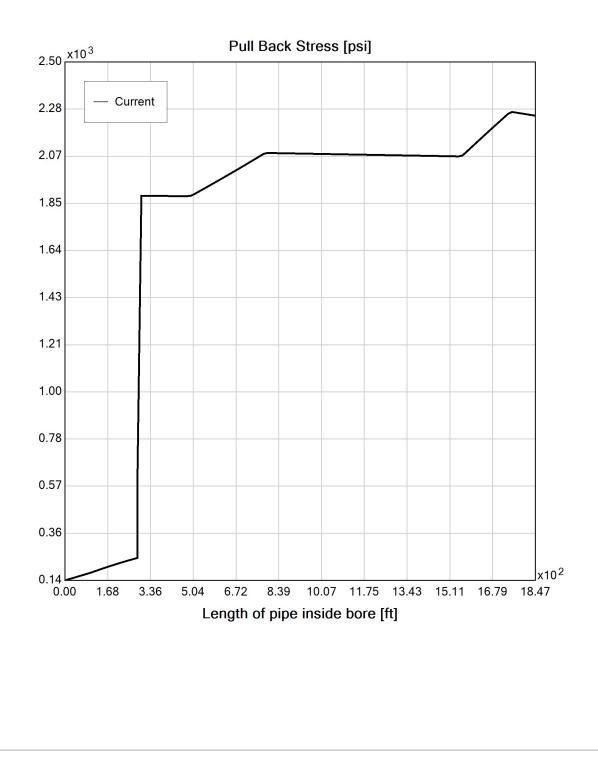
Effective Viscosity (cP): 859.3

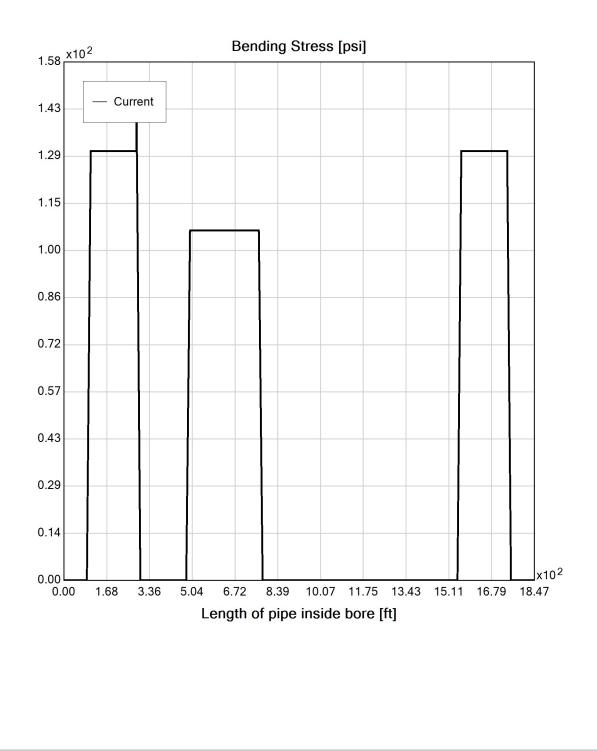
Virtual Site

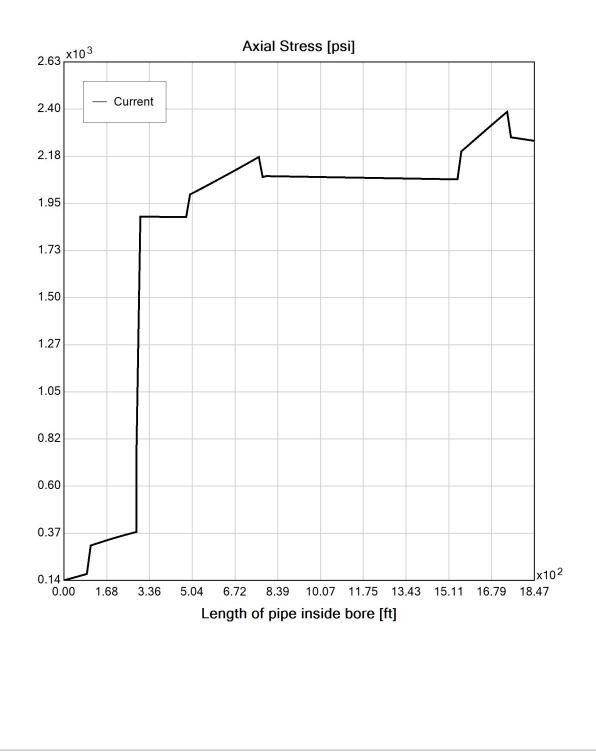


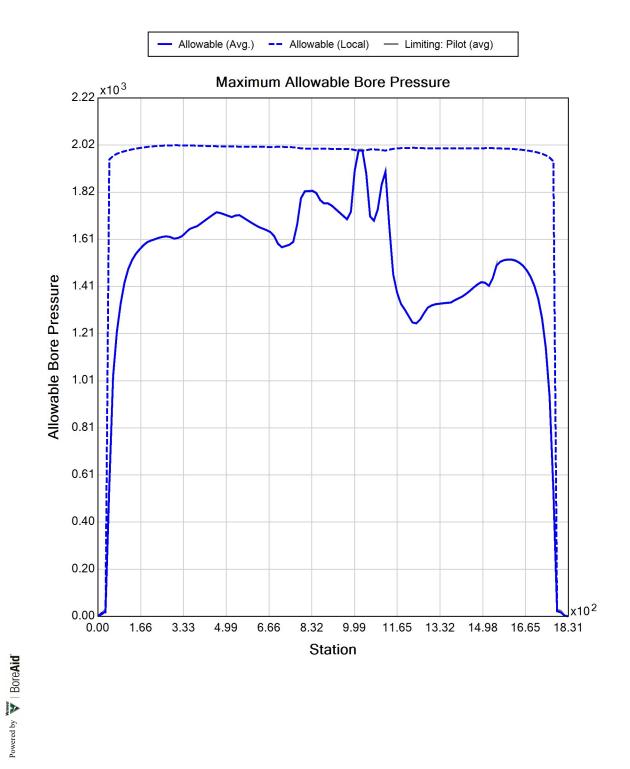


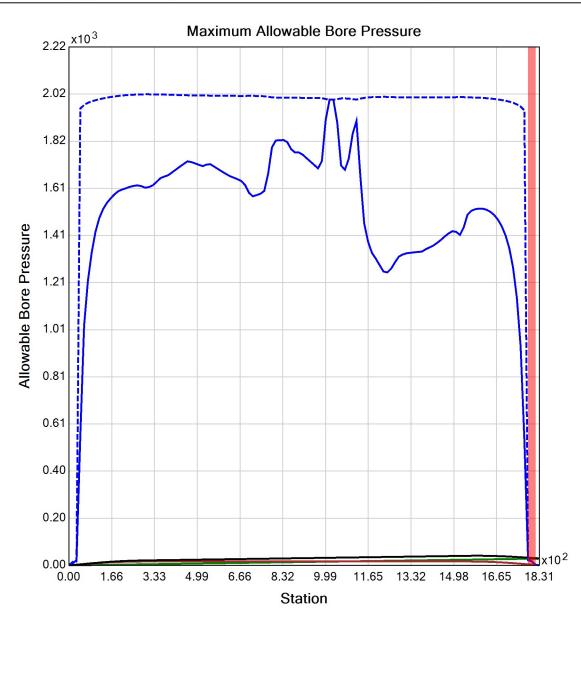












- Allowable (Avg.) -- Allowable (Local) -- Friction Loss -- Static -- Circulating ||||| Potential Hydrofracture Locations



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General:	CHPE HDD 59A
	P4A
	Start Date: 05-16-2023
	End Date: 05-16-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	MDB
	BCE
Description:	HDD 59A 3-inch DR7 HDPE Telecom Ballast Rollers C1

Input Summary

Start Coordinate	(0.00, 0.00, 264.60) ft
End Coordinate	(1826.00, 0.00, 262.20) ft
Project Length	1826.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	3.500 in
Pipe DR	7.0
Pipe Thickness	0.50 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 3" (3.5") Pipe DR: 7 Pipe Length: 1845.00 ft Internal Pressure: 0 psi Borehole Diameter: 0.625 ft Silo Width: 0.625 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1300 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.1 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.6	28.3
Water Pressure	14.8	14.7
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	17.4	43.0
Deflection		
Earth Load Deflection	0.320	3.248
Buoyant Deflection	0.020	0.020
Reissner Effect	0	0
Net Deflection	0.340	3.268
Compressive Stress [psi]		
Compressive Wall Stress	60.8	150.5

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	6325.1	6325.1
Pullback Stress [psi]	1342.2	1342.2
Pullback Strain	2.334E-2	2.334E-2
Bending Stress [psi]	0.0	8.4
Bending Strain	0	1.455E-4
Tensile Stress [psi]	1342.2	1345.5
Tensile Strain	2.334E-2	2.353E-2

Net External Pressure = 13.4 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 172.8 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.340	7.5	22.1	OK
Unconstrained Collapse [psi]	22.5	317.5	14.1	OK
Compressive Wall Stress [psi]	60.8	1150.0	18.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.010	7.5	756.1	OK
Unconstrained Collapse [psi]	17.5	403.1	23.0	OK
Tensile Stress [psi]	1345.5	1300.0	1.0	OK



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Project Summary

General:	CHPE HDD 59A
	P4A
	Start Date: 07-31-2023
	End Date: 07-31-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	MDB
	BCE
Description:	HDD 59A 8-inch DR18 . Ballast Rollers PVC pipe C2

Input Summary

Start Coordinate	(0.00, 0.00, 264.60) ft
End Coordinate	(1826.00, 0.00, 262.00) ft
Project Length	1826.00 ft
Pipe Type	PVC
OD Classification	IPS
Pipe OD	8.625 in
Pipe DR	18.0
Pipe Thickness	0.48 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 4

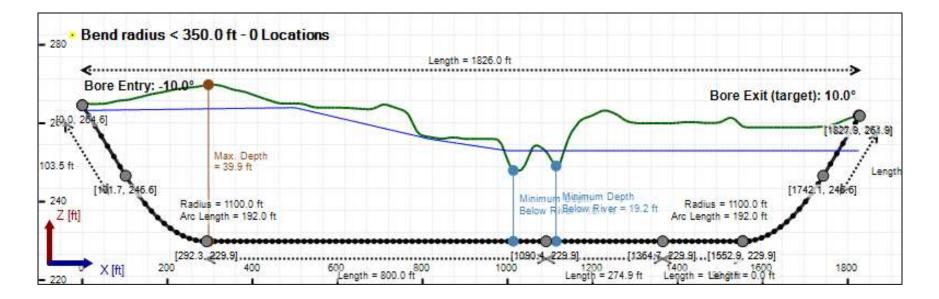
Soil Layer #1 USCS, Sand (S), SP From Assistant Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Clay (C), CL From Assistant Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 300.00, Coh: 5.10 [psi]

Soil Layer #3 USCS, Gravel (G), GM From Assistant Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

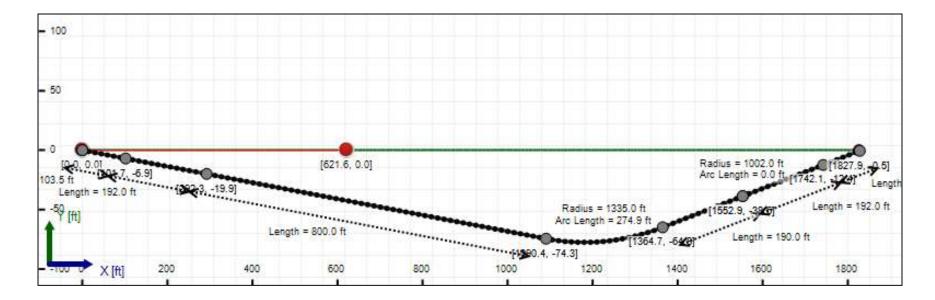
Soil Layer #4 Rock, Geological Classification, Sedimentary Rocks From Assistant Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 2000.00, Coh: 3000.00 [psi]

Bore Cross-Section View



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Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: PVC Classification: IPS Pipe OD: 8" (8.625") Pipe DR: 18 Pipe Length: 1845.14 ft Internal Pressure: 0 psi Borehole Diameter: 1.07799990971883 ft Silo Width: 1.07799990971883 ft Surface Surcharge: 0 psi Short Term Modulus: 400000 psi Long Term Modulus: 400000 psi Short Term Poisson Ratio: 0.38 Long Term Poisson Ratio: 0.38 Pipe Unit Weight: 87.40220 lb/ft3 Allowable Tensile Stress (Short Term): 2800 psi Allowable Tensile Stress (Long Term): 2800 psi Allowable Compressive Stress (Short Term): 3200 psi Allowable Compressive Stress (Long Term): 3200 psi Surface-pipe friction coefficient at entrance: 0.1 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	4.5	28.3
Water Pressure	14.8	14.7
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	19.3	43.0
Deflection		
Earth Load Deflection	0.850	5.214
Buoyant Deflection	0.060	0.060
Reissner Effect	0	0
Net Deflection	0.909	5.274
Compressive Stress [psi]		
Compressive Wall Stress	173.5	386.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	26935.3	26935.3
Pullback Stress [psi]	2196.6	2196.6
Pullback Strain	5.491E-3	5.491E-3
Bending Stress [psi]	0.0	143.5
Bending Strain	0	3.587E-4
Tensile Stress [psi]	2196.6	2319.4
Tensile Strain	5.491E-3	6.125E-3

Net External Pressure = 13.4 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 365.0 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.909	7.5	8.2	OK
Unconstrained Collapse [psi]	22.6	175.4	7.8	OK
Compressive Wall Stress [psi]	173.5	3200.0	18.4	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.060	7.5	125.5	OK
Unconstrained Collapse [psi]	17.5	143.0	8.2	OK
Tensile Stress [psi]	2319.4	2800.0	1.2	OK

Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	1998.953 psi	2018.295 psi
1	8.00 in	12.00 in	1997.308 psi	2017.931 psi
2	12.00 in	16.13 in	1994.922 psi	2017.402 psi

Note: The maximum bore pressures presented in this table are the maximum values along the length of the bore and not the maximum allowable at any point. The estimated maximum pressures should be compared to the estimated circulating pressures along the bore to determine potential locations of inadvertant returns.

Estimated Circulating Pressure Summary

Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

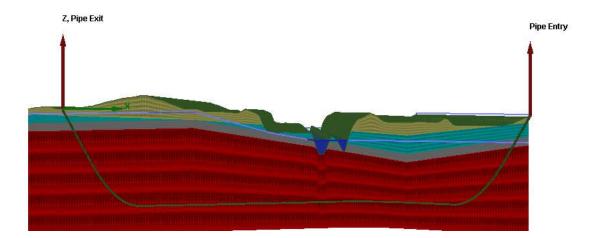
Flow Rate (Q): 40.00 US (liquid) gallon/min Drill Fluid Density: 68.700 lb/ft3 Rheological model: Power-Law

Fluid Consistency Index (K): 63.17

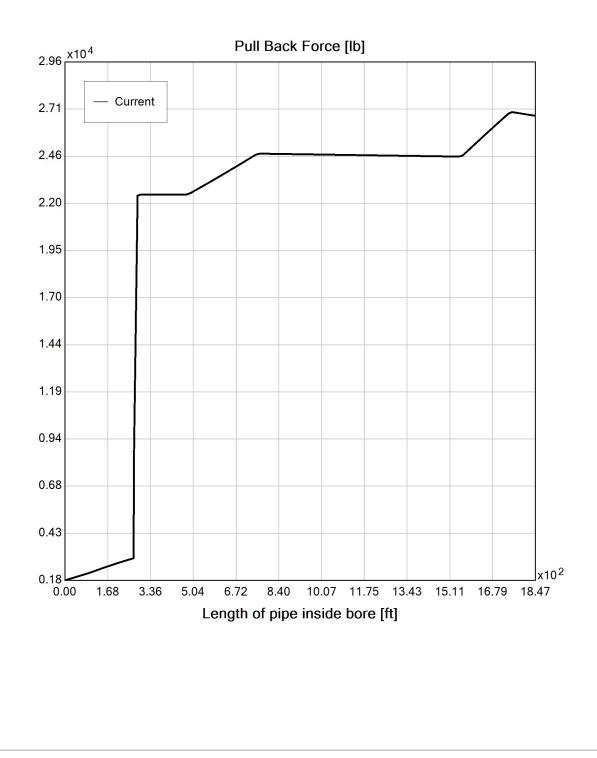
Power Law Exponent (n): 0.14

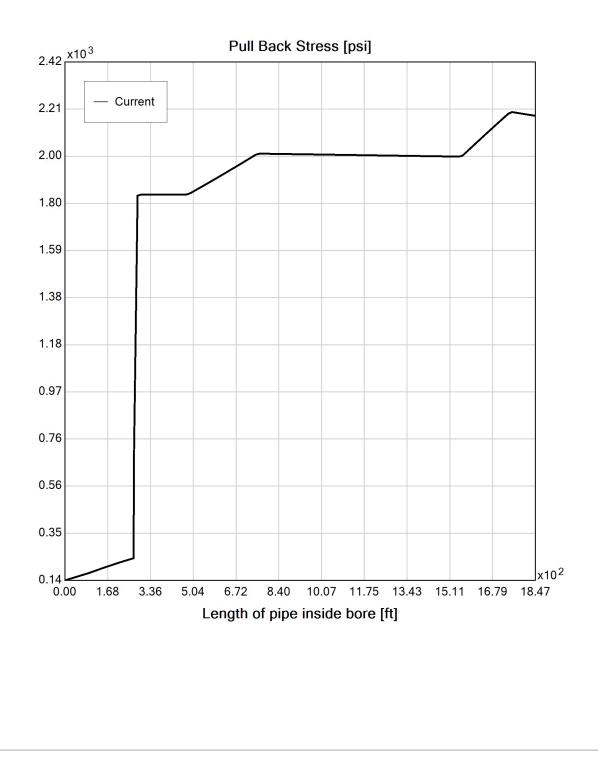
Effective Viscosity (cP): 859.3

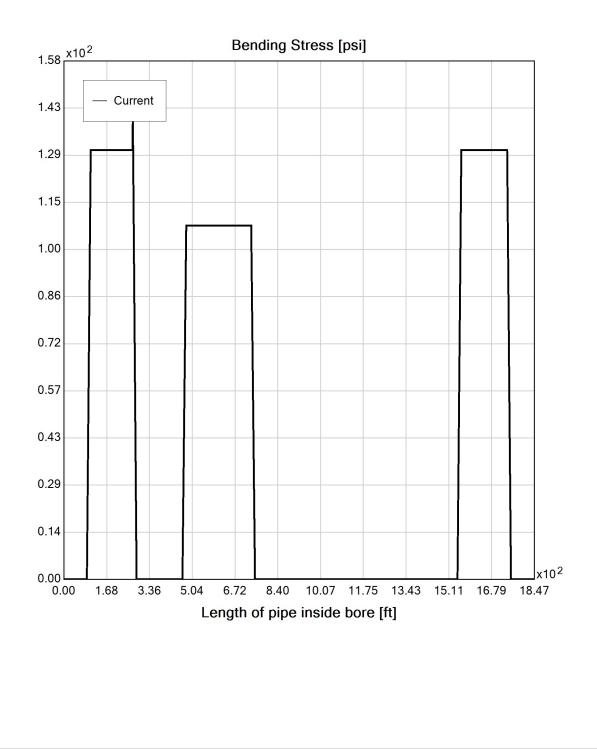
Virtual Site

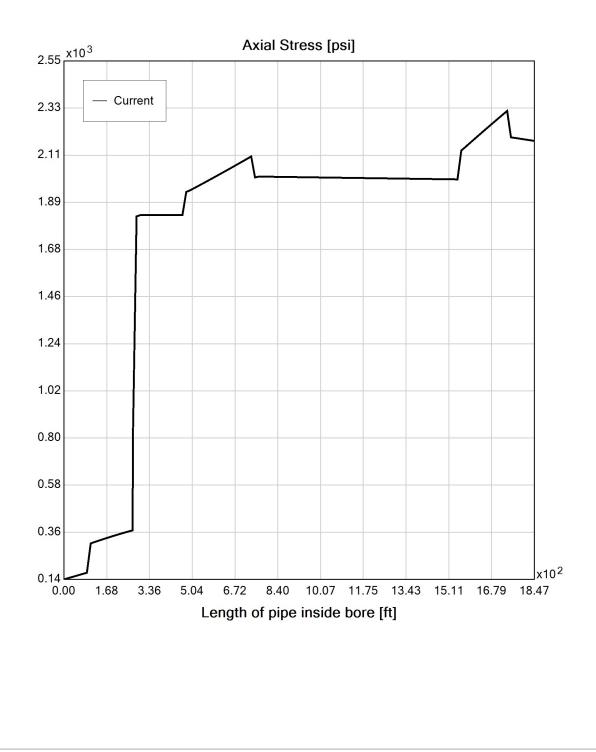


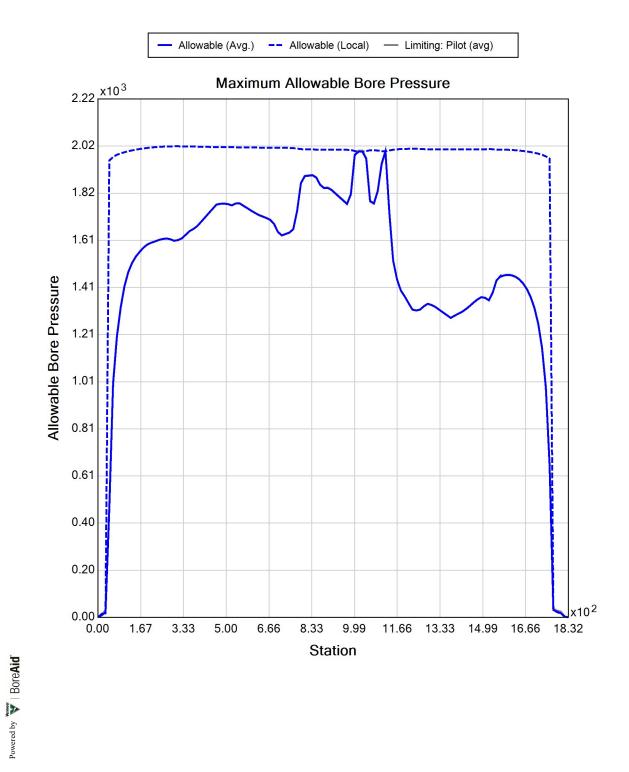


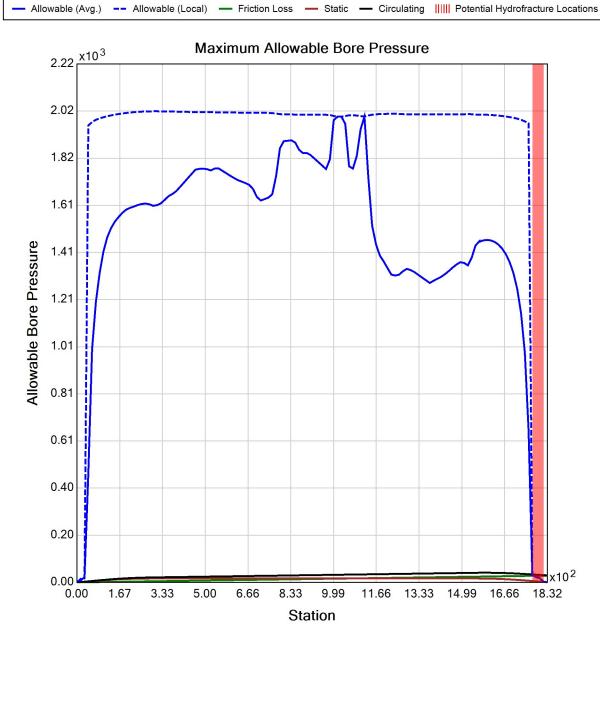














Generated Output

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Project Summary

General:	CHPE HDD 59A
	P4A
	Start Date: 07-31-2023
	End Date: 07-31-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	MDB
	BCE
Description:	HDD 59A 3-inch HDPE DR 7. Ballast Rollers C2

Input Summary

Start Coordinate	(0.00, 0.00, 264.60) ft
End Coordinate	(1826.00, 0.00, 262.00) ft
Project Length	1826.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	3.500 in
Pipe DR	7.0
Pipe Thickness	0.50 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 3" (3.5") Pipe DR: 7 Pipe Length: 1845.14 ft Internal Pressure: 0 psi Borehole Diameter: 0.625 ft Silo Width: 0.625 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1300 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.1 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.6	28.3
Water Pressure	14.8	14.7
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	17.4	43.0
Deflection		
Earth Load Deflection	0.320	3.252
Buoyant Deflection	0.020	0.020
Reissner Effect	0	0
Net Deflection	0.340	3.272
Compressive Stress [psi]		
Compressive Wall Stress	60.9	150.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	6134.7	6134.7
Pullback Stress [psi]	1301.8	1301.8
Pullback Strain	2.264E-2	2.264E-2
Bending Stress [psi]	0.0	8.4
Bending Strain	0	1.455E-4
Tensile Stress [psi]	1301.8	1305.4
Tensile Strain	2.264E-2	2.283E-2

Net External Pressure = 13.4 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 172.8 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.340	7.5	22.0	OK
Unconstrained Collapse [psi]	22.6	317.5	14.1	OK
Compressive Wall Stress [psi]	60.9	1150.0	18.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.010	7.5	756.1	OK
Unconstrained Collapse [psi]	17.5	410.9	23.5	OK
Tensile Stress [psi]	1305.4	1300.0	1.0	OK



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Project Summary

General:	CHPE HDD 59B	
	P4A	
	Start Date: 12-10-2021	
	End Date: 12-10-2021	
Project Owner:	TDI	
Project Contractor:	Kiewit	
Project Consultant:	CHA/BCE	
Designer:	AB	
	СНА	
Description:	HDD 59B 10-Inch DR 9 Conduit	

1

Input Summary

(0.00, 0.00, 252.00) ft
(830.00, 0.00, 241.00) ft
830.00 ft
HDPE
IPS
10.750 in
9.0
1.19 in
15.00 ft
3.5 in
(0.00, 0.00, 0.00) ft

Soil Summary

Number of Layers: 5

Soil Layer #1 USCS, Sand (S), SP From Assistant Unit Weight: 105.0000 (dry), 115.0000 (sat) [lb/ft3] Phi: 30.00, S.M.: 200.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SP From Assistant Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

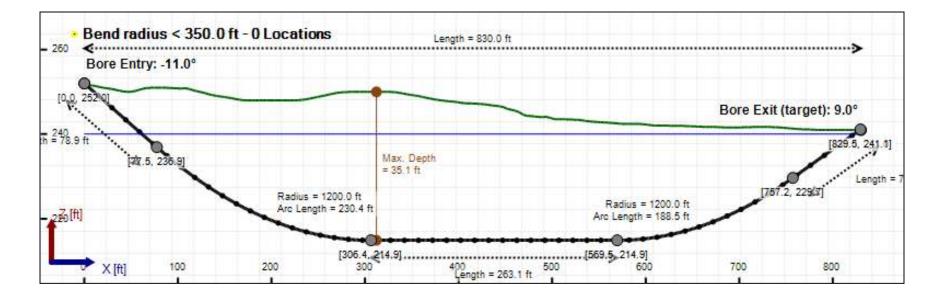
Soil Layer #3 USCS, Sand (S), SM From Assistant Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 500.00, Coh: 0.00 [psi]

Soil Layer #4 USCS, Gravel (G), GP From Assistant Unit Weight: 120.0000 (dry), 140.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

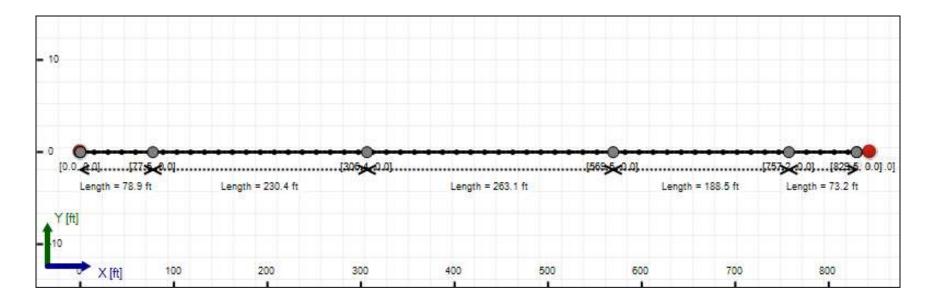
Soil Layer #5 Rock, Geological Classification, Sedimentary Rocks From Assistant Unit Weight: 160.0000 (dry), 170.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 2000.00, Coh: 3000.00 [psi]

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Bore Cross-Section View







Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 840.00 ft Internal Pressure: 0 psi Borehole Diameter: 1.34400002161662 ft Silo Width: 1.34400002161662 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1200 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.5 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	5.5	24.7
Water Pressure	10.9	10.9
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.4	35.6
Deflection		
Earth Load Deflection	1.503	6.732
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.635	6.864
Compressive Stress [psi]		
Compressive Wall Stress	73.6	160.1

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	13429.5	13429.5
Pullback Stress [psi]	374.5	374.5
Pullback Strain	6.514E-3	6.514E-3
Bending Stress [psi]	0.0	21.5
Bending Strain	0	3.733E-4
Tensile Stress [psi]	374.5	395.0
Tensile Strain	6.514E-3	7.244E-3

Net External Pressure = 19.3 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.635	7.5	4.6	OK
Unconstrained Collapse [psi]	24.1	119.4	4.9	OK
Compressive Wall Stress [psi]	73.6	1150.0	15.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	34.1	233.9	6.9	OK
Tensile Stress [psi]	395.0	1200.0	3.0	OK

Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	1423.736 psi	2011.084 psi
1	8.00 in	12.00 in	1423.200 psi	2010.611 psi
2	12.00 in	16.13 in	1422.424 psi	2009.924 psi

Note: The maximum bore pressures presented in this table are the maximum values along the length of the bore and not the maximum allowable at any point. The estimated maximum pressures should be compared to the estimated circulating pressures along the bore to determine potential locations of inadvertant returns.

Estimated Circulating Pressure Summary

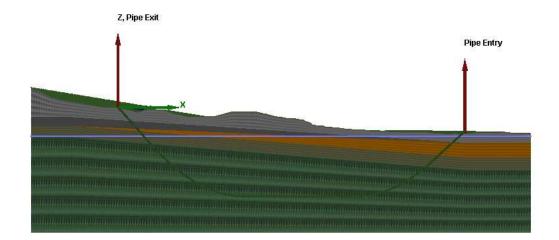
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

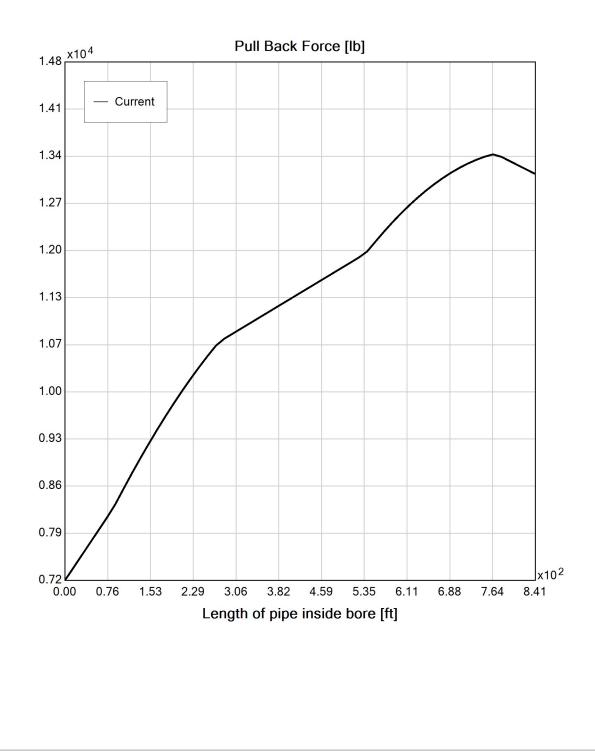
Yield Point (YP): 16.49

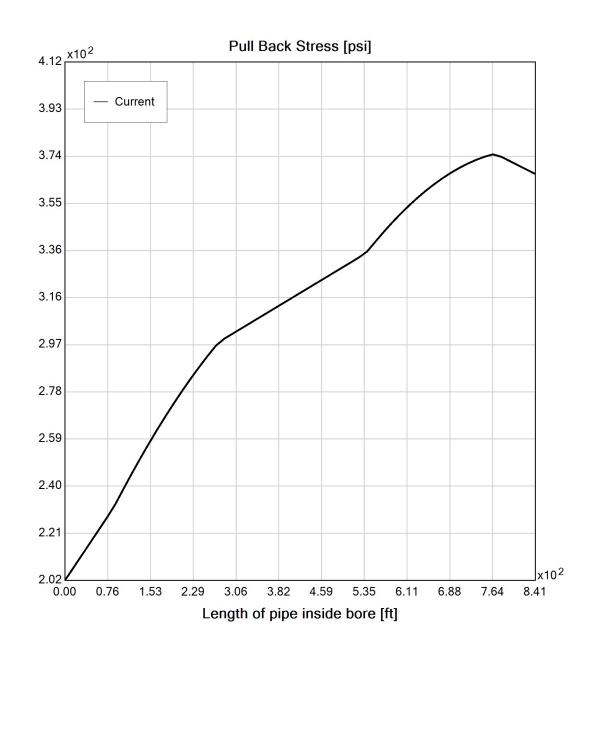
Effective Viscosity (cP): 1202.0

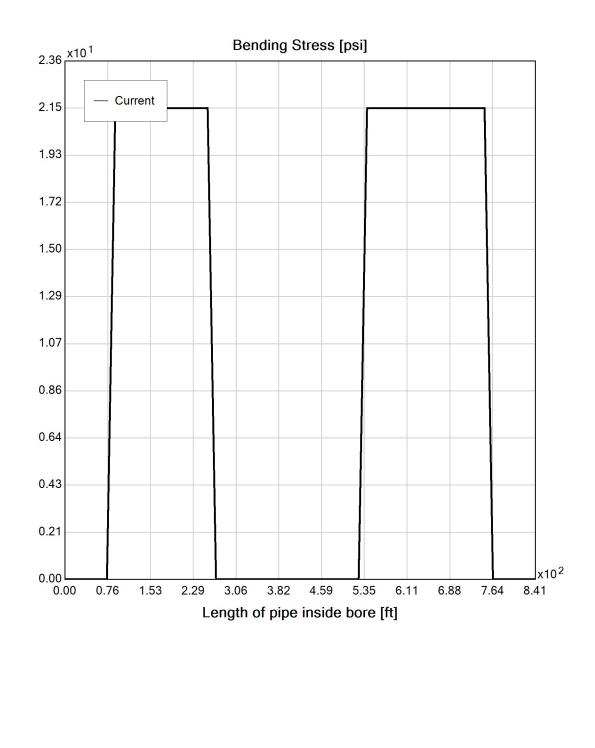
Virtual Site

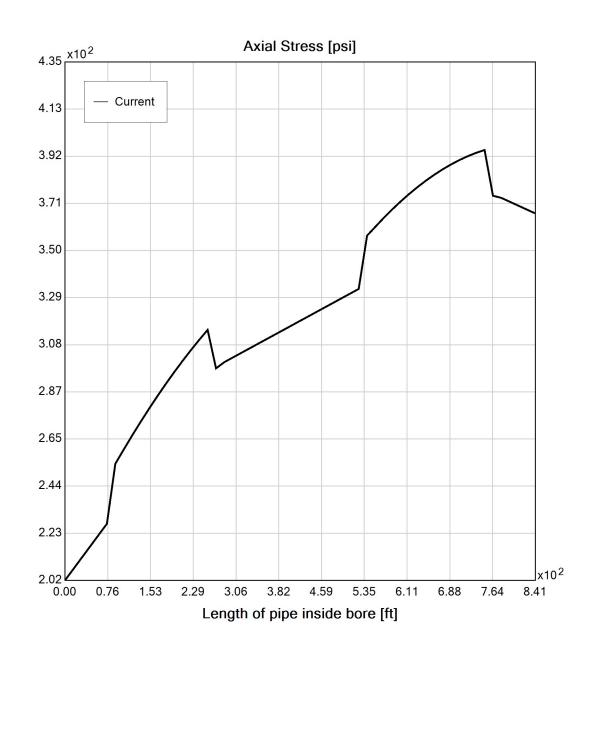


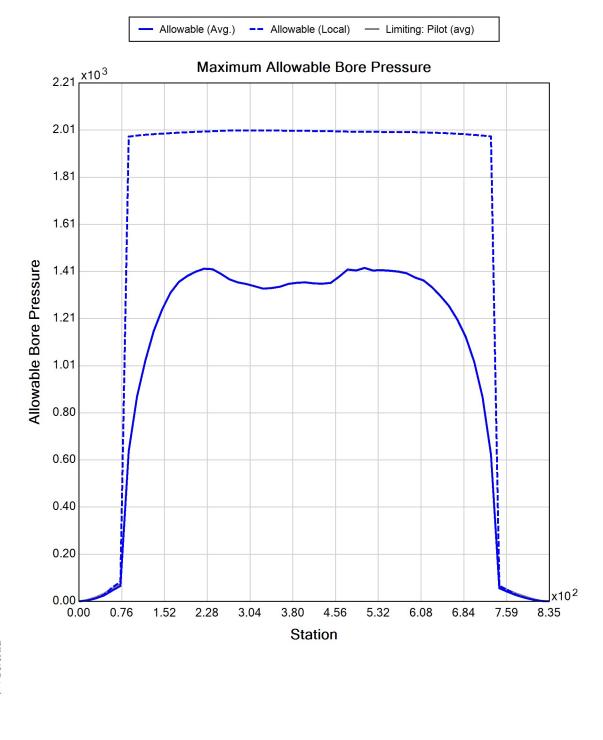


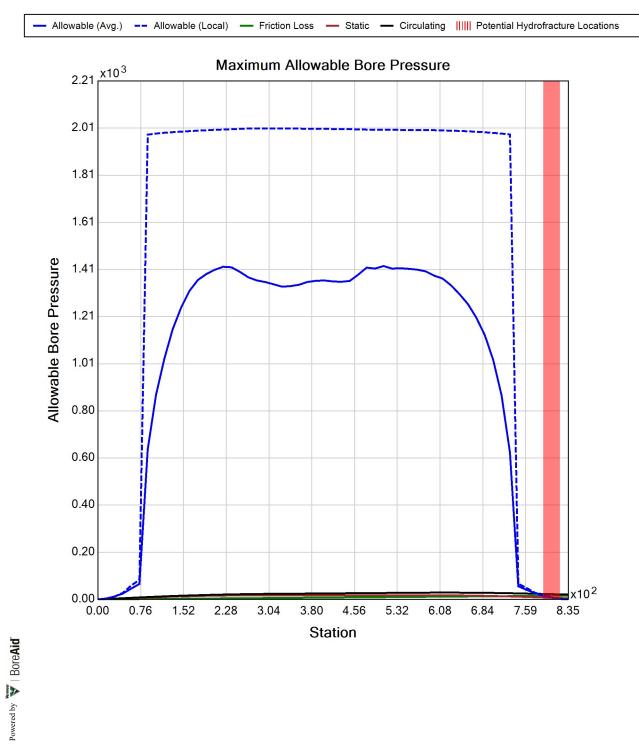














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Project Summary

General:	CHPE HDD 59B		
	P4A		
	Start Date: 12-10-2021		
	End Date: 12-10-2021		
Project Owner:	TDI		
Project Contractor:	Kiewit		
Project Consultant:	CHA/BCE		
Designer:	AB		
	CHA		
Description:	HDD 59B 2-Inch DR 9 Conduit 1		

Input Summary

Start Coordinate	(0.00, 0.00, 252.00) ft
End Coordinate	(830.00, 0.00, 241.00) ft
Project Length	830.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	2.375 in
Pipe DR	9.0
Pipe Thickness	0.26 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 2" (2.375") Pipe DR: 9 Pipe Length: 840.00 ft Internal Pressure: 0 psi Borehole Diameter: 0.531000018119812 ft Silo Width: 0.531000018119812 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1200 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.5 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.2	24.7
Water Pressure	10.9	10.9
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	13.1	35.6
Deflection		
Earth Load Deflection	0.608	6.732
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.637	6.761
Compressive Stress [psi]		
Compressive Wall Stress	58.8	160.1

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	765.1	765.1
Pullback Stress [psi]	437.1	437.1
Pullback Strain	7.603E-3	7.603E-3
Bending Stress [psi]	0.0	4.7
Bending Strain	0	8.247E-5
Tensile Stress [psi]	437.1	440.9
Tensile Strain	7.603E-3	7.751E-3

Net External Pressure = 19.3 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.637	7.5	11.8	OK
Unconstrained Collapse [psi]	24.1	130.6	5.4	OK
Compressive Wall Stress [psi]	58.8	1150.0	19.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	34.1	231.9	6.8	OK
Tensile Stress [psi]	440.9	1200.0	2.7	OK



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Project Summary

General:	CHPE HDD 60		
	P4A		
	Start Date: 06-07-2023		
	End Date: 06-07-2023		
Project Owner:	TDI		
Project Contractor:	Kiewit		
Project Consultant:	СНА		
Designer:	MDB		
	BCE		
	Amherst, MA		
Description:	HDD 60 Reversed Conduit 1 10-inch DR9 ALT		

Input Summary

0.00, 0.00, 231.00) ft
1335.00, 0.00, 235.00) ft
335.00 ft
IDPE
PS
0.750 in
0.0
.19 in
5.00 ft
5.5 in
0.00, 0.00, 0.00) ft
1 H ())

Soil Summary

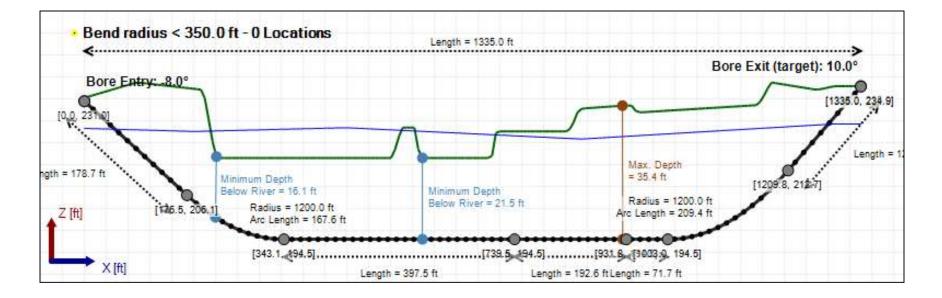
Number of Layers: 3

Soil Layer #1 USCS, Sand (S), SM From Assistant Unit Weight: 105.0000 (dry), 132.8832 (sat) [lb/ft3] Phi: 30.00, S.M.: 200.00, Coh: 0.00 [psi]

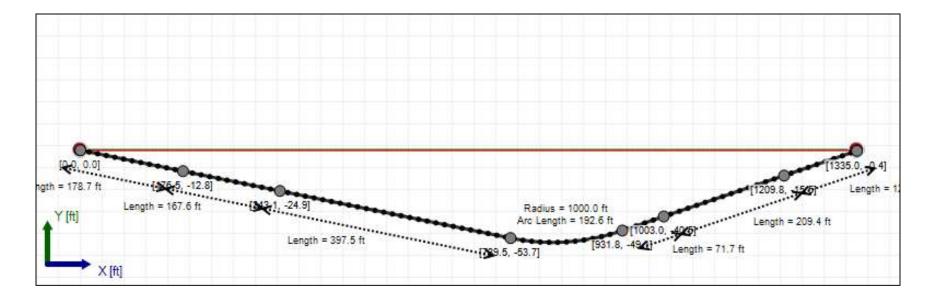
Soil Layer #2 USCS, Clay (C), CH From Assistant Unit Weight: 80.0000 (dry), 110.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 300.00, Coh: 5.50 [psi]

Soil Layer #3 USCS, Sand (S), SM From Assistant Unit Weight: 130.0000 (dry), 140.0000 (sat) [lb/ft3] Phi: 37.00, S.M.: 1000.00, Coh: 0.00 [psi]

Bore Cross-Section View



Bore Plan View



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Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 1350.00 ft Internal Pressure: 0 psi Borehole Diameter: 1.34400002161662 ft Silo Width: 1.34400002161662 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1200 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.5 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	4.8	22.1
Water Pressure	12.1	11.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	16.9	33.9
Deflection		
Earth Load Deflection	1.354	6.005
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.486	6.137
Compressive Stress [psi]		
Compressive Wall Stress	76.2	152.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	22473.1	22473.1
Pullback Stress [psi]	626.7	626.7
Pullback Strain	1.090E-2	1.090E-2
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	626.7	646.5
Tensile Strain	1.090E-2	1.162E-2

Net External Pressure = 28.0 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.486	7.5	5.0	OK
Unconstrained Collapse [psi]	26.8	120.9	4.5	OK
Compressive Wall Stress [psi]	76.2	1150.0	15.1	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	36.8	217.4	5.9	OK
Tensile Stress [psi]	646.5	1200.0	1.9	OK

Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	190.031 psi	190.031 psi
1	8.00 in	12.00 in	188.810 psi	188.810 psi
2	12.00 in	16.13 in	187.092 psi	187.092 psi

Note: The maximum bore pressures presented in this table are the maximum values along the length of the bore and not the maximum allowable at any point. The estimated maximum pressures should be compared to the estimated circulating pressures along the bore to determine potential locations of inadvertant returns.

Estimated Circulating Pressure Summary

Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

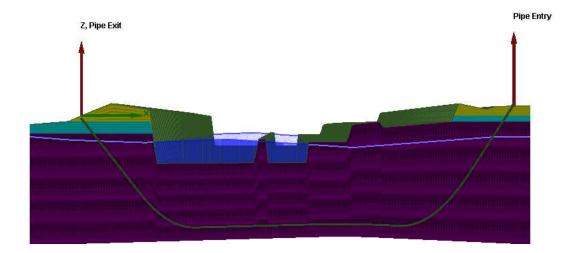
Flow Rate (Q): 120.00 US (liquid) gallon/min Drill Fluid Density: 68.700 lb/ft3 Rheological model: Bingham-Plastic

Plastic Viscosity (PV): 25.53

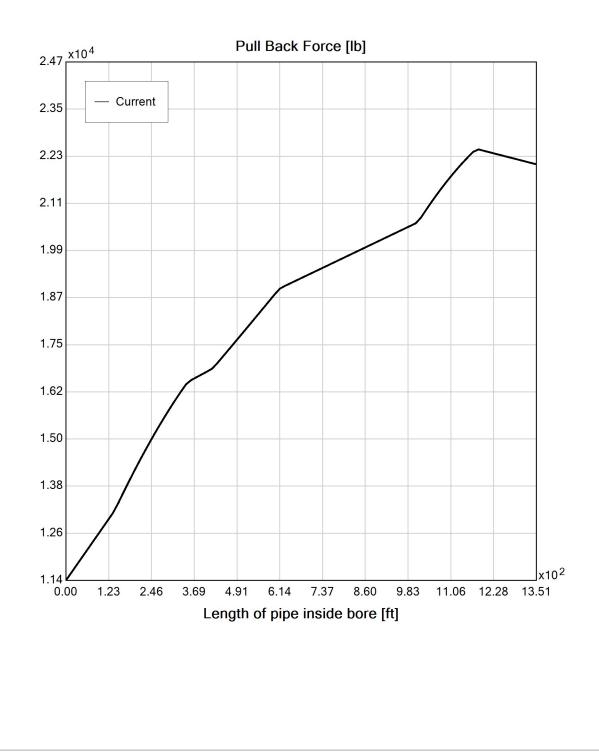
Yield Point (YP): 16.49

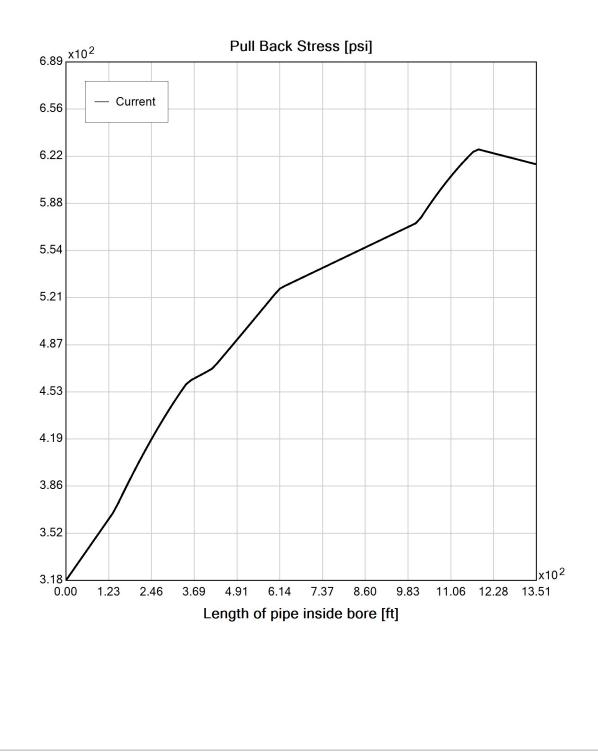
Effective Viscosity (cP): 417.7

Virtual Site

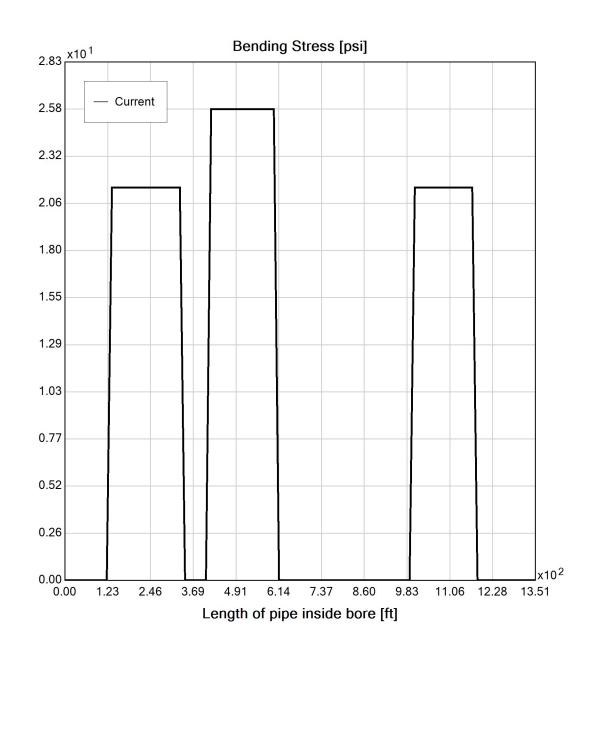




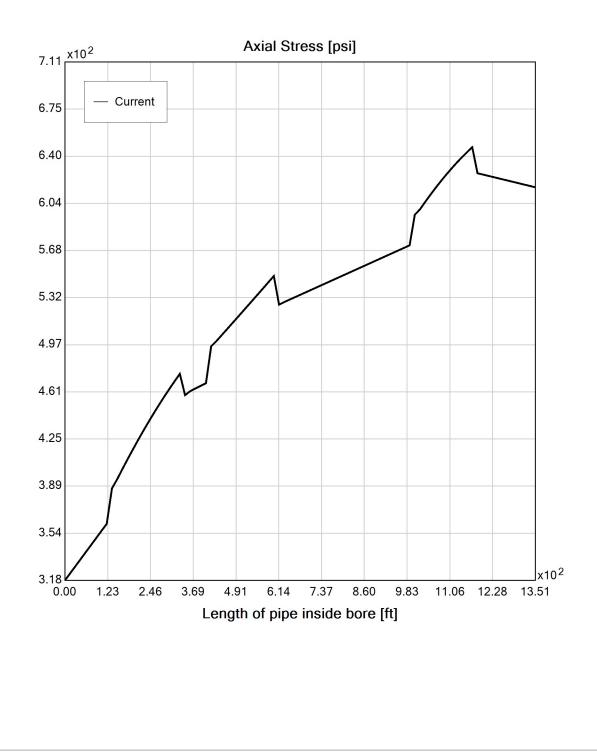




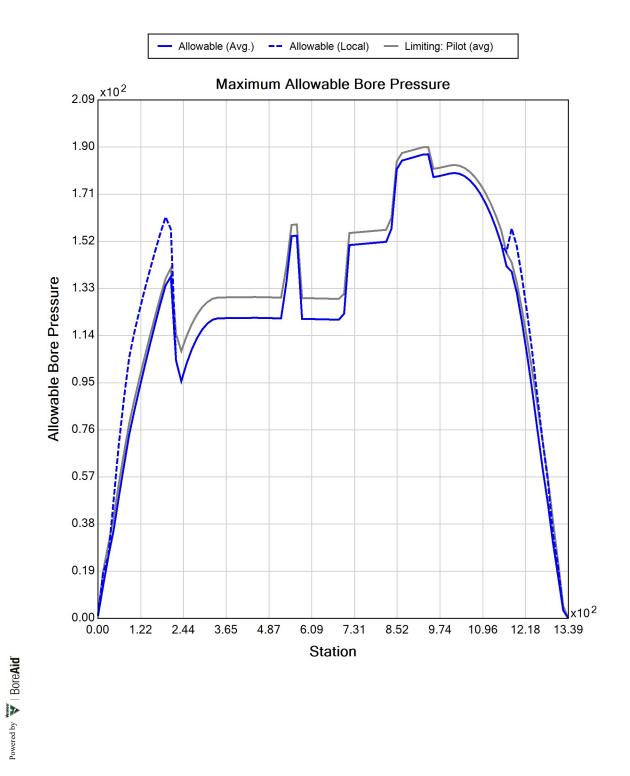
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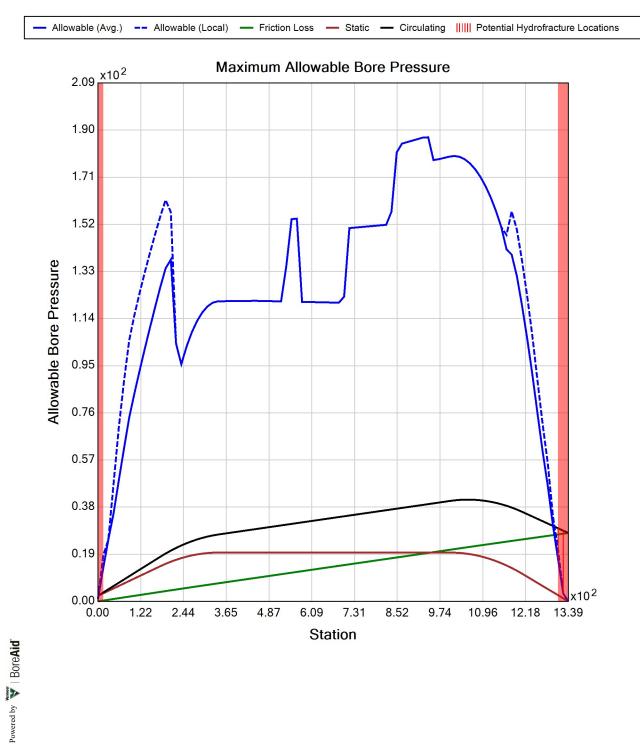


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Generated Output

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Project Summary

General:	CHPE HDD 60
	P4A
	Start Date: 06-07-2023
	End Date: 06-07-2023
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	СНА
Designer:	MDB
	BCE
	Amherst, MA
Description:	HDD 60 Reversed Conduit 1 2-inch DR9 ALT

Input Summary

Start Coordinate	(0.00, 0.00, 231.00) ft
End Coordinate	(1335.00, 0.00, 235.00) ft
Project Length	1335.00 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	2.375 in
Pipe DR	9.0
Pipe Thickness	0.26 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 2" (2.375") Pipe DR: 9 Pipe Length: 1350.00 ft Internal Pressure: 0 psi Borehole Diameter: 0.531000018119812 ft Silo Width: 0.531000018119812 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1200 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.5 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	1.7	22.1
Water Pressure	12.8	11.8
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	14.5	33.9
Deflection		
Earth Load Deflection	0.600	6.005
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.629	6.035
Compressive Stress [psi]		
Compressive Wall Stress	65.3	152.6

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	1206.5	1206.5
Pullback Stress [psi]	689.4	689.4
Pullback Strain	1.199E-2	1.199E-2
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	689.4	692.4
Tensile Strain	1.199E-2	1.212E-2

Net External Pressure = 28.0 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.629	7.5	11.9	OK
Unconstrained Collapse [psi]	26.8	131.2	4.9	OK
Compressive Wall Stress [psi]	65.3	1150.0	17.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	36.8	214.9	5.8	OK
Tensile Stress [psi]	692.4	1200.0	1.7	OK



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Project Summary

General:	HDD #61
	P4A
	Start Date: 12-10-2021
	End Date: 12-10-2021
Project Owner:	TDI
Project Contractor:	Kiewit
Project Consultant:	CHA/BCE
Designer:	
Description:	HDD 61 10-inch DR 9

Input Summary

Start Coordinate	(0.00, 0.00, 233.50) ft
End Coordinate	(684.50, 0.00, 233.00) ft
Project Length	684.50 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	10.750 in
Pipe DR	9.0
Pipe Thickness	1.19 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Soil Summary

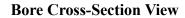
Number of Layers: 4

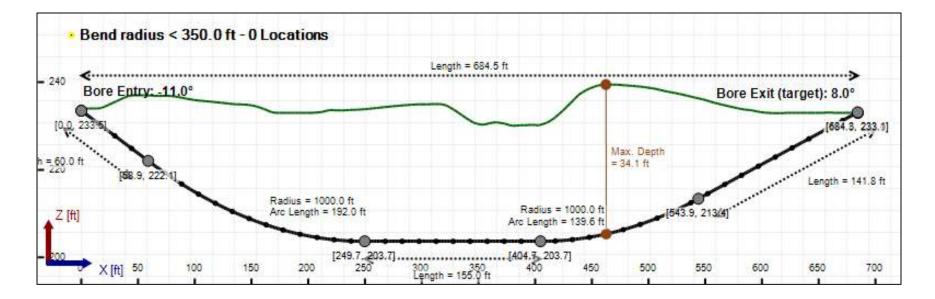
Soil Layer #1 USCS, Sand (S), SP From Assistant Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

Soil Layer #2 USCS, Sand (S), SM From Assistant Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]

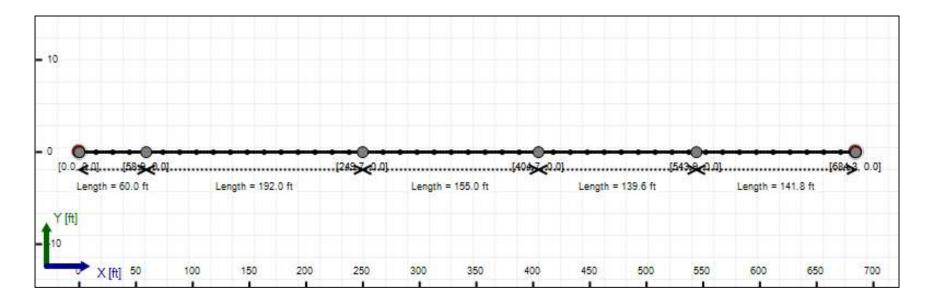
Soil Layer #3 USCS, Clay (C), CL From Assistant Unit Weight: 70.0000 (dry), 100.0000 (sat) [lb/ft3] Phi: 0.00, S.M.: 145.00, Coh: 3.13 [psi]

Soil Layer #4 USCS, Sand (S), SM From Assistant Unit Weight: 110.0000 (dry), 125.0000 (sat) [lb/ft3] Phi: 34.00, S.M.: 145.00, Coh: 0.00 [psi]









Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 10" (10.75") Pipe DR: 9 Pipe Length: 690.00 ft Internal Pressure: 0 psi Borehole Diameter: 1.34400002161662 ft Silo Width: 1.34400002161662 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1200 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.5 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	5.9	26.1
Water Pressure	0.0	0.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	5.9	26.1
Deflection		
Earth Load Deflection	1.597	7.097
Buoyant Deflection	0.132	0.132
Reissner Effect	0	0
Net Deflection	1.729	7.229
Compressive Stress [psi]		
Compressive Wall Stress	26.4	117.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	11519.5	11519.5
Pullback Stress [psi]	321.3	321.3
Pullback Strain	5.587E-3	5.587E-3
Bending Stress [psi]	0.0	25.8
Bending Strain	0	4.479E-4
Tensile Stress [psi]	321.3	345.8
Tensile Strain	5.587E-3	6.462E-3

Net External Pressure = 17.4 [psi] Buoyant Deflection = 0.1 Hydrokinetic Force = 567.6 lb

In-service Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	1.729	7.5	4.3	OK
Unconstrained Collapse [psi]	19.4	119.1	6.1	OK
Compressive Wall Stress [psi]	26.4	1150.0	43.6	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.065	7.5	115.8	OK
Unconstrained Collapse [psi]	29.3	236.6	8.1	OK
Tensile Stress [psi]	345.8	1200.0	3.5	OK

Maximum Allowable Bore Pressure Summary

Ream Number	Initial Diameter	Final Diameter	Estimated Maximum Pressure (Avg.)	Estimated Maximum Pressure (Local)
Pilot Bore	0.00 in	8.00 in	92.554 psi	92.554 psi
1	8.00 in	12.00 in	92.466 psi	92.466 psi
2	12.00 in	16.13 in	92.338 psi	92.338 psi

Note: The maximum bore pressures presented in this table are the maximum values along the length of the bore and not the maximum allowable at any point. The estimated maximum pressures should be compared to the estimated circulating pressures along the bore to determine potential locations of inadvertant returns.

Estimated Circulating Pressure Summary

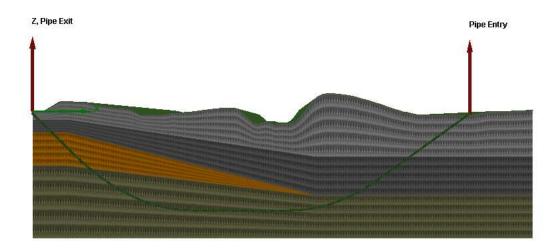
Active	Shear Rate [rpm]	Shear Stress [Fann Degrees]
No	600	37
No	300	32
No	200	29
Yes	100	25
Yes	6	17
No	3	15

Flow Rate (Q): 40.00 US (liquid) gallon/minDrill Fluid Density: 68.700 lb/ft3Rheological model: Bingham-PlasticPlastic Viscosity (PV): 25.53

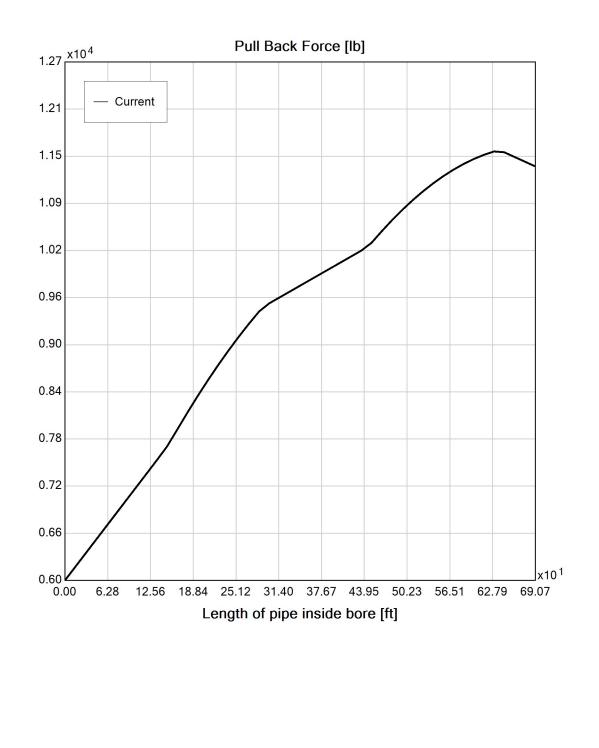
Yield Point (YP): 16.49

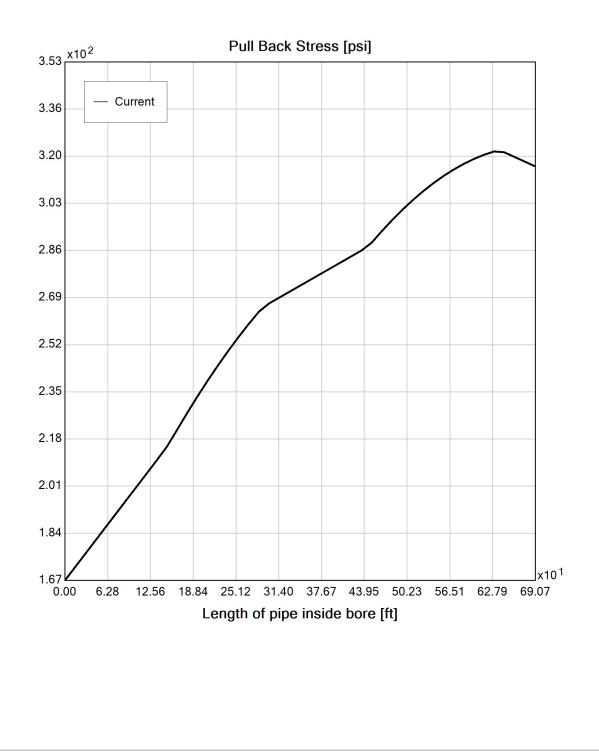
Effective Viscosity (cP): 1202.0

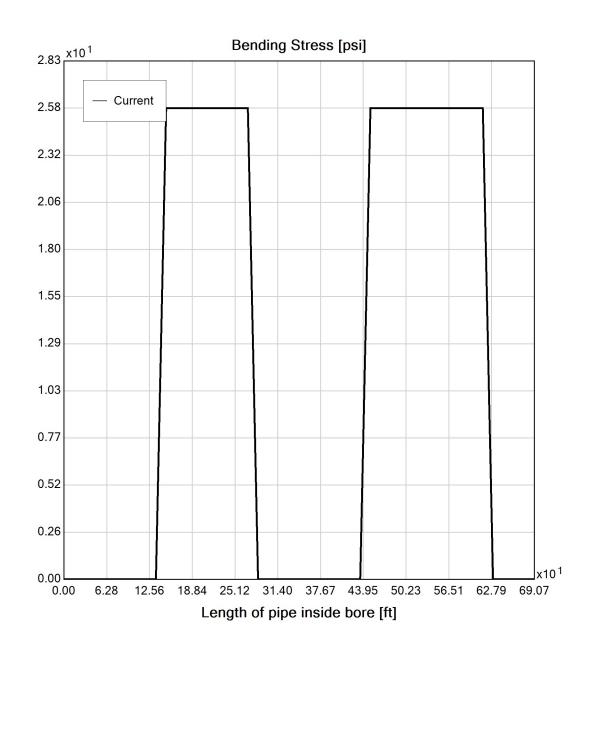
Virtual Site

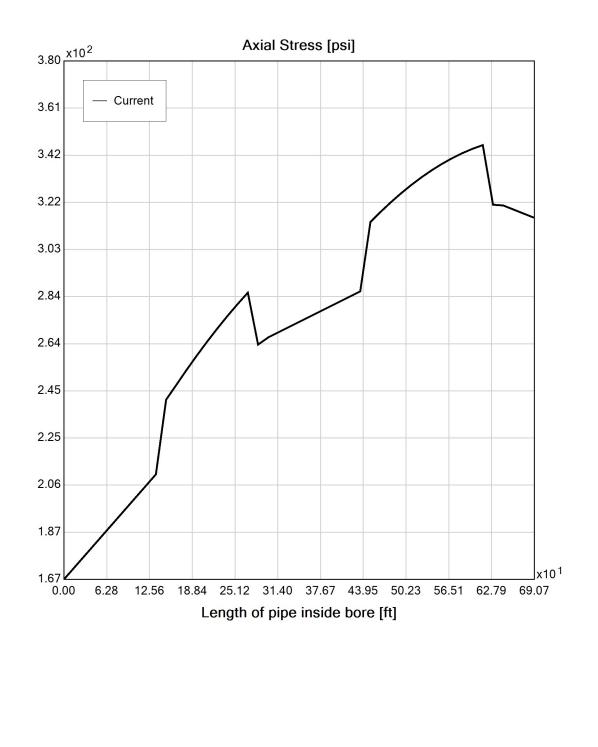


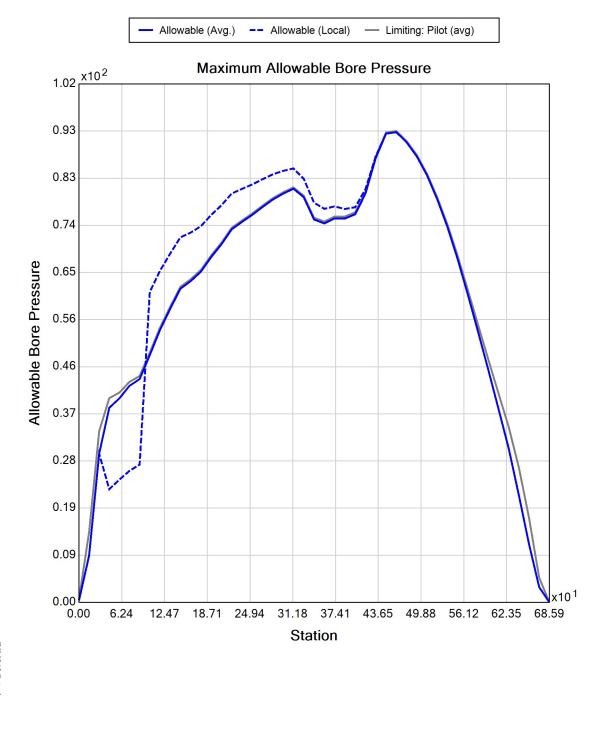


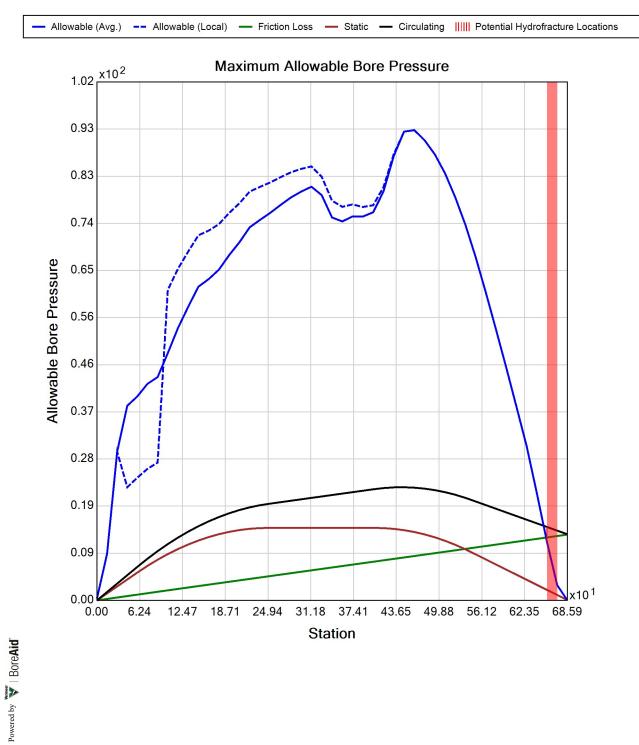














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Project Contractor:	Kiewit	
Project Consultant:	CHA/BCE	
Designer:		
Description:	HDD 61 2-inch DR 9	

Input Summary

Start Coordinate	(0.00, 0.00, 233.50) ft
End Coordinate	(684.50, 0.00, 233.00) ft
Project Length	684.50 ft
Pipe Type	HDPE
OD Classification	IPS
Pipe OD	2.375 in
Pipe DR	9.0
Pipe Thickness	0.26 in
Rod Length	15.00 ft
Rod Diameter	3.5 in
Drill Rig Location	(0.00, 0.00, 0.00) ft

Load Verifier Input Summary:

Pipe Application: Electrical Cable Pipe Type: HDPE Classification: IPS Pipe OD: 2" (2.375") Pipe DR: 9 Pipe Length: 690.00 ft Internal Pressure: 0 psi Borehole Diameter: 0.531000018119812 ft Silo Width: 0.531000018119812 ft Surface Surcharge: 0 psi Short Term Modulus: 57500 psi Long Term Modulus: 28200 psi Short Term Poisson Ratio: 0.35 Long Term Poisson Ratio: 0.45 Pipe Unit Weight: 59.30500 lb/ft3 Allowable Tensile Stress (Short Term): 1200 psi Allowable Tensile Stress (Long Term): 1100 psi Allowable Compressive Stress (Short Term): 1150 psi Allowable Compressive Stress (Long Term): 1150 psi Surface-pipe friction coefficient at entrance: 0.5 Surface-pipe friction coefficient in borehole: 0.3 Pipe-soil friction angle: 30 Slurry Unit Weight: 93.64118 lb/ft3 Hydrokinetic Pressure: 10 psi Ballast Unit Weight: 62.42746 lb/ft3

In-service Load Summary:

Pressure [psi]	Deformed	Collapsed
Earth Pressure	2.3	26.1
Water Pressure	0.0	0.0
Surface Surcharge	0.0	0.0
Internal Pressure	0.0	0.0
Net Pressure	2.3	26.1
Deflection		
Earth Load Deflection	0.639	7.097
Buoyant Deflection	0.029	0.029
Reissner Effect	0	0
Net Deflection	0.668	7.126
Compressive Stress [psi]		
Compressive Wall Stress	10.6	117.3

Installation Load Summary:

Forces/Stresses	@Maximum Force	Absolute Maximum
Pullback Force [lb]	671.9	671.9
Pullback Stress [psi]	383.9	383.9
Pullback Strain	6.676E-3	6.676E-3
Bending Stress [psi]	0.0	5.7
Bending Strain	0	9.896E-5
Tensile Stress [psi]	383.9	388.3
Tensile Strain	6.676E-3	6.853E-3

Net External Pressure = 17.4 [psi] Buoyant Deflection = 0.0 Hydrokinetic Force = 137.3 lb

In-service Analysis

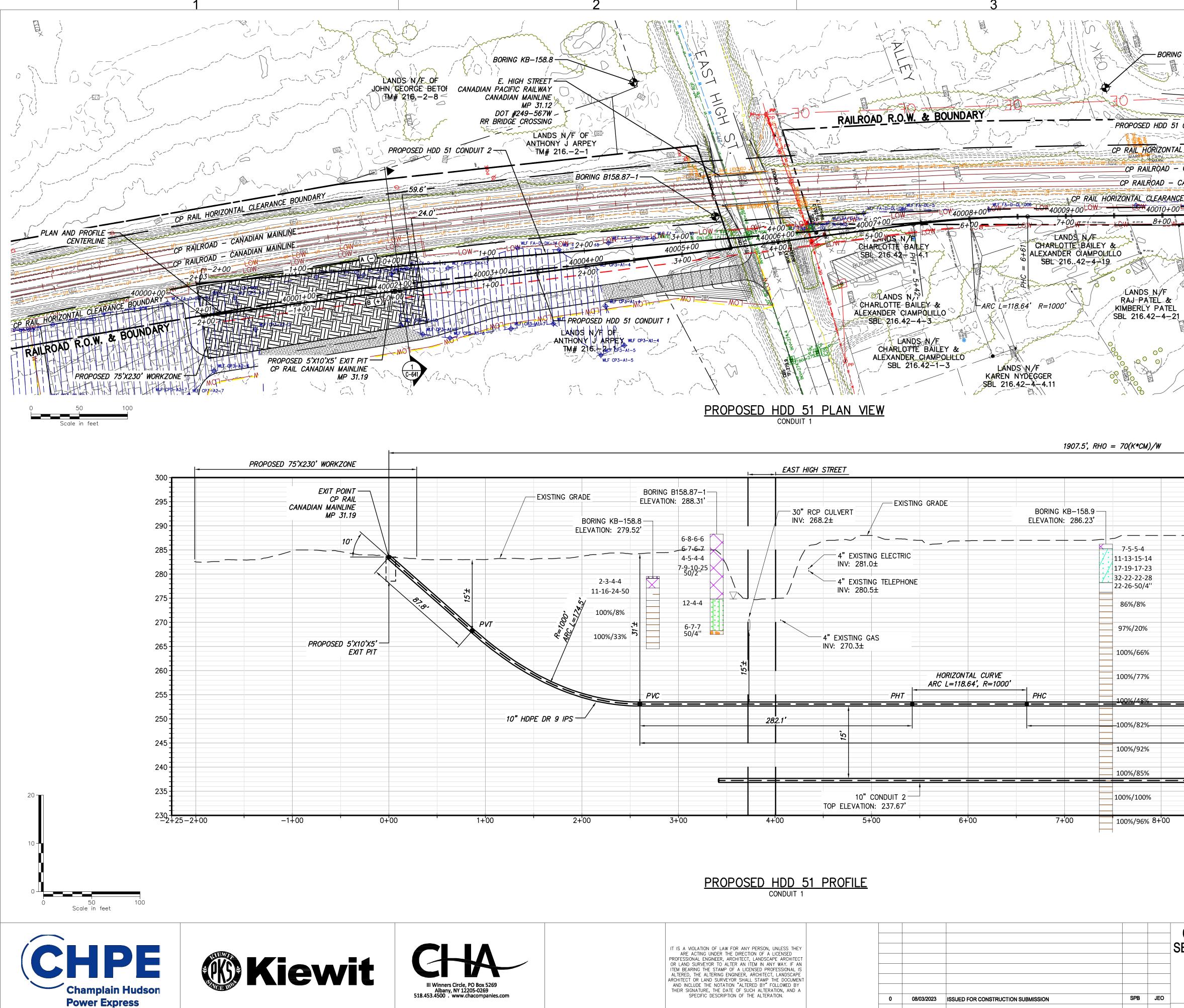
	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.668	7.5	11.2	OK
Unconstrained Collapse [psi]	19.4	130.3	6.7	OK
Compressive Wall Stress [psi]	10.6	1150.0	108.9	OK

Installation Analysis

	Calculated	Allowable	Factor of Safety	Check
Deflection [%]	0.014	7.5	524.3	OK
Unconstrained Collapse [psi]	29.3	234.9	8.0	OK
Tensile Stress [psi]	388.3	1200.0	3.1	OK

Appendix E

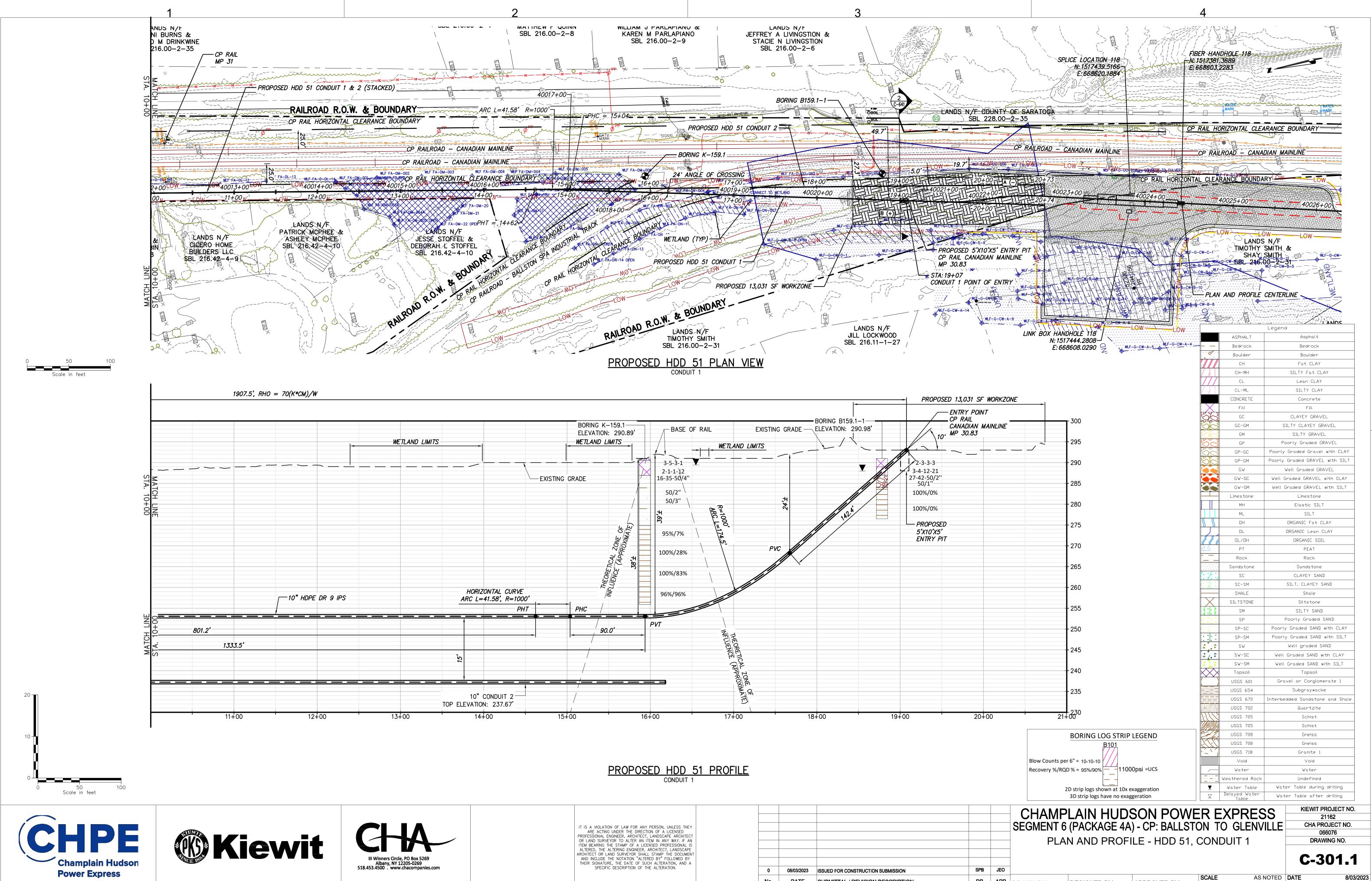
HDD Design Drawings



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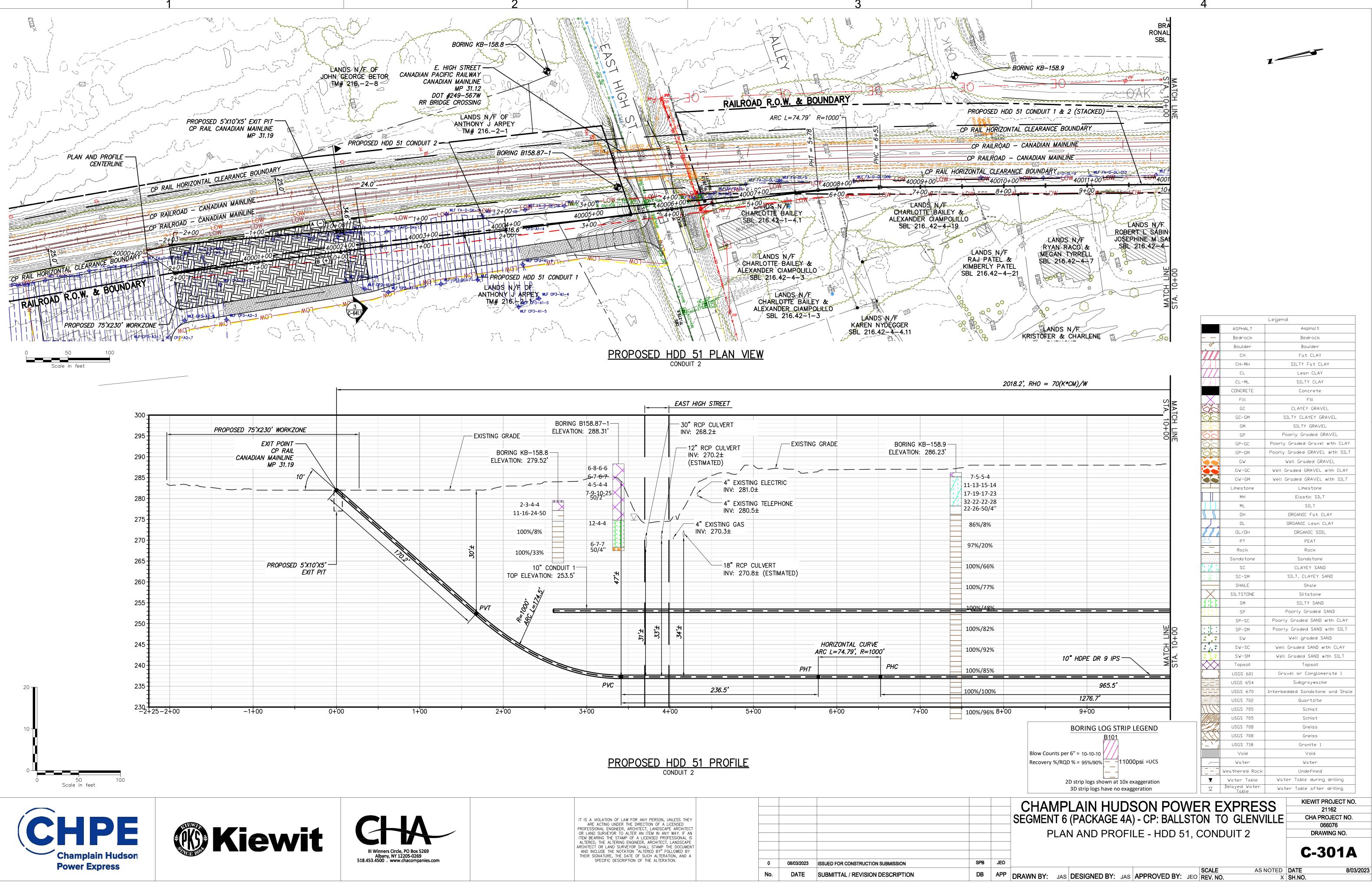
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		CONCRETE		Concrete	
		Fill		Fill CLAYEY GRAVEL	
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	23	GW-GM	Well	Graded GRAVEL with SILT	
		Limestone		Limestone Elastic SILT	
		ML		SILT	
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9+00		USGS 705 USGS 705		Schist Schist	
BORING LOG STRIP LEGEND		USGS 703		Gneiss	
B101		USGS 708		Gneiss	
Blow Counts per 6" = 10-10-10	· - `	USGS 718 Void		Granite 1 Void	
Recovery %/RQD % = 95%/90%		Water		Water	
2D strip logs shown at 10x overground in		Weathered Rock Water Table	Wat	Undefined ter Table during drilling	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration		Delayed Water Table		ter Table after drilling	
			20	KIEWIT PROJECT NO.	
CHAMPLAIN HUDSON POW SEGMENT 6 (PACKAGE 4A) - CP: BALLS				21162 CHA PROJECT NO.	
			ILLC	000070	
PLAN AND PROFILE - HDD 51	, CON			DRAWING NO.	
				C-301	
	SCALE	Δςι	NOTED	DATE 8/03/20	23
RAWN BY: JAS DESIGNED BY: JAS APPROVED BY: JE)	101ED	SH.NO.	20

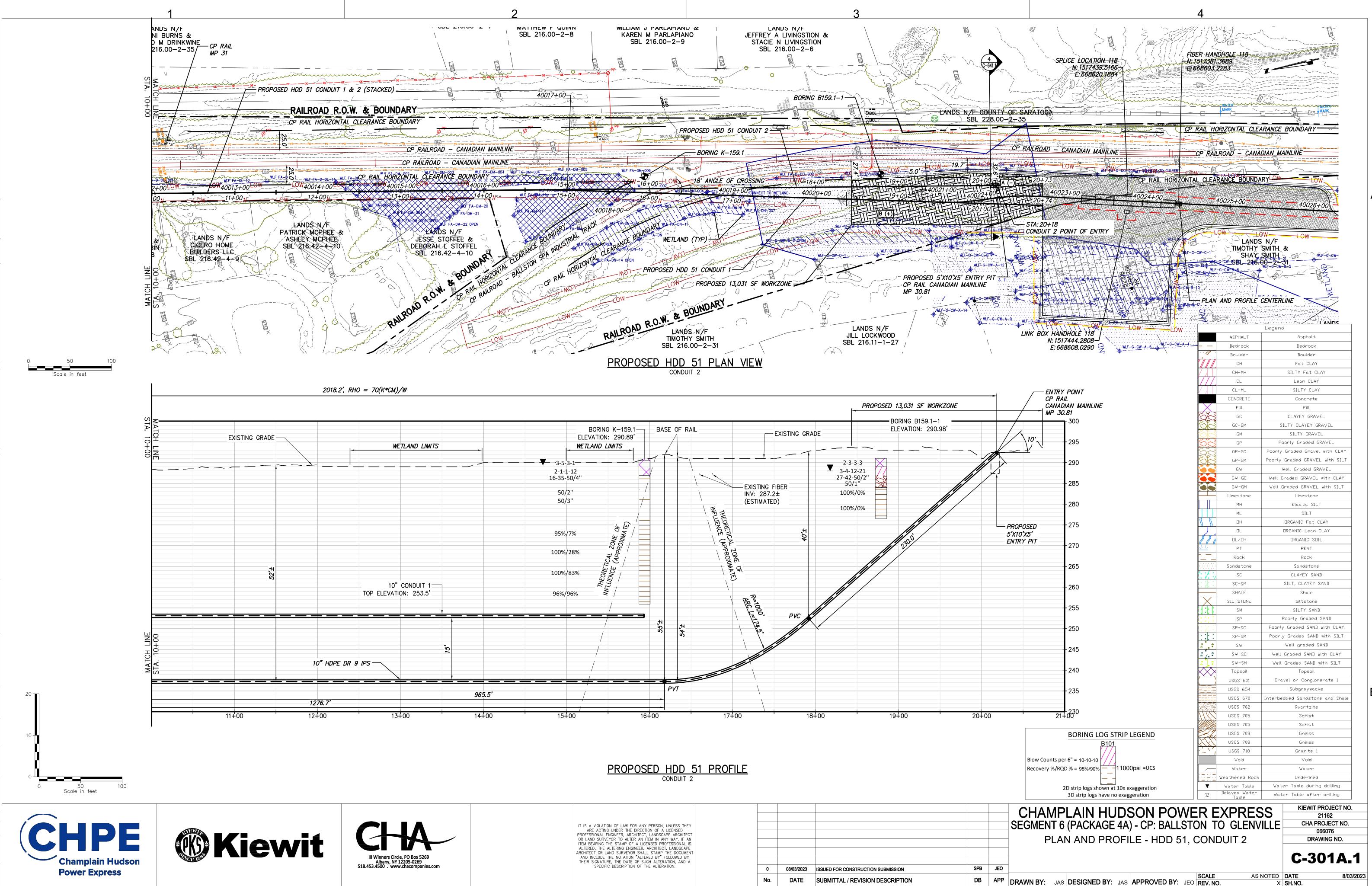
BR



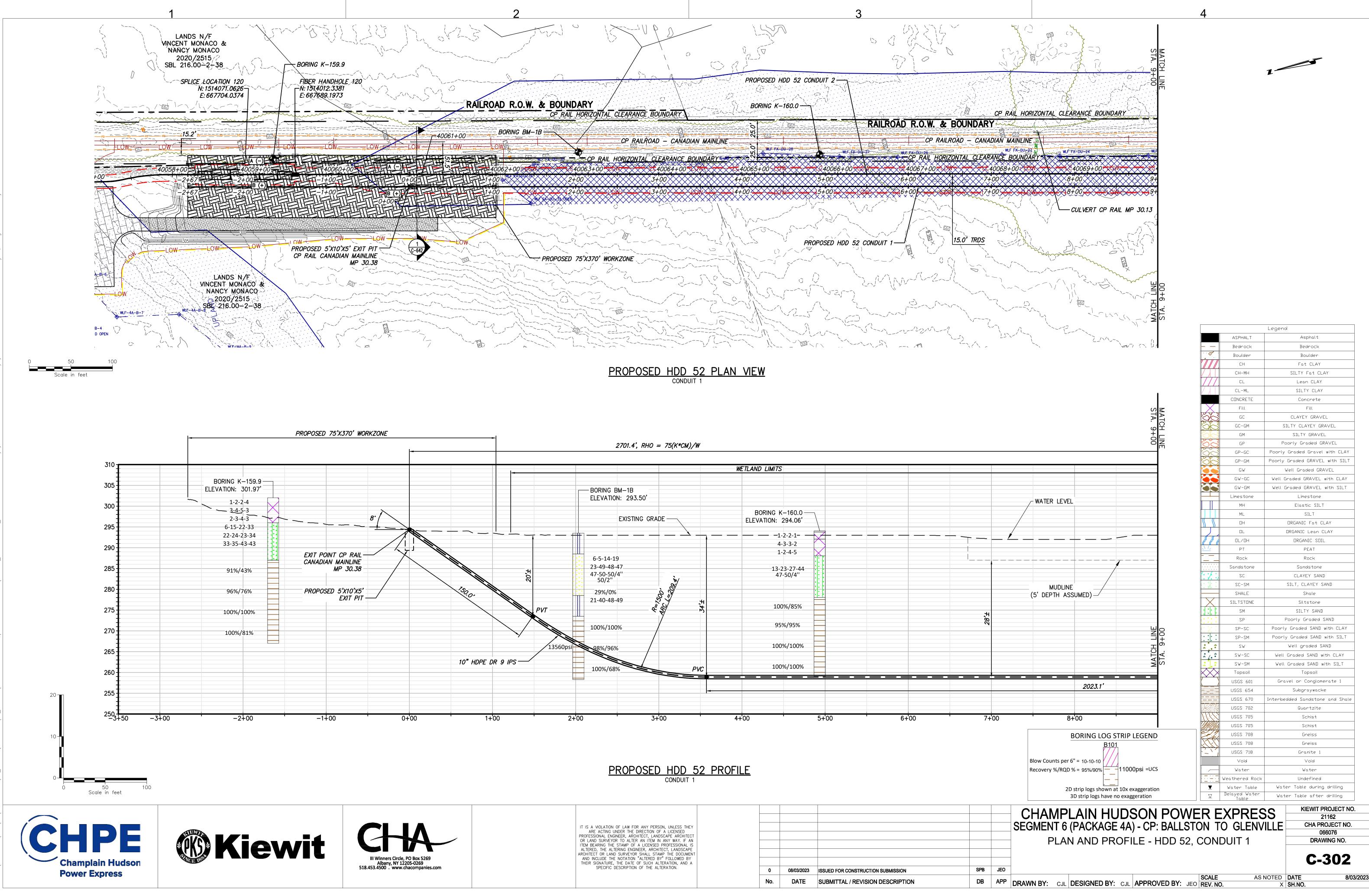
DB APP DRAWN BY: JAS DESIGNED BY: JAS APPROVED BY: JEO REV. NO. No. DATE SUBMITTAL / REVISION DESCRIPTION

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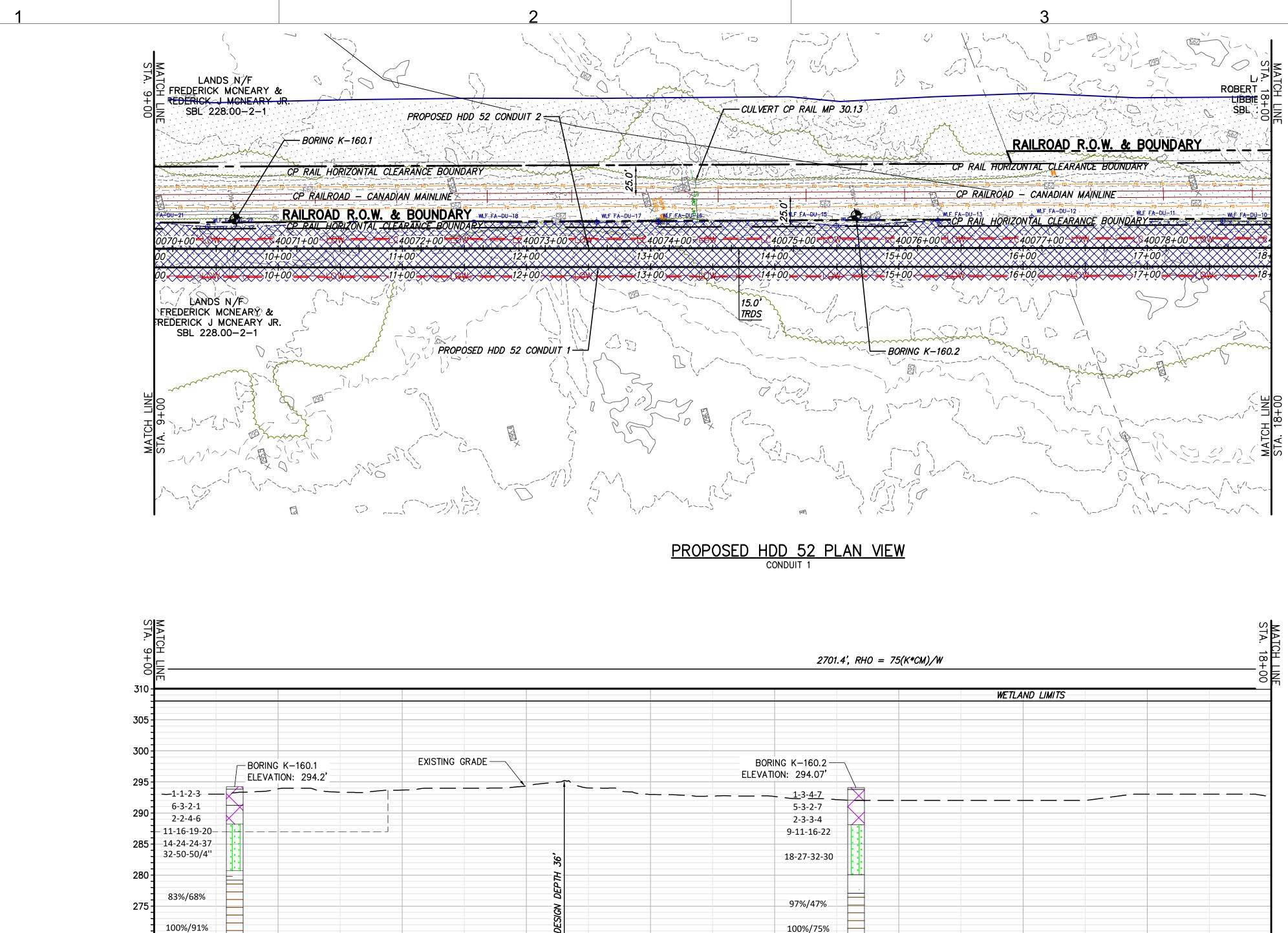


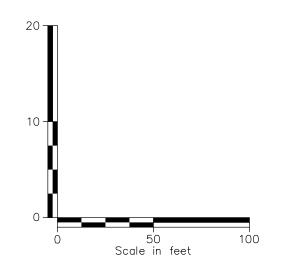


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	No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DRAV



Scale in fe









270

265

260

255

250.

MATCH LINE STA. 9+00

100%/100%

95%/86%



11**+**00

10+00

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		5-3-2-7						
		2-3-3-4 9-11-16-22						
36,		18-27-32-30						
DEPTH								
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PROPOSED HDD 52 PROFILE

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SPECIFIC DESCRIPTION OF THE ALTERATION.	0	08/03/2023	ISSUED FOR CONSTRUCTION SUBMISSION	SPB	JEO	
	No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DRA

		CUNCRETE		Concrete	
		Fill		Fill	
	00	GC		CLAYEY GRAVEL	
	00	GC-GM	S	SILTY CLAYEY GRAVEL	
	00	GM		SILTY GRAVEL	
	00	GP	P	oorly Graded GRAVEL	
	00	GP-GC	Poorly	Graded Gravel with CLAY	
	00	GP-GM	Poorly	Graded GRAVEL with SILT	
		GW		Well Graded GRAVEL	
		GW-GC	Well (Graded GRAVEL with CLAY	
		GW-GM	Well (Graded GRAVEL with SILT	
		Limestone		Limestone	
		МН		Elastic SILT	
		ML		SILT	
	S S	DH		ORGANIC Fat CLAY	
		OL		ORGANIC Lean CLAY	
	220	OL/OH		ORGANIC SOIL	
	<u>\\/</u>	PT		PEAT	
	- <u> </u>	Rock		Rock	
		Sandstone		Sandstone	
		SC		CLAYEY SAND	
		SC-SM		SILT, CLAYEY SAND	
		SHALE		Shale	
	\mathbf{X}	SILTSTONE		Siltstone	
		SM		SILTY SAND	
		SP		Poorly Graded SAND	
		SP-SC	Poorl	y Graded SAND with CLAY	
		SP-SM	Poorl	y Graded SAND with SILT	
		۶W		Well graded SAND	
		SW-SC	Well	Graded SAND with CLAY	
		SW-SM	Well	Graded SAND with SILT	
		Topsoil		Topsoil	
		USGS 601	Gro	avel or Conglomerate 1	
	······	USGS 654		Subgraywacke	
		USGS 670	Interbe	edded Sandstone and Shale	
		USGS 702		Quartzite	
	<u>).[.[.</u>	USGS 705		Schist	
		USGS 705		Schist	
BORING LOG STRIP LEGEND		USGS 708		Gneiss	
B101		USGS 708		Gneiss	
(77)		USGS 718		Granite 1	
w Counts per 6" = 10-10-10	- 1	Void		Void	
covery %/RQD % = 95%/90% - 11000psi =UCS		Water		Water	
		Weathered Rock		Undefined	
		weathered Rock			
		Water Table	Wat	er Table during drilling	
	· _ · · _		Wat	er Table during drilling	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	<u> </u>	Water Table Delayed Water Table	Wat	Eer Table after drilling	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration HAMPLAIN HUDSON POWE		Water Table Delayed Water Table	Wat	KIEWIT PROJECT NO. 21162 CHA PROJECT NO.	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration AMPLAIN HUDSON POWE MENT 6 (PACKAGE 4A) - CP: BALLST		Water Table Delayed Water Table EXPRES	Wat	KIEWIT PROJECT NO. 21162	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration AMPLAIN HUDSON POWE		Water Table Delayed Water Table EXPRES	Wat	KIEWIT PROJECT NO. 21162 CHA PROJECT NO. 066076	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration AMPLAIN HUDSON POWE MENT 6 (PACKAGE 4A) - CP: BALLST	ER E ON T CON	Water Table Delayed Water Table EXPRES O GLENV DUIT 1	Wat	KIEWIT PROJECT NO. 21162 CHA PROJECT NO. 066076 DRAWING NO.	

Legend

Asphalt

Bedrock

Boulder

Fat CLAY

SILTY Fat CLAY

Lean CLAY SILTY CLAY

ASPHALT

Bedrock

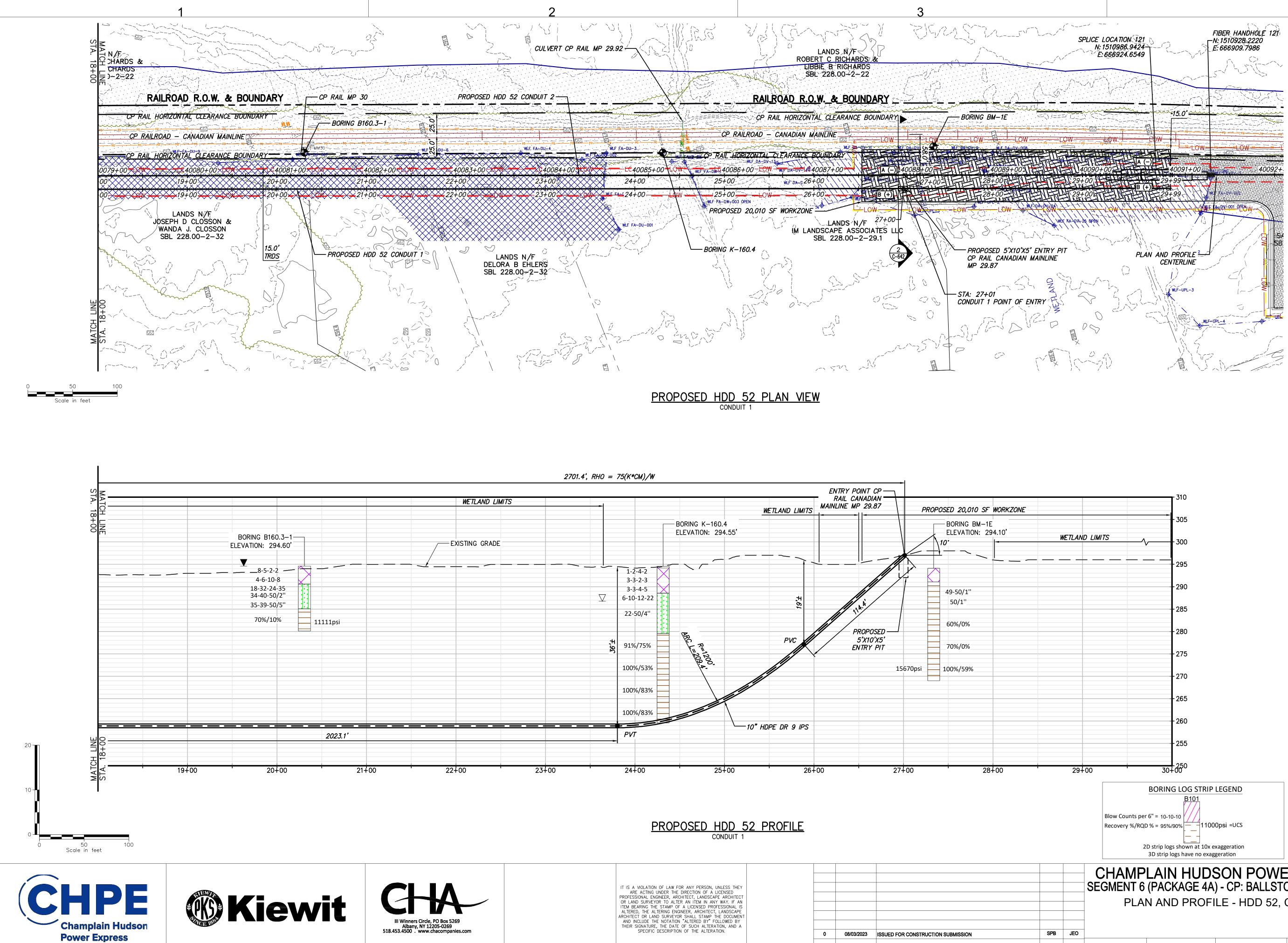
Boulder

СН

CH-MH

CL

CL-ML

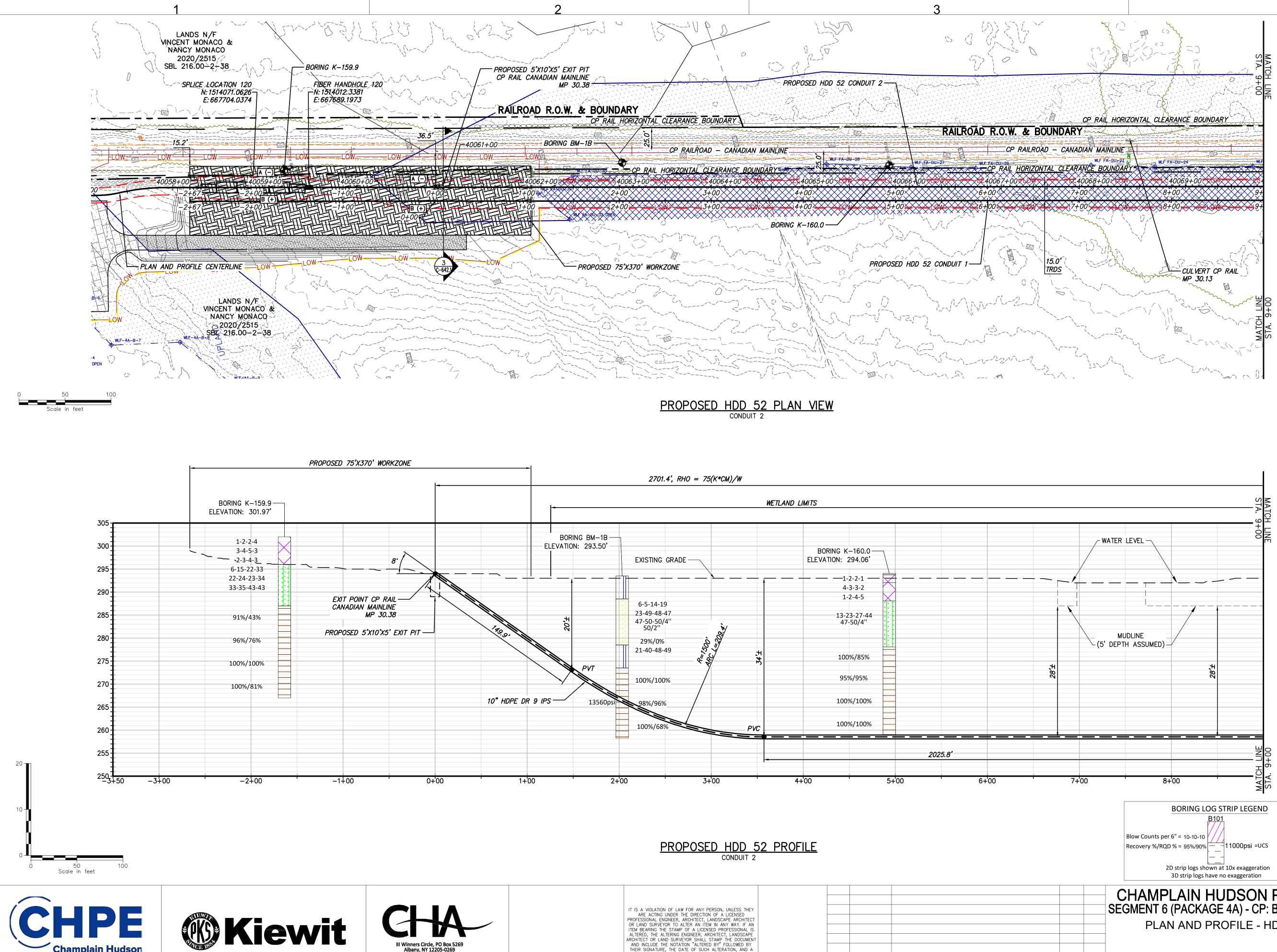


		5	san all's	88				ASCHALI	Ποριαζί
				N				Bedrock	Bedrock
								Boulder	Boulder
								СН	Fat CLAY
	OPOSED HDD 52	<u>Z PLAN VIEW</u>						CH-MH	SILTY Fat CLAY
	CONDUIT 1	i -						CL	Lean CLAY
								CL-ML	SILTY CLAY
								CONCRETE	Concrete
								Fill	Fill
								GC	CLAYEY GRAVEL
								GC-GM	SILTY CLAYEY GRAVEL
								GM	SILTY GRAVEL
4', RHO = 75(K*CM)/W							$\bigcirc \bigcirc$	GP	Poorly Graded GRAVEL
								GP-GC	Poorly Graded Gravel with CLAY
			NTRY POINT CP				00	GP-GM	Poorly Graded GRAVEL with SILT
			ILINE MP 29.87					GW	Well Graded GRAVEL
		WETLAND LIMITS		PROPOSED 20,010 SF WO	RKZONE			GW-GC	Well Graded GRAVEL with CLAY
	BORING K-160.4			BORING BM-1E				GW-GM	Well Graded GRAVEL with SILT
	ELEVATION: 294.55'			ELEVATION: 294.1	0'			Limestone	Limestone
					WETLAND LIMITS	300		MH	Elastic SILT
						500		ML	SILT
				$\leq \mp - \sim < $					
		<u>↓</u>					<u>}</u>		ORGANIC Fat CLAY
1-2-4-2								۵L	ORGANIC Lean CLAY
3-3-2-3			11 77				i i i	OL/OH	ORGANIC SOIL
3-3-4-5				49-50/1''			<u>\\ /</u>	PT	PEAT
☑ 6-10-12-22				50/1"				Rock	Rock
	•	<i>16,7</i>	// h.k.	50/1		- 285		Sandstone	Sandstone
22-50/4"							• :/ :.	SC	CLAYEY SAND
				60%/0%				SC-SM	SILT, CLAYEY SAND
	- BA		/ PROPOSED			- 280	. 71	SHALE	Shale
, + 91%/75%	3	PVC	5'X10'X5'	700/ /00/				SILTSTONE	Siltstone
<u>90</u>	R=1200, 4.		ENTRY PIT	70%/0%				SM	SILTY SAND
	100120					275			
100%/53%	iA.		15670	0psi 100%/59%				SP	Poorly Graded SAND
							. /	SP-SC	Poorly Graded SAND with CLAY
100% (02%)		/						SP-SM	Poorly Graded SAND with SILT
100%/83%						265		۶W	Well graded SAND
						265		SM-SC	Well Graded SAND with CLAY
100%/83%								SW-SM	Well Graded SAND with SILT
						- 260		Topsoil	Topsoil
		0" HDPE DR 9 IPS						USGS 601	Gravel or Conglomerate 1
PVT								USGS 654	Subgraywacke
								USGS 670	Interbedded Sandstone and Shale
								USGS 702	Quartzite
						250 30+00		USGS 705	
24+00	25+00	26+00	27+00	0 28+00	29+00	30+00			Schist
								USGS 705	Schist
						BORING LOG STRIP LEGEND		USGS 708	Gneiss
						<u>B101</u>		USGS 708	Gneiss
								USGS 718	Granite 1
					Blow Counts per			Void	Void
PR	OPOSED HDD 52	2 PROFILE			Recovery %/RQI	D% = 95%/90% - 11000psi =UCS		Water	Water
<u></u>	CONDUIT 1					[]		Veathered Rock	Undefined
					د د	D strip logs shown at 10x exaggeration	T T	Water Table	Water Table during drilling
						3D strip logs have no exaggeration		Delayed Water Table	Water Table after drilling
						·			
						LAIN HUDSON POV		YDDEC	KIEWIT PROJECT NO.
	LAW FOR ANY PERSON, UNLESS THEY				SEGMENT 6	(PACKAGE 4A) - CP: BALLS	STON TO) GLENV	TILLE CHA PROJECT NO.
IT IS A VIOLATION OF	ER THE DIRECTION OF A LICENSED								000070
ARE ACTING UND PROFESSIONAL ENGINE	ER, ARCHITECT, LANDSCAPE ARCHITECT	· · · · · · · · · · · · · · · · · · ·			PLA	N AND PROFILE - HDD 5	2, CONE		DRAWING NO.
ARE ACTING UND PROFESSIONAL ENGINE OR LAND SURVEYOR ITEM BEARING THE ST	ER, ARCHITECT, LANDSCAPE ARCHITECT TO ALTER AN ITEM IN ANY WAY. IF AN TAMP OF A LICENSED PROFESSIONAL IS								
ARE ACTING UND PROFESSIONAL ENGINE OR LAND SURVEYOR ITEM BEARING THE ST ALTERED, THE ALTER	ER, ARCHITECT, LANDSCAPE ARCHITECT TO ALTER AN ITEM IN ANY WAY. IF AN 'AMP OF A LICENSED PROFESSIONAL IS NG ENGINEER, ARCHITECT, LANDSCAPE								
ARE ACTING UND PROFESSIONAL ENGINE OR LAND SURVEYOR ITEM BEARING THE ST ALTERED, THE ALTERI ARCHITECT OR LAND S AND INCLUDE THE N	ER, ARCHITECT, LANDSCAPE ARCHITECT TO ALTER AN ITEM IN ANY WAY, IF AN "AMP OF A LICENSED PROFESSIONAL IS NG ENGINEER, ARCHITECT, LANDSCAPE URVEYOR SHALL STAMP THE DOCUMENT OTATION "ALTERED BY" FOLLOWED BY								C-302 2
ARE ACTING UND PROFESSIONAL ENGINE OR LAND SURVEYOR ITEM BEARING THE ST ALTERED, THE ALTERI ARCHITECT OR LAND S AND INCLUDE THE N THEIR SIGNATURE, TH	ER, ARCHITECT, LANDSCAPE ARCHITECT TO ALTER AN ITEM IN ANY WAY. IF AN 'AMP OF A LICENSED PROFESSIONAL IS NG ENGINEER, ARCHITECT, LANDSCAPE URVEYOR_SHALL STAMP THE DOCUMENT		08/03/2023		SPB JEO				C-302.2
ARE ACTING UND PROFESSIONAL ENGINE OR LAND SURVEYOR ITEM BEARING THE ST ALTERED, THE ALTERI ARCHITECT OR LAND S AND INCLUDE THE N THEIR SIGNATURE, TH	ER, ARCHITECT, LANDSCAPE ARCHITECT TO ALTER AN ITEM IN ANY WAY. IF AN 'AMP OF A LICENSED PROFESSIONAL IS NG ENGINEER, ARCHITECT, LANDSCAPE URVEYOR SHALL STAMP THE DOCUMENT OTATION "ALTERED BY" FOLLOWED BY E DATE OF SUCH ALTERATION, AND A	0 No.		DNSTRUCTION SUBMISSION	DB APP DRAWN BY: CIII		SCALE	Δςι	C-302.2

Legend

Asphalt

ASPHALT



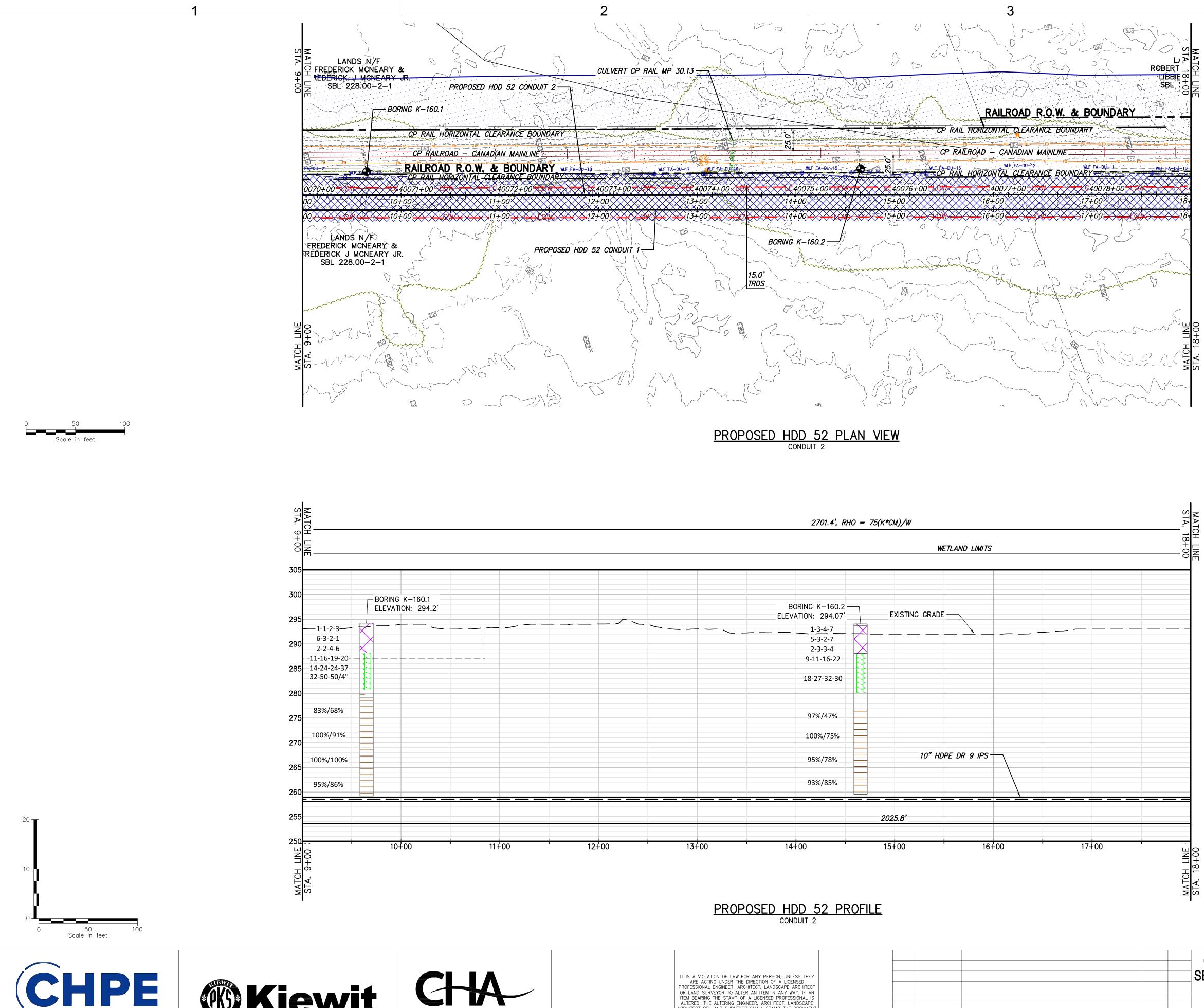
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Champlain Hudson

Power Express

					2			~			Legend
						1				ASPHALT Bedrock	Asphalt Bedrock
									· · • •	Boulder	Boulder
										CH	Fat CLAY
	PROPOSED HDD 52	2 PLAN VIEW								CH-MH	SILTY Fat CLAY
	CONDUIT 2		-							CL	Lean CLAY
										CL-ML	SILTY CLAY
										CONCRETE	Concrete
										Fill	Fill
									20	GC	CLAYEY GRAVEL
								1	90	GC-GM	SILTY CLAYEY GRAVEL
	2701.4', RHO = 75(K*CM)/W									GM GP	SILTY GRAVEL Poorly Graded GRAVEL
										GP-GC	Poorly Graded Gravel with CLA
		WETLAND LIMITS						ST NTS	200	GP-GM	Poorly Graded GRAVEL with SIL
								- Ă		GW	Well Graded GRAVEL
								- 9 + ¹		GW-GC	Well Graded GRAVEL with CLA
BM-1B										GW-GM	Well Graded GRAVEL with SILT
293.50'								[T]		Limestone	Limestone
			NG K-160.0							МН	Elastic SILT
	EXISTING GRADE		JIN. 294.00							ML	SILT
			<u> 1-2-2-1 </u>	\triangleleft — — — — —					N N	DH	ORGANIC Fat CLAY
			4-3-3-2	\checkmark							ORGANIC Lean CLAY
			1-2-4-5						<u>í í í</u>	DL/DH PT	DRGANIC SOIL
	6-5-14-19					- \ 1			- <u>-</u>	Rock	PEAT Rock
	23-49-48-47		-13-23-27-44 47-50/4''							Sandstone	Sandstone
	47-50-50/4'' 50/2''		47-30/4						·····	SC	CLAYEY SAND
	29%/0%									SC-SM	SILT, CLAYEY SAND
	21-40-48-49	н —				<u> </u>	' DEPTH ASSUMED)		- 71	SHALE	Shale
	29%/0% 21-40-48-49	+ +	100%/85%						X	SILTSTONE	Siltstone
/Τ	Y Y				58,7		58,7			SM	SILTY SAND
	100%/100%		95%/95%		<u> </u>					SP	Poorly Graded SAND
										SP-SC	Poorly Graded SAND with CLA
13560psi	98%/96%		100%/100%							SP-SM	Poorly Graded SAND with SIL
										۶W	Well graded SAND
	100%/68% PVC	,	100%/100%						<u> </u>	SW-SC	Well Graded SAND with CLAY
	100%/68% PVC									SW-SM Topsoil	Well Graded SAND with SILT Topsoil
								Щ	\sim	USGS 601	Gravel or Conglomerate 1
				2025.8'						USGS 654	Subgraywacke
								ب ب		USGS 670	Interbedded Sandstone and Sh
2+00	0 3+00	4+00		5+00 6	6+'00	7+00	8+'00	A.		USGS 702	Quartzite
2100	5 5100	1100			,100	7100	5100	ATC STA		USGS 705	Schist
								•		USGS 705	Schist
							BORING LOG STRIP LE	GEND		USGS 708	Gneiss
							B101			USGS 708	Gneiss
									[_ ` _]	USGS 718	Granite 1
							Blow Counts per 6" = 10-10-10 Recovery %/RQD % = 95%/90% - 11000p	si =UCS		Void	Void
	PROPOSED HDD 5	<u>Z FRUFILE</u>								Water Weathered Rock	Water Undefined
	CONDUIT 2						2D strip loss shows at 10.5 such	geration	· _ · · _	Water Table	Water Table during drilling
							2D strip logs shown at 10x exage 3D strip logs have no exagge		\square	Delayed Water Table	Water Table after drilling
							I			, did (c	
							CHAMPLAIN HUDS	ON POW	'ER F	:XPRES	SS KIEWIT PROJECT
	IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY						SEGMENT 6 (PACKAGE 4A)				
	ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT										000070
	OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS						PLAN AND PROFIL	E - HDD 52	, CONE	JUIT 2	DRAWING NC
	ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR SHALL STAMP THE DOCUMENT										A A A A
I	AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY										C-302
	THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A										
	THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.		0 08/03/2023	ISSUED FOR CONSTRUCTION SUBMISS	NON	SPB JEO			SCALE		NOTED DATE

В



Kiewit

Champlain Hudson

Power Express

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		WET	TLAND LIMITS	
	BORING K–160.2 - ELEVATION: 294.07'	EXISTING GRADE		
/~	1-3-4-7			
	5-3-2-7 2-3-3-4			
	9-11-16-22			
	18-27-32-30			
	97%/47%			
	100%/75%			
	95%/78%	10" HDP	E DR 9 IPS	
	93%/85%			

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT						C SE
OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY, IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A						
SPECIFIC DESCRIPTION OF THE ALTERATION.	0	08/03/2023	ISSUED FOR CONSTRUCTION SUBMISSION	SPB	JEO	
	No.	DATE	SUBMITTAL / REVISION DESCRIPTION	DB	APP	DRA

	////	CL		Lean CLAY	
		CL-ML		SILTY CLAY	
		CONCRETE		Concrete	
	\mathbf{X}	Fill		Fill	
	EXAS	GC		CLAYEY GRAVEL	
	36	GC-GM	S	SILTY CLAYEY GRAVEL	
	56	GM		SILTY GRAVEL	
	00	GP	P	oorly Graded GRAVEL	
	00	GP-GC	Poorly	Graded Gravel with CLAY	
	56	GP-GM	Poorly	Graded GRAVEL with SILT	
		GW		Well Graded GRAVEL	
		GW-GC	Well (Graded GRAVEL with CLAY	
	MA	GW-GM	Well	Graded GRAVEL with SILT	
		Limestone		Limestone	
		МН		Elastic SILT	
		ML		SILT	
		ОН		ORGANIC Fat CLAY	
	<u> </u>	OL		ORGANIC Lean CLAY	
		DL/DH		ORGANIC SOIL	
		PT		PEAT	
		Rock		Rock	
		Sandstone		Sandstone	
		SC		CLAYEY SAND	
		SC-SM		SILT, CLAYEY SAND	
	. 71.	SHALE		Shale	
	X	SILTSTONE		Siltstone	
		SM		SILTY SAND	
		SP		Poorly Graded SAND	
		SP-SC	Poorl	y Graded SAND with CLAY	
		SP-SM	Poorl	y Graded SAND with SILT	
		SW		Well graded SAND	
	<u>م / م</u>	SW-SC	Well	Graded SAND with CLAY	
		SW-SM	Well	Graded SAND with SILT	
		Topsoil		Topsoil	
		USGS 601	Gro	avel or Conglomerate 1	
		USGS 654		Subgraywacke	E
		USGS 670	Interbe	edded Sandstone and Shale	
		USGS 702		Quartzite	
	<u>) [[[[[[[[[[[[[[[[[[</u>	USGS 705		Schist	
		USGS 705		Schist	
BORING LOG STRIP LEGEND		USGS 708		Gneiss	
<u>B101</u>		USGS 708		Gneiss	
		USGS 718		Granite 1	
Blow Counts per 6" = 10-10-10		Void		Void	
Recovery %/RQD % = 95%/90%11000psi =UCS	·	Water		Water	
		Weathered Rock		Undefined	
2D strip logs shown at 10x exaggeration	T	Water Table	Wat	er Table during drilling	
3D strip logs have no exaggeration	\Box	Delayed Water Table	Wat	ter Table after drilling	
				KIEWIT PROJECT NO.	
CHAMPLAIN HUDSON POW				21162	
EGMENT 6 (PACKAGE 4A) - CP: BALLS1	ΓΟΝ Τ	O GLENV	ILLE	CHA PROJECT NO.	
				066076	
PLAN AND PROFILE - HDD 52,	CON	DUIT 2		DRAWING NO.	
				C 2024	4
				C-302A. [•]	
	SCALE	A	NOTED	DATE 8/03/2	2022
AWN BY: CJL DESIGNED BY: CJL APPROVED BY: JE		0.		SH.NO.	.023
			23	1	

Legend

Asphalt

Bedrock

Boulder

Fat CLAY

SILTY Fat CLAY

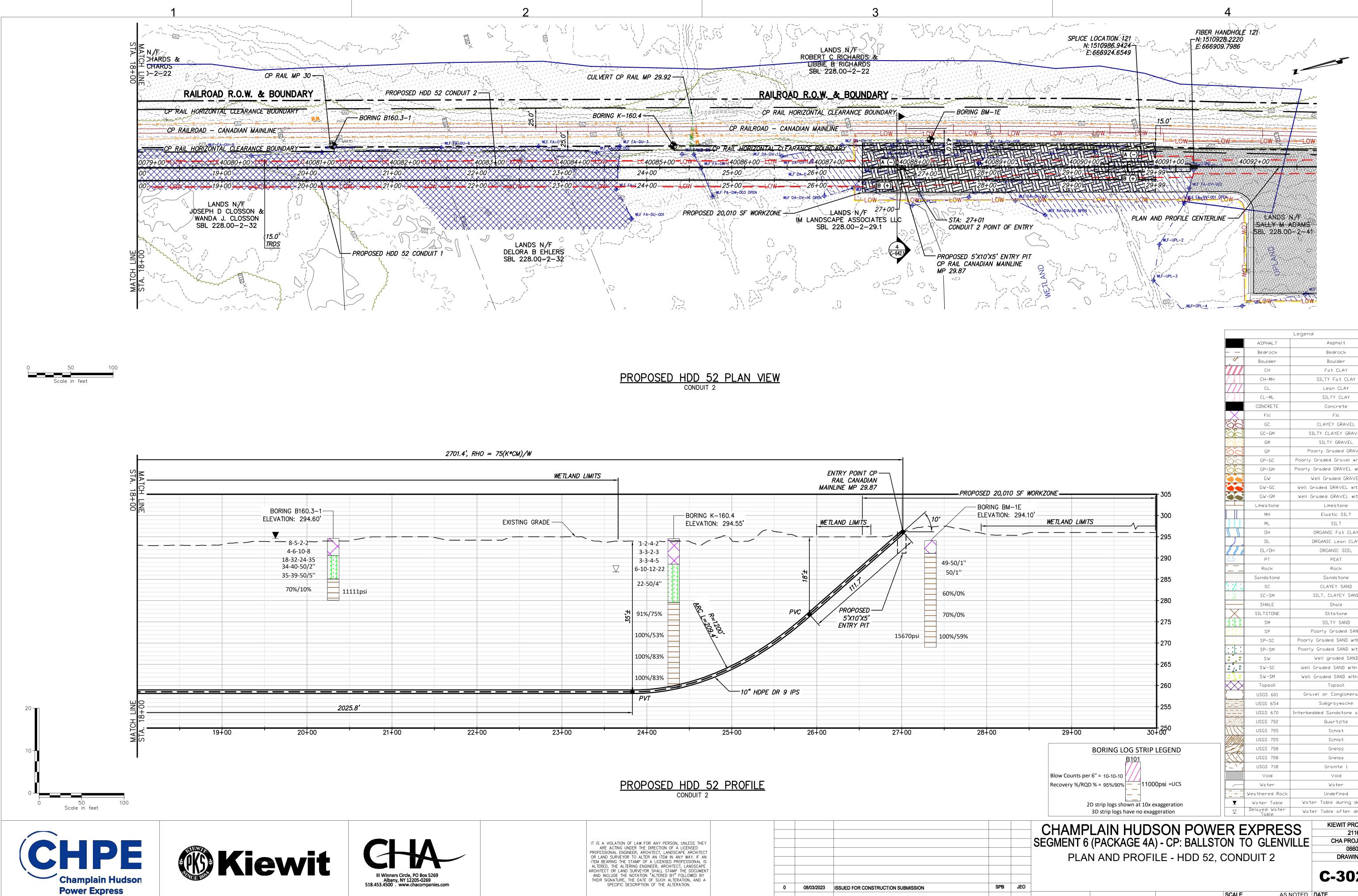
ASPHALT

Bedrock

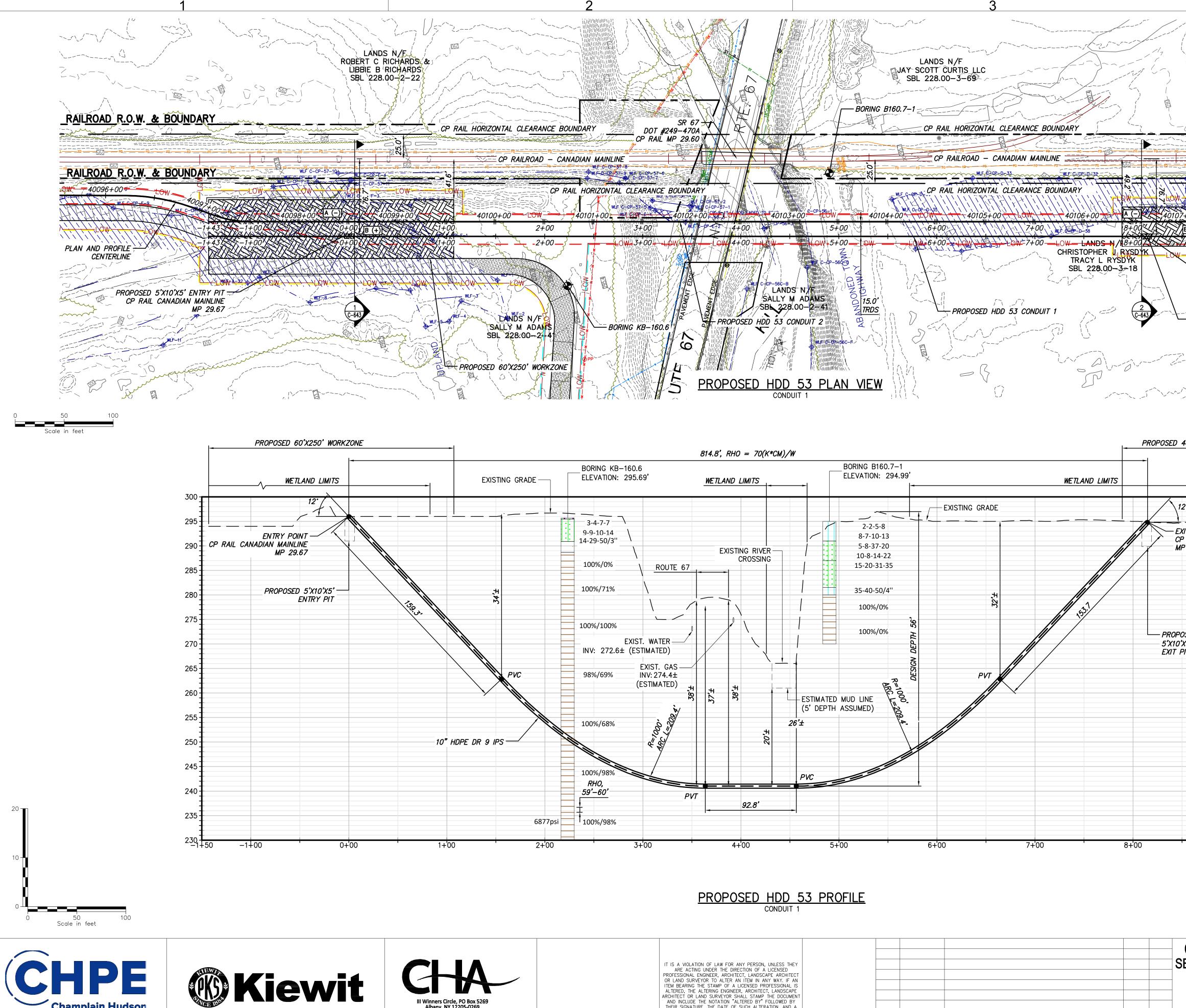
Boulder

СН

CH-MH



											Fill	Fill	
											GC	CLAYEY GRAVEL	
										00	GC-GM	SILTY CLAYEY GRAVEL	
										66	GM	SILTY GRAVEL	
/₩										00	GP	Poorly Graded GRAVEL	
										00	GP-GC	Poorly Graded Gravel with	CLAY
				ENT						66	GP-GM	Poorly Graded GRAVEL with	SILT
WETLAND LIMITS	-1				RY POINT CP						GW	Well Graded GRAVEL	
				MAINLIN	NE MP 29.87						GW-GC	Well Graded GRAVEL with (CLAY
						PROPOSED 2	,010 SF W	ORKZONE	305		GW-GM	Well Graded GRAVEL with :	SILT
							BM_1F				Limestone	Limestone	
		BORING K-160.4					ON: 294.10	۶	- 300		МН	Elastic SILT	
G GRADE		ELEVATION: 294.5		WETLAI	ND LIMITS			WETLAND LIMITS	000		ML	SILT	
											DH	ORGANIC Fat CLAY	
`~							· ·		- 295		DL	ORGANIC Lean CLAY	
	3-3-2-3									55	OL/OH	DRGANIC SOIL	
	3-3-4-5								290		PT	PEAT	
7	✓ 6-10-12-22	1				49-50/1''					Rock	Rock	
	<u> </u>	•		6		50/1"			0.05	· · · · · · · · ·	Sandstone	Sandstone	
	22-50/4"	•		~~~~					- 285	·····	SC	CLAYEY SAND	
		•				60%/0%				. /. /	SC-SM	SILT, CLAYEY SAND	
									- 280	·	SHALE	Shale	
	<u>+</u> 91%/75%	Ra l		PVC	PROPOSED —	700/ /00/					SILTSTONE	Siltstone	
	, 5 91%/75%	LI RI			5'X10'X5'	70%/0%			- 275		SM	SILTY SAND	
		R=1200			ENTRY PIT				2/3		SP	Poorly Graded SAND	
	100%/53%				15670ps	i 100%/59%					SP-SC	Poorly Graded SAND with (
									270	. /		Poorly Graded SAND with S	
	100%/83%										SP-SM	Well graded SAND	
		-							265		SM		
											SM-SC	Well Graded SAND with CL	
	100%/83%								000		SW-SM	Well Graded SAND with SI	
			-10" HDPE DR	9 IPS					- 260		Topsoil	Topsoil	
	PVT			0 // 0						<u> </u>	USGS 601	Gravel or Conglomerate	
									- 255		USGS 654	Subgraywacke	E
											USGS 670	Interbedded Sandstone and	Shale
									250	N	USGS 702	Quartzite	
23+00	24+00	25+0)0 '	26+00	27+00	28+00	1	29+00	30+00		USGS 705	Schist	
											USGS 705	Schist	
								BORING LOG ST	RIP LEGEND		USGS 708	Gneiss	
								B101			USGS 708	Gneiss	
											USGS 718	Granite 1	
								Blow Counts per 6" = 10-10-10		-	Void	Void	
	<u>PROPOSED</u>	HDD 52 PR	<u>CHILE</u>					Recovery %/RQD % = 95%/90%1	1000psi =UCS		Water	Water	
		CONDUIT 2									Weathered Rock	Undefined	
								2D strip logs shown at 1	Ox exaggeration	T	Water Table	Water Table during drilli	ng
								3D strip logs have no	exaggeration	\Box	Delayed Water Table	Water Table after drilli	ng
												KIEWIT PROJE	CT NO.
								CHAMPLAIN HU	JSON POV	WEK E	XPRES	21162	
	ATION OF LAW FOR ANY PERSON	N, UNLESS THEY						SEGMENT 6 (PACKAGE					
ARE AC	TING UNDER THE DIRECTION OF L ENGINEER, ARCHITECT, LANDSO	A LICENSED						•	-			000070	
OR LAND SU	RVEYOR TO ALTER AN ITEM IN A G THE STAMP OF A LICENSED P	ANY WAY. IF AN						PLAN AND PRO	FILE - HDD 5	52, CONE	DUIT 2	DRAWING	NO.
ALTERED. T	E ALTERING ENGINEER, ARCHITE LAND SURVEYOR SHALL STAMF	CT. LANDSCAPE											
AND INCLU	THE NOTATION "ALTERED BY". TURE, THE DATE OF SUCH ALTE	'FOLLOWED BY										C-302	A.2
	CIFIC DESCRIPTION OF THE ALTER			0 08/03/2023 ISS	SUED FOR CONSTRUCTION SUBMISSI	ON S	B JEO						
										SCALE	ASI	NOTED DATE	8/03/2023
			I 1	No. DATE SU	UBMITTAL / REVISION DESCRIF		B APP	DRAWN BY: CJL DESIGNED BY: (X SH.NO.	



III Winners Circle, PO Box 5269 Albany, NY 12205-0269 518.453.4500 . www.chacompanies.com

Champlain Hudson

Power Express

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION. SPB JEO 0 08/03/2023 ISSUED FOR CONSTRUCTION SUBMISSION DB APP DRAWN BY: CKZ DESIGNED BY: CKZ APPROVED BY: JEO REV. NO. No. DATE SUBMITTAL / REVISION DESCRIPTION

			1
RAILROAD R.O.W. & BO	UNDARY		
RAILROAD R.O.W. & BOU	JNDARY		
LOW -	40109+00		
40108+00			
9+00 9+40 9+001	PLAN AND PROFIL CENTERLIN		
PROPOSED 40	O'X150' WORKZONE		
PROPOSED 5'X10'X5' E	EXIT PIT		
A:8475 NDUIT 1 NT OF EXIT			
	<u><u><u> </u></u></u>		
N/	\langle	ASPHALT	Legend Asphalt
		Bedrock Boulder	Bedrock Boulder
		СН	Fat CLAY
		CH-MH CL	SILTY Fat CLAY Lean CLAY
50' WORKZONE		CL-ML	SILTY CLAY
		CONCRETE Fill	Concrete Fill
		GC	CLAYEY GRAVEL
300		GC-GM GM	SILTY CLAYEY GRAVEL
		GP	Poorly Graded GRAVEL
295 DINT -		GP-GC GP-GM	Poorly Graded Gravel with CLAY Poorly Graded GRAVEL with SILT
CANADIAN MAINLINE 52 290		GW	Well Graded GRAVEL
		GW-GC GW-GM	Well Graded GRAVEL with CLAY Well Graded GRAVEL with SILT
- 285		Limestone	Limestone
- 280	╟┰┦┰┦	MH	Elastic SILT SILT
		DH	ORGANIC Fat CLAY
		OL OL/OH	ORGANIC Lean CLAY ORGANIC SOIL
- 270		PT	PEAT
		Rock Sandstone	Rock Sandstone
- 265		SC SC-SM	CLAYEY SAND SILT, CLAYEY SAND
- 260		SHALE	Shale
		SILTSTONE	Siltstone SILTY SAND
- 255		SP	Poorly Graded SAND
- 250		SP-SC SP-SM	Poorly Graded SAND with CLAY Poorly Graded SAND with SILT
		SW	Well graded SAND
- 245		SW-SC SW-SM	Well Graded SAND with CLAY Well Graded SAND with SILT
- 240		Topsoil	Topsoil
		USGS 601 USGS 654	Gravel or Conglomerate 1 Subgraywacke
- 235		USGS 670	Interbedded Sandstone and Shale
070		USGS 702 USGS 705	Quartzite Schist
9+00 9+50 9+00 9+50		USGS 705 USGS 708	Schist
BORING LOG STRIP LEGEND		USGS 708 USGS 708	Gneiss
ow Counts per 6" = 10-10-10		USGS 718 Void	Granite 1 Void
		Void Water	Void Water
covery %/RQD % = 95%/90% - 11000psi = 0CS		Weathered Rock	Undefined
		Water Table	Water Table during drilling
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration		Delayed Water	Water Table after drilling
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	\Box	Delayed Water Table	
2D strip logs shown at 10x exaggeration 3D strip logs have no exaggeration	POWER E	Delayed Water Table	S KIEWIT PROJECT NO. 21162
	POWER E BALLSTON T	Delayed Water Table	S KIEWIT PROJECT NO. 21162

X SH.NO.