



# **Bluestone Wind**

Electric and Magnetic Field Study  
BLS-E-STDY-03 RD

August 22, 2018

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# Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	05/11/18	B. Carroll	T. Clark	C. Ferrell	Issue for Review
B	07/16/18	B. Carroll	D. Hynes C. Ferrell	K. Sokolowski	Second Issue
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**Document reference:** BLS-E-STDY-03 RD

**Information class:** Standard

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# Introduction

The Bluestone Wind Farm is a proposed 124 MW utility-scale wind energy facility located in eastern Broome County, New York, in the towns of Windsor and Sanford. The project, which is being developed by Bluestone Wind, LLC, is proposed to interconnect into New York State Electric and Gas Corporation's (NYSEG) 115 kV transmission line to deliver power to the New York State transmission system. Mott MacDonald (MM) is responsible for supporting the Article 10 permitting application.

This report presents the Electric and Magnetic Field (EMF) calculations for the underground cables conducted using CYMCAP 7.1 Rev 02 and the overhead transmission line conducted using PLS-CADD. The following cable configurations were studied:

- One 1250 kcmil UG cable in a 42" trench
- Two 1250 kcmil UG cables in parallel 42" trenches with 15 ft. separation
- Three 1250 kcmil UG cables in parallel 42" trenches with 15 ft. separation
- Four 1250 kcmil US cables in parallel 42" trenches with 15 ft. separation
- Five 1250 kcmil UG cables in parallel 42" trenches with 15 ft. separation
- 115 kV transmission span

These underground cable configurations are seen as the worst-case, as they have the largest cables carrying the highest currents and thus are used at various locations throughout the collection system as identified on the Underground Collection System Map and the corresponding cable trench details in Appendix A. Since current drives electric and magnetic fields, these locations will have the highest levels of EMF. The overhead transmission line was calculated at the lowest sag point between the lowest structure locations. This in turn gives the highest EMF calculation at the one meter above grade test point.

The following sections detail the method used in the studies and present the results of the analysis.

# 1 Design Criteria

The following data points were used as inputs to CYMCAP 7.1 Rev 02 and PLS CADD for calculating the electric and magnetic fields for the Bluestone Wind Project:

- The electric field standard in the State of New York is set forth by the Public Service Commission (PSC). Opinion No. 78-13 set an interim standard of 1.6 kilovolts per meter (kV/m) for transmission lines, measured at the edge of the right-of-way, one meter above ground level, with the line at rated voltage [1].
- The magnetic field standard in the State of New York is set forth by the PSC in cases 26529 and 26559, which set an interim standard of 200 milligauss (mG), measured at the edge of the right-of-way, one meter above ground level [1].
- The right-of-way for the underground cables is assumed to be 15 feet beyond the outer most cable or as otherwise shown in Appendix A to maintain a maximum right-of-way width of 75ft.
- The right-of-way for the overhead cables is assumed to be 40 feet from centerline of the support structure, which is largely within the substation fences.
- Exhibit 35 of the Article 10 regulation, 16 NYCRR 1001.35, requires the electric field calculation to use 5-foot measurement intervals showing the entire right-of-way and out to 500 feet on both sides.
- The values were calculated at 3.28 feet above the ground (i.e., 1-meter) as required by 16 NYCRR 1001.35.
- All calculations were run at the cables' full ampacity for worst case conditions.
- All underground cables were studied as fully bonded (bonded ends) for the sheath configuration.
- All underground cables were set in a 42" trench as detailed in the project trench drawings as shown in Appendix A.
- The 115 kV transmission span was studied based on the lowest sag point seen in the project. The configuration was based on the substation dead-end structure drawings for the project.

## 2 Underground Cable Results

Electric Field levels for the underground cables were not calculated due to the nature of the installation. The concentric neutral wires create a grounded cage around the cable core that reduces the electric fields around the outside of the cables. With the cables buried in a 42" trench, the soil cover further reduces the electric field levels to negligible values.

The Millennium and Bluestone Gathering natural gas pipelines run through portions of the project and run parallel to approximately 3 miles of the underground collector cables with four single cable crossings. Due to the reasons stated above the impact of EMF on the pipelines is minimal. The EMF values are given at the edge of right-of-way. However, a cathodic protection study will be performed during the detailed design of the project to determine if any upgrades are required to the pipelines cathodic protection system.

Refer to Appendix A for the collector system map, trench details and transmission structure details. Refer to Appendix B for aerial maps showing clearances to residences near the underground cable routes.

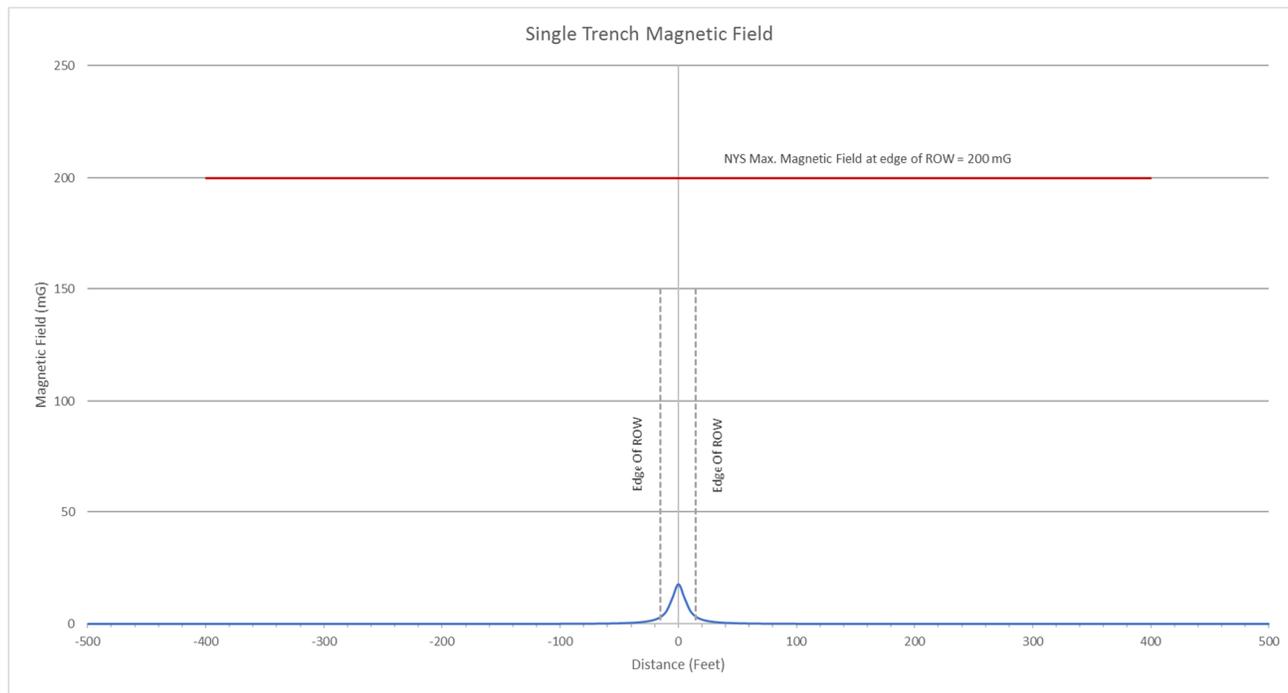
## 2.1 Case 1 - One 1250 kcmil UG cable in a 42" trench

See cable trench detail "G" on BLS-E-520-02 and corresponding locations shown on the Collection System Map on BLS-E-500-01 in Appendix A.

**Table 1: One 1250 kcmil Results**

Description	Station Number	Field Strength Calculated at Centerline	Field Strength Calculated at Edge of Right-of-Way	New York Magnetic Field Standard at Edge of Right-of-Way
Single 1250 kcmil	G-1 through G-15	17.6742 mG	3.1832 mG @ ±15ft	<200 mG

**Figure 1: Case 1 – Magnetic Field Calculation**



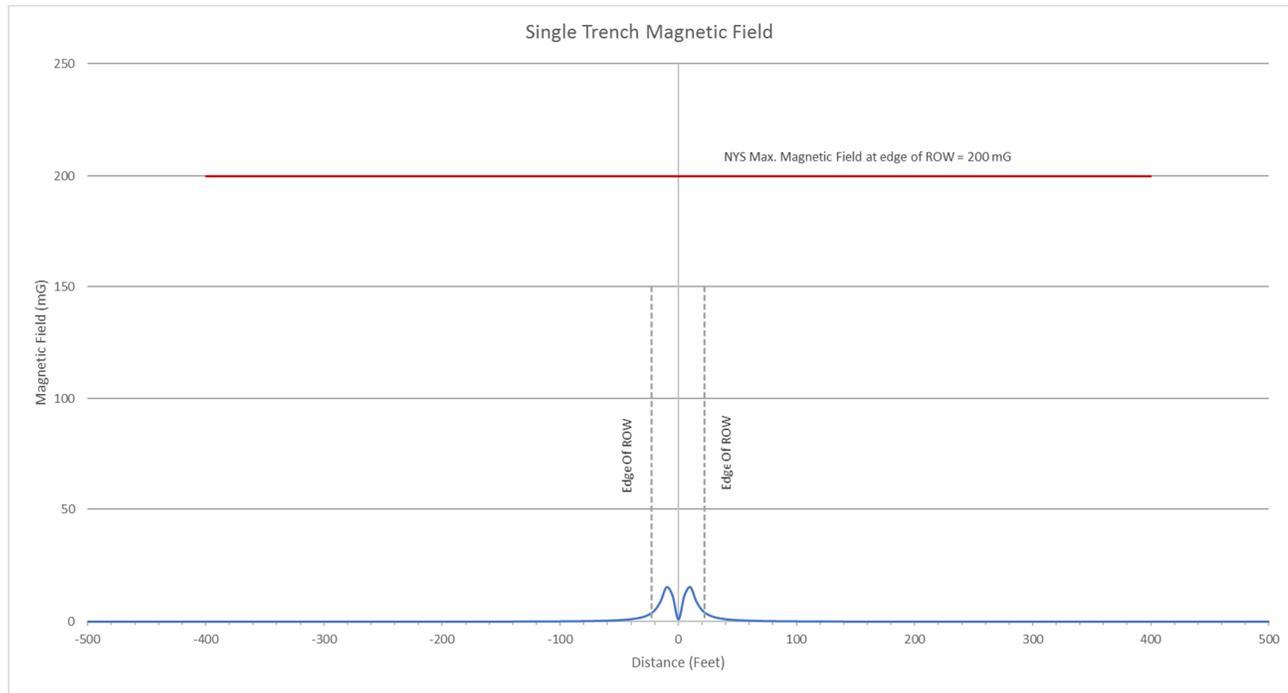
## 2.2 Case 2 - Two 1250 kcmil UG cables in a 42" trench

See cable trench detail "H" on BLS-E-520-02 and corresponding locations shown on the Collection System Map on BLS-E-500-01 in Appendix A.

**Table 2: Two 1250 kcmil Results**

Description	Station Number	Field Strength Calculated at Centerline	Field Strength Calculated at Edge of Right-of-Way	New York Magnetic Field Standard at Edge of Right-of-Way
Two 1250 kcmil, 15' spacing	H-1 through H-4	1.0623 mG	3.9862 mG @ ±22.5ft	<200 mG

**Figure 2: Case 2 - Magnetic Field Calculation**



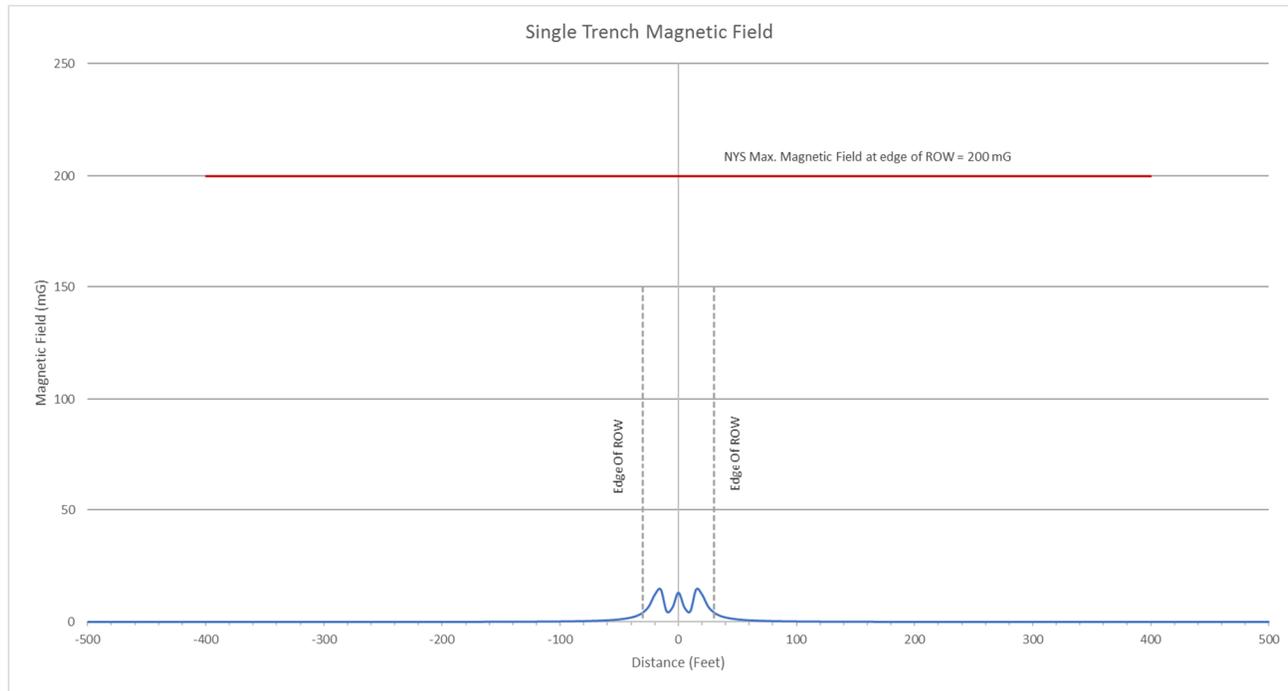
### 2.3 Case 3 - Three 1250 kcmil UG cables in a 42" trench

See cable trench detail "I" on BLS-E-520-02 and corresponding locations shown on the Collection System Map on BLS-E-500-01 in Appendix A

**Table 3: Three 1250 kcmil Results**

Description	Station Number	Field Strength Calculated at Centerline	Field Strength Calculated at Edge of Right-of-Way	New York Magnetic Field Standard at Edge of Right-of-Way
Three 1250 kcmil, 15' spacing	I-1 & I-2	13.2376 mG	4.3024 mG @ ±30ft	<200 mG

**Figure 3: Case 3 - Magnetic Field Calculation**



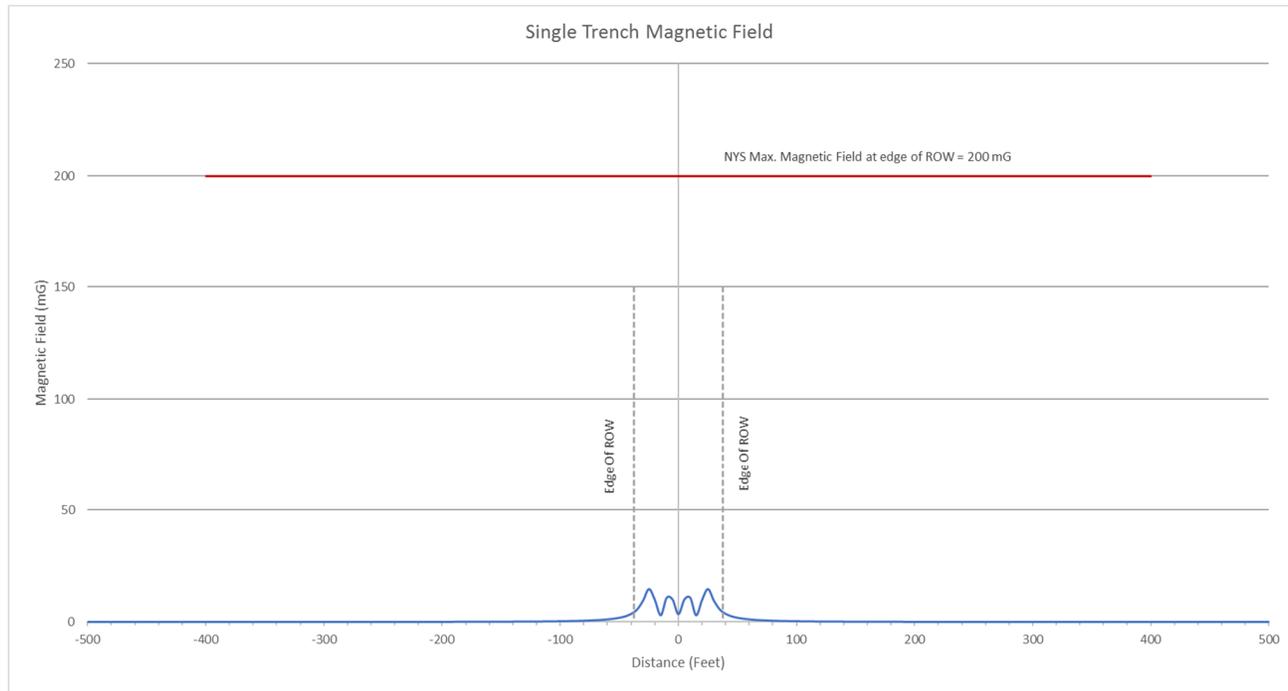
## 2.4 Case 4 – Four 1250 kcmil UG cable in a 42” trench

See cable trench detail "J" on BLS-E-520-03 and corresponding locations shown on the Collection System Map on BLS-E-500-01 in Appendix A

**Table 4: Four 1250 kcmil Results**

Description	Station Number	Field Strength Calculated at Centerline	Field Strength Calculated at Edge of Right-of-Way	New York Magnetic Field Standard at Edge of Right-of-Way
Four 1250 kcmil, 15' spacing	J-1 through J-4	3.5443 mG	4.4912 mG @ ±37.5ft.	<200 mG

**Figure 4: Case 4 - Magnetic Field Calculation**



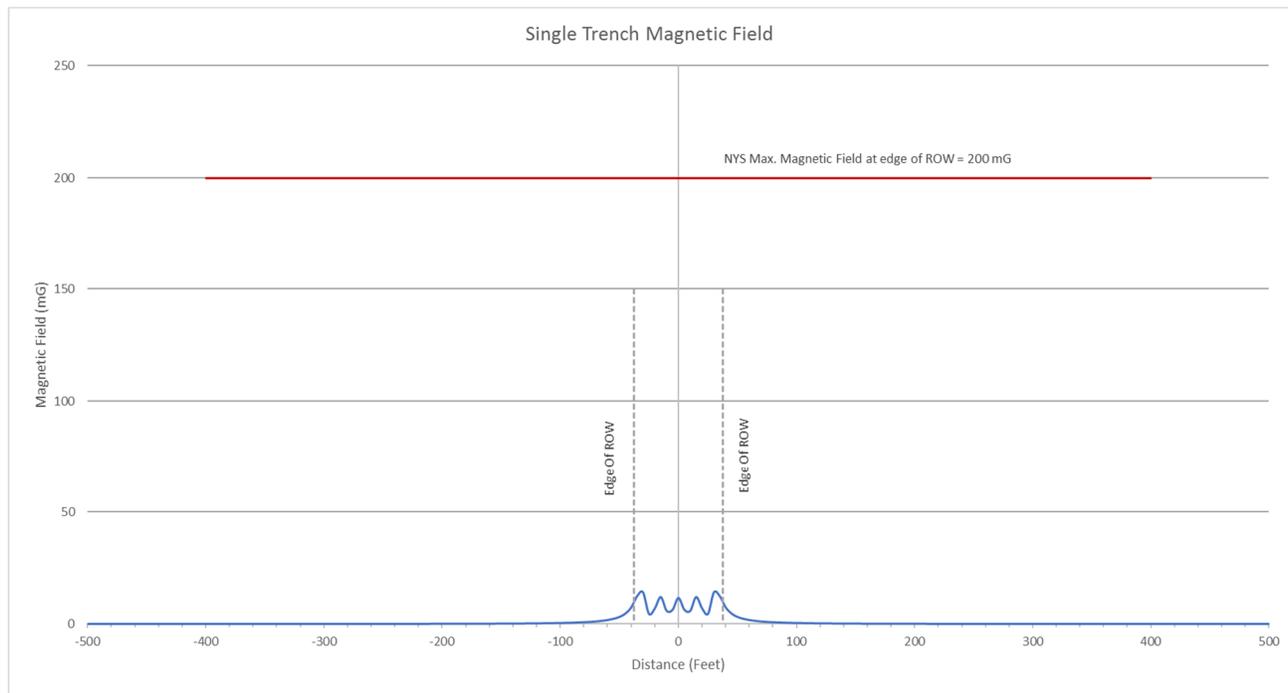
## 2.5 Case 5 - Five 1250 kcmil UG cable in a 42" trench

See cable trench detail "K" on BLS-E-520-03 and corresponding locations shown on the Collection System Map on BLS-E-500-01 in Appendix A

**Table 5: Five 1250 kcmil Results**

Description	Station Number	Field Strength Calculated at Centerline	Field Strength Calculated at Edge of Right-of-Way	New York Magnetic Field Standard at Edge of Right-of-Way
Five 1250 kcmil, 15' spacing	K-1	11.5500 mG	9.5734 mG @ ±37.5ft.	<200 mG

**Figure 5: Case 5 - Magnetic Field Calculation**



# 3 Overhead Cable Results

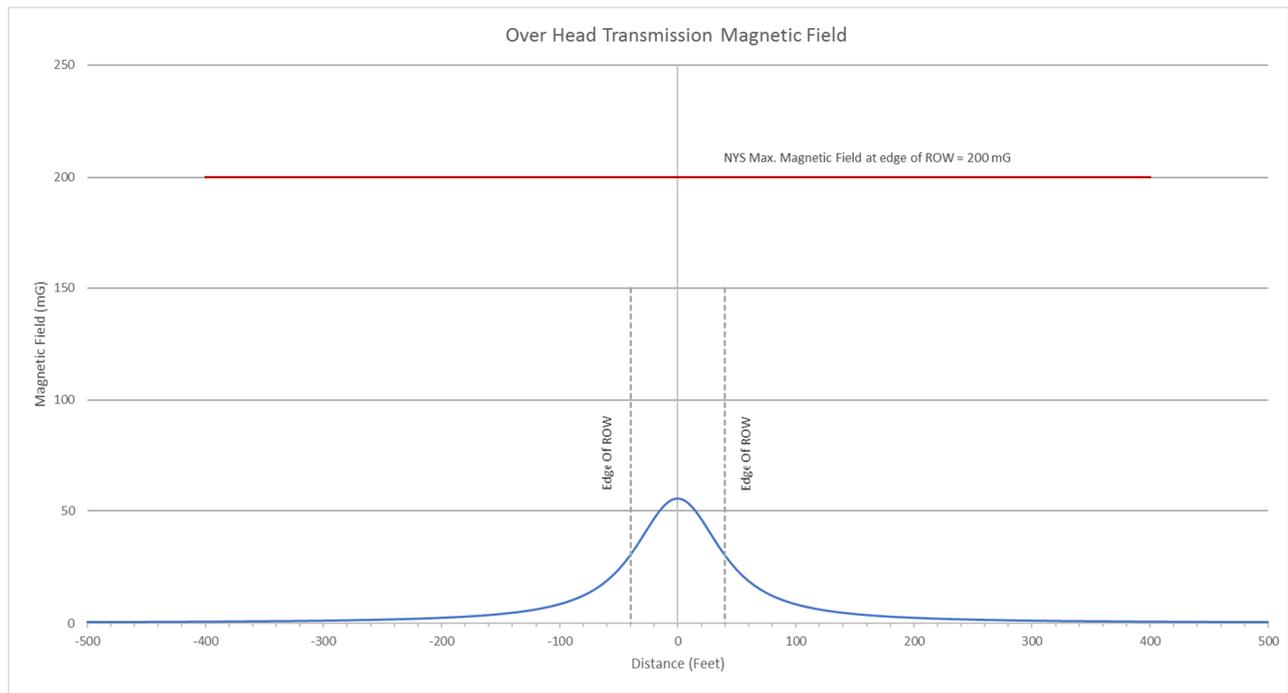
## 3.1 Case 6 - 115 kV Transmission Line Magnetic Field Levels

See dead-end structure details shown on BLS-T-100-01 and corresponding location shown on the Collection System Map on BLS-E-500-01 in Appendix A.

**Table 6: 115 kV Transmission Line Magnetic Field Results**

Description	Station Number	Field Strength Calculated at Centerline	Field Strength Calculated at Edge of Right-of-Way	New York Magnetic Field Standard at Edge of Right-of-Way
115kV Transmission Line	T-1	55.302 mG	30.153 mG @ ±40ft.	<200 mG

**Figure 6: Case 6 – Magnetic Field Calculation**



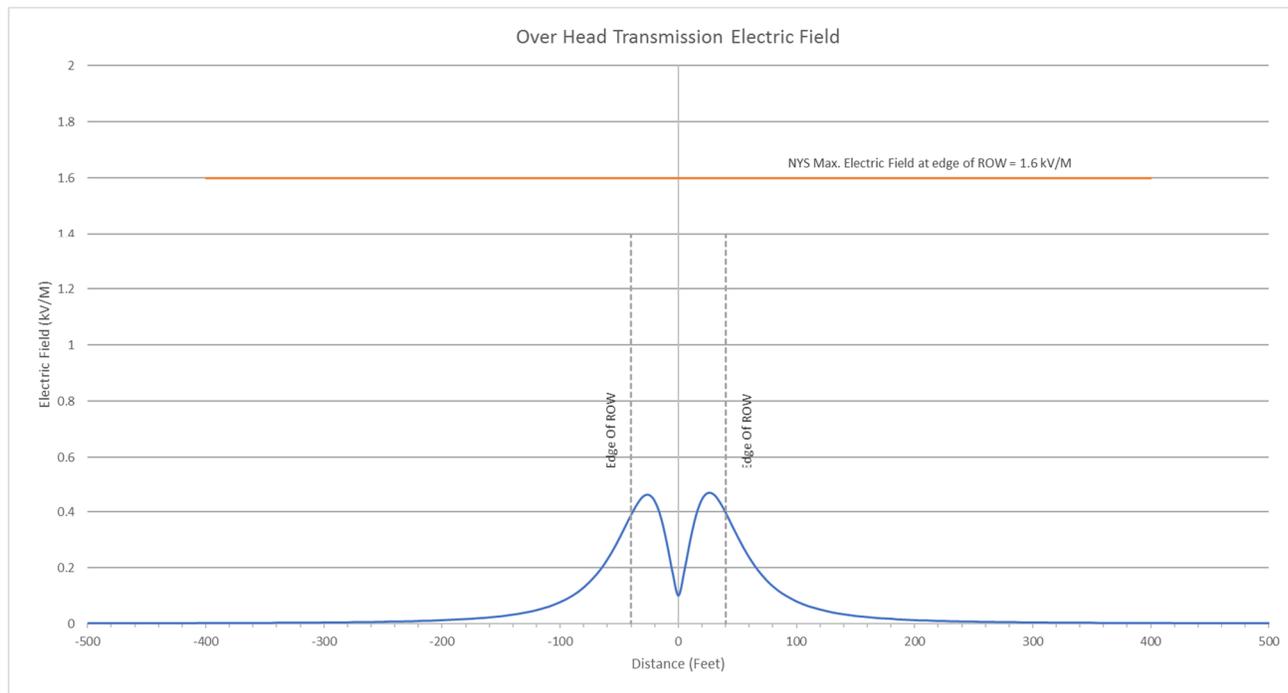
### 3.2 Case 6 - 115 kV Transmission Line Electric Field Levels

See dead-end structure details shown on BLS-T-100-01 and corresponding location shown on the Collection System Map on BLS-E-500-01 in Appendix A.

**Table 7: 115 kV Transmission Line Electric Field Results**

Description	Station Number	Field Strength Calculated at Centerline	Field Strength Calculated at Edge of Right-of-Way	New York Electric Field Standard at Edge of Right-of-Way
115kV Transmission Line	T-1	0.1 kV/m	0.39 kV/m @ ±40ft.	<1.6 kV/m

**Figure 7: Case 6 – Electric Field Calculation**



## 4 Conclusion

The EMF Study concludes that all electric and magnetic field levels for the underground and overhead cables are within the Interim Standard values of 1.6 kV/m for Electric Fields and 200 mG for Magnetic Fields set forth by the New York State Public Service Commission.

**Table 8: EMF Calculation Results**

Case No.	Description	Station Number	Magnetic Field Strength Calculated at Centerline	Magnetic Field Strength Calculated at Edge of Right-of-Way	Electric Field Strength Calculated at Centerline	Electric Field Strength Calculated at Edge of Right-of-Way	New York Magnetic Field Standard at Edge of Right-of-Way	New York Electric Field Standard at Edge of Right-of-Way
1	Single 1250 kcmil	G-1 through G-15	17.6742 mG	3.1832 mG @ ±15ft	N/A	N/A	<200 mG	<1.6 kV/m
2	Two 1250 kcmil, 15' spacing	H-1 through H-4	1.0623 mG	3.9862 mG @ ±22.5ft	N/A	N/A	<200 mG	<1.6 kV/m
3	Three 1250 kcmil, 15' spacing	I-1 & I-2	13.2376 mG	4.3024 mG @ ±30ft	N/A	N/A	<200 mG	<1.6 kV/m
4	Four 1250 kcmil, 15' spacing	J-1 through J-4	3.5443 mG	4.4912 mG @ ±37.5ft.	N/A	N/A	<200 mG	<1.6 kV/m
5	Five 1250 kcmil, 15' spacing	K-1	11.5500 mG	9.5734 mG @ ±37.5ft.	N/A	N/A	<200 mG	<1.6 kV/m
6	115kV Transmission Line	T-1	55.302 mG	30.153 mG @ ±40ft.	0.1 kV/m	0.39 kV/m @ ±40ft.	<200 mG	<1.6 kV/m

## 5 References

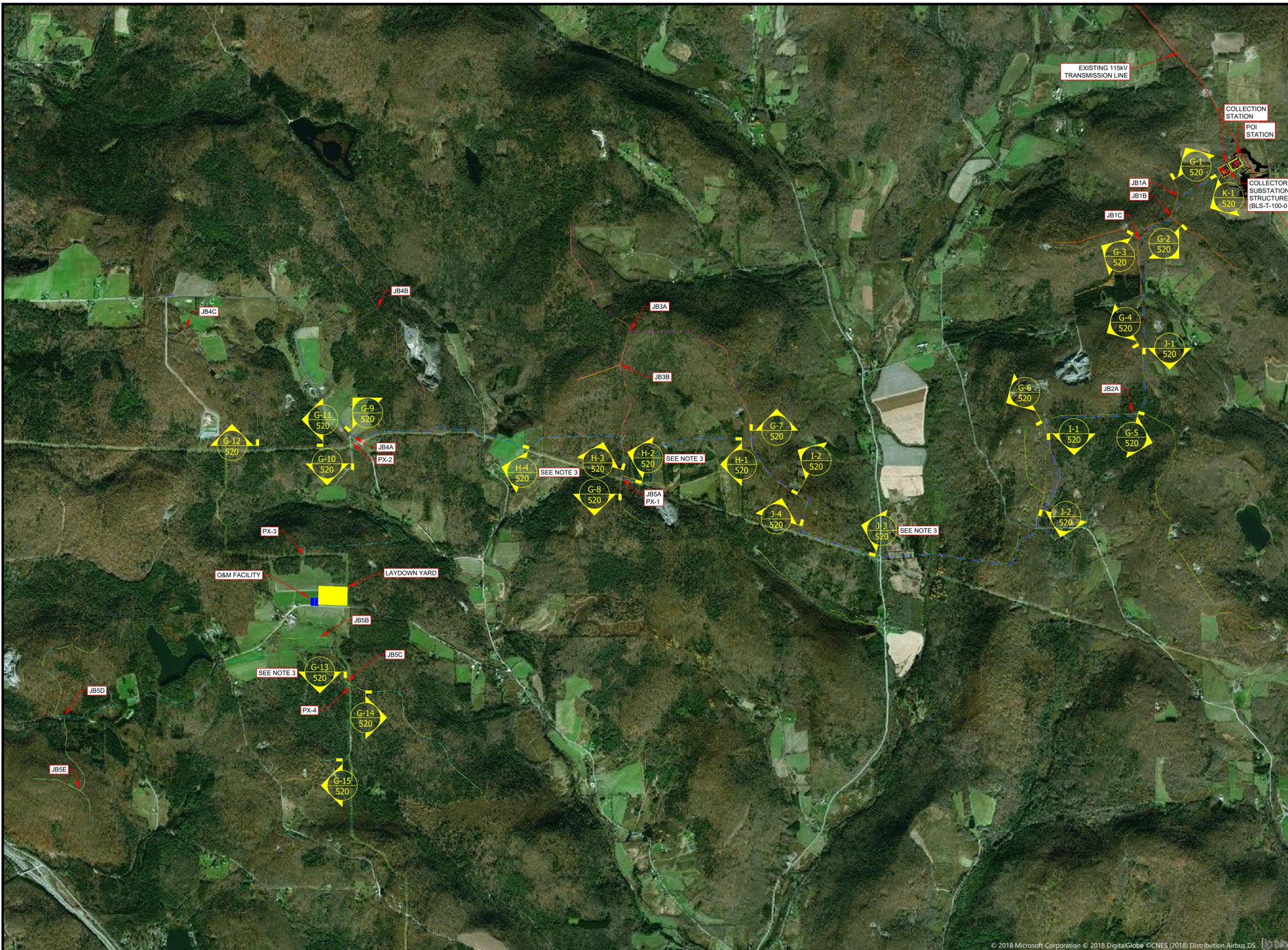
No.	Type	Description
1.	Proceeding Notes	Statement of Interim Policy on Magnetic Fields of Major Electric Transmission Facilities, Dated September 11, 1990

# Appendices

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## A. Project Drawings

<b>A1.</b>	<b>BLS-E-500-01</b>	<b>Underground Collection System Map</b>
<b>A2.</b>	<b>BLS-E-520-02</b>	<b>Underground Collection Cable Trench Details</b>
<b>A3.</b>	<b>BLS-E-520-03</b>	<b>Underground Collection Cable Trench Details</b>
<b>A4.</b>	<b>BLS-E-520-04</b>	<b>Underground Collection Cable Trench Details</b>
<b>A5.</b>	<b>BLS-E-522-02</b>	<b>Underground Collection Pipeline Crossing Details</b>
<b>A6.</b>	<b>BLS-T-100-01</b>	<b>115kV Transmission Line Substation Bay Dead-End</b>



LEGEND	
	ACCESS ROAD
	CIRCUIT 1
	CIRCUIT 2
	CIRCUIT 3
	CIRCUIT 4
	CIRCUIT 5
	EXISTING TRANSMISSION LINE
	WIND TURBINE GENERATOR (WTG)
	PIPELINE CROSSING REFER TO BLS-E-522-02

NOTES	
1.	ALL INFORMATION SHOWN IN THIS SYSTEM MAP IS CONCEPTUAL IN NATURE.
2.	LAYOUT IS BASED ON VESTAS V150-4.2 TURBINES WHICH HAVE A 4.2MW OUTPUT EACH.
3.	FOR FEEDER SECTIONS PARALLELING PIPELINES REFER TO DRAWING BLS-E-520-04 FOR SECTION DETAILS.

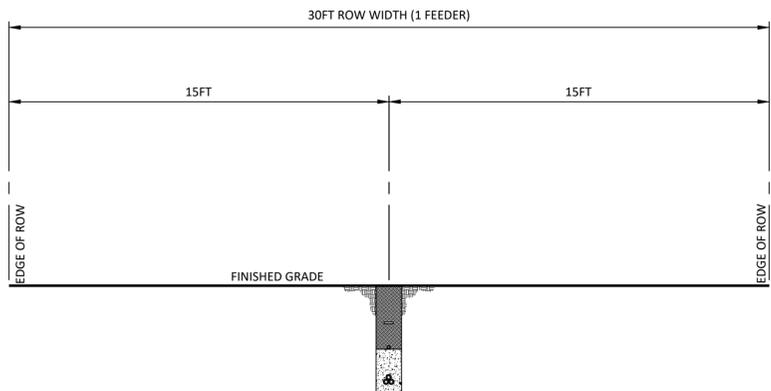
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D	8/17/2018	BK	Issued for Review	MB	SA
C	7/16/2018	BK	Issued for Review	MB	SA
B	7/06/2018	BK	Issued for Review	MB	SA
A	5/04/2018	MB	Issued for Review	SA	SA

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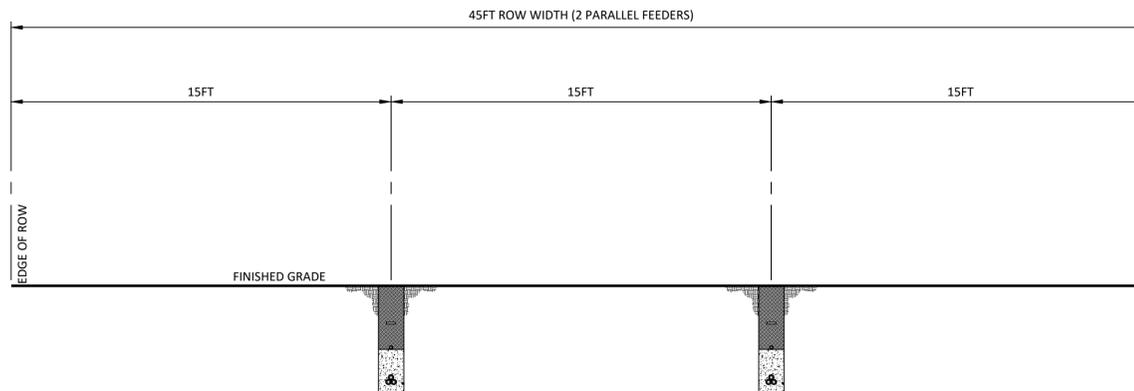
Title **BLUESTONE WIND FARM  
UNDERGROUND COLLECTION  
SYSTEM MAP**

<b>PRELIMINARY NOT FOR CONSTRUCTION</b> REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION	Designed	MB	Eng check	SA
	Drawn	MB	Approved	SA
	Dwg check	SA	Project Mngr	HM
	Scale at ANSI D	N.T.S.	Date	Rev
Drawing Number		8/17/2018 <b>E</b>		
		BLS-E-500-01		

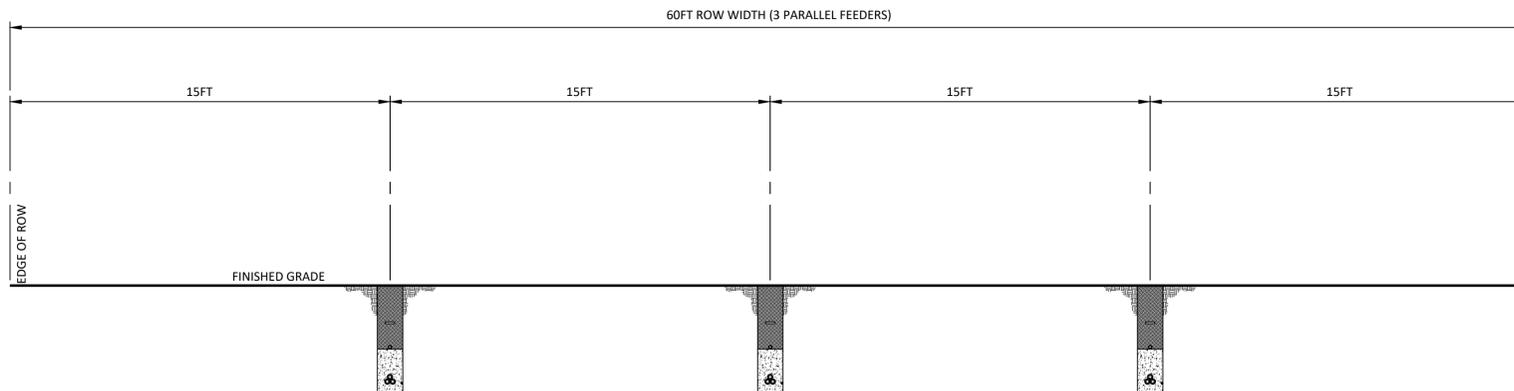
CONCEPTUAL - NOT FOR CONSTRUCTION



**G** TYPICAL SINGLE TRENCH  
Not to Scale



**H** TYPICAL 2 PARALLEL TRENCH SEPARATION  
Not to Scale



**I** TYPICAL 3 PARALLEL TRENCH SEPARATION  
Not to Scale

NOTES

1. ALL EXISTING UTILITIES MUST BE LOCATED BEFORE ANY EXCAVATION/TRENCHING IS STARTED. REGARDLESS OF OTHER UTILITY CONTACTS, CONTRACTOR MUST NOTIFY LOCAL LOCATING CLEARING HOUSE (I.E. ONECALL) OR OTHER STATE BODY.
2. ALL GRADE SURFACES THAT ARE DISTURBED SHALL BE RESTORED TO ESSENTIALLY ORIGINAL CONDITION AND TO THE SATISFACTION OF THE OWNER.
3. THE CABLE ROUTE TO BE FOLLOWED BY CONTRACTOR SHALL BE AS STAKED BY THE CONTRACTOR. ALL TRENCHES SHALL FOLLOW AS STRAIGHT A LINE AS PRACTICAL. ANY DEVIATION FROM THE ROUTING PROVIDED SHALL BE DISCUSSED WITH AND APPROVED BY THE OWNER PRIOR TO CONSTRUCTION. ROCK MAY BE REMOVED BY ANY MEANS CONTRACTOR PREFERENCES, EXCEPT BLASTING. BLASTING WILL NOT BE PERMITTED UNLESS SPECIFICALLY AUTHORIZED BY OWNER.
4. IF THE GROUND WATER LEVEL IS ABOVE THE BOTTOM OF THE TRENCH THE CONTRACTOR AND OWNER SHALL DISCUSS AND AGREE UPON AN ALTERNATIVE CABLE INSTALLATION METHOD. IF THE GROUND WATER LEVEL IS BELOW THE BOTTOM OF THE TRENCH THE FOLLOWING REQUIREMENTS SHALL BE SATISFIED:
  - 4.a. EVERY TRENCH MUST BE A MINIMUM OF 12-INCHES WIDE (WITH PROPER SLOPE FOR WEAK SOILS), AND MUST PROVIDE SUFFICIENT SPACE TO ALLOW COMPACTION AS SPECIFIED WITH THE EQUIPMENT BEING UTILIZED. THE CONTRACTOR SHALL ENSURE THAT SUFFICIENT AMOUNT OF FINE SOIL IS ADDED ABOVE CABLE FOR BACKFILLS.
  - 4.b. THE TOP SOIL MUST BE PUSHED TO ONE SIDE OF THE TRENCH ROUTE AND KEPT SEPARATE FROM BASE MATERIAL. THE STORED TOP SOIL IS TO BE SPREAD UNIFORMLY OVER THE AREA DISTURBED BY TRENCHING FOLLOWING BACKFILL AND COMPACTION.
  - 4.c. CONTRACTOR SHALL PROTECT ALL TRENCHES AND OTHER EXCAVATIONS FROM SURFACE WATER RUNOFF. ANY WATER THAT HAS ACCUMULATED IN THE EXCAVATION SHALL BE REMOVED AND ANY SOFT TRENCH BOTTOM REMOVED AND REPLACED PRIOR TO THE INSTALLATION OF THE CABLES. THIS INCLUDES REMOVAL AND REPLACEMENT OF SAND BACKFILL THAT HAS BECOME CONTAMINATED WITH SILT, ROCKS, MUD, CLAY, ETC. THE REMOVAL OF WATER AND CORRECTION OF SOFT GROUND CONDITIONS DUE TO SURFACE WATER WILL BE THE RESPONSIBILITY OF CONTRACTOR.
  - 4.d. CONTRACTOR MUST PROTECT THE PUBLIC AND LIVESTOCK FROM ALL TRENCHES AND EXCAVATIONS BY UTILIZING SUITABLE BARRICADES OR OTHER WARNING DEVICES.
  - 4.e. ALL TRENCHES SHALL BE EXCAVATED TO DEPTH AS NECESSARY TO MAINTAIN THE SPECIFIED COVER OVER THE INSTALLED CABLE. IF THE BOTTOM OF THE TRENCH CONTAINS ROCKS, WOOD, VEGETATION MATERIAL OR OTHER HARD, ROUGH, OR SHARP MATERIALS THAT COULD DAMAGE THE CABLE, THE TRENCH SHALL BE OVER-EXCAVATED AND BACKFILLED WITH A 4-INCH LAYER OF COMPACTED FINE CLEAN SOIL (NOTHING LARGER THAN WHAT WOULD PASS THROUGH A 3/8-INCH SCREEN) OR SAND PRIOR TO THE CABLE BEING LAID IN PLACE.
5. ALL DIRECT BURIED POWER CABLES SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING:
  - 5.a. 34.5KV CABLES SHALL BE PLACED IN A TRIANGULAR CONFIGURATION, WITH NO INTENTIONAL SEPARATION, SECURED TOGETHER WITH CABLE TIES TO ENSURE THEY REMAIN IN THIS CONFIGURATION DURING AND AFTER INSTALLATION & BACK-FILL. PROPER TIE-WRAP TOOLS SHALL BE USED TO PREVENT OVER-TIGHTENING OF THE CABLE TIE.
  - 5.b. A 4/0 BARE COPPER WIRE SHALL RUN IN THE TRENCH WITH THE POWER CABLES. THERE SHALL BE A MINIMUM OF 4 INCHES OF SEPARATION BETWEEN THIS WIRE AND THE POWER CONDUCTORS PER WIND TURBINE GENERATOR MANUFACTURER'S REQUIREMENT OF THERE BEING INTENTIONAL SEPARATION.
  - 5.c. WHEN INSTALLED ABOVE THE POWER CABLES, THE INNERDUCT FOR FIBER OPTIC COMMUNICATION CABLE SHALL BE LAD ON TOP OF THE PADDING MATERIAL. WHEN INSTALLED AT THE SAME DEPTH AS THE POWER CABLE, THE INNERDUCT AND THE POWER CABLE SHALL BE SEPARATED BY A MINIMUM OF 4 INCHES.
  - 5.d. WHERE TWO OR MORE PARALLEL COMMUNICATION CABLES ARE REQUIRED IN TRENCH, LAY EACH INNERDUCT NEXT TO EACH OTHER WHILE STILL MAINTAINING CLEARANCES SHOWN.
6. BACKFILL AND COMPACTION REQUIREMENTS ARE AS FOLLOWS:
  - 6.a. ALL EXCAVATED AREAS, INCLUDING TRENCHES AND BELL HOLES MUST BE THOROUGHLY COMPACTED TO NO LESS THAN 85% STANDARD PROCTOR OR 105 PCF, UNLESS OTHERWISE NOTED IN THE PROJECT GEO-TECHNICAL REPORT. COMPACTION SHALL BE BY PROVEN METHODOLOGY. SPECIAL CARE MUST BE TAKEN IN THE AREAS WHERE THE THERMAL TESTING OF SOILS IN THAT AREA INDICATES A POTENTIALLY HIGH RESISTIVITY. COMPACTION BY FLOODING WILL NOT BE PERMITTED.
  - 6.b. THE FIRST 12-INCHES OF BACKFILL ABOVE THE CABLE (THIS IS THE CABLE PADDING) MUST BE FREE OF ROCKS, TOP SOIL, ROOTS, AND OTHER ORGANIC MATTER (NOTHING LARGER THAN WHAT WOULD PASS THROUGH A 3/8-INCH SCREEN). IF HEAVY STIFF CLAY IS ENCOUNTERED, THE NATIVE MATERIAL MUST BE EITHER MIXED WITH SANDY SOIL FROM OTHER STRATA IN THE SAME TRENCH, MIXED WITH FINE GRADE SAND THAT IS IMPORTED, OR REPLACED WITH IMPORTED MATERIAL.
  - 6.c. SELECT NATIVE SOIL CAN BE USED FOR THE REMAINDER OF THE TRENCH BACKFILL EXCEPT THAT LARGE CLUMPS AND ROCKS LARGER THAN 4-INCHES MUST BE EXCLUDED AND SUFFICIENT FINES PROVIDED TO ELIMINATE VOIDS.
  - 6.d. AT THE BEGINNING OF THE TRENCH BACKFILLING OPERATION, THE CONTRACTOR AND THE OWNER SHALL DETERMINE THE SUITABILITY OF THE NATIVE SOIL FOR USE AS BACKFILL, AND ANY ADDITIONAL MEASURES THAT MAY BE REQUIRED TO ENSURE ADEQUATE COMPACTION.
  - 6.e. THE CONTRACTOR SHALL FILL THE TRENCH TO PRE-CONSTRUCTION GRADE WITH THE STOCKPILED TOP SOIL AND WITH ADDITIONAL BACKFILL ADDED TO ALLOW FOR SETTLING. CONTRACTOR MAY SLIGHTLY OVERFILL TRENCH IN ORDER TO ALLOW FOR SETTLING.
7. CONTRACTOR SHALL PROVIDE AND INSTALL A PLASTIC WARNING TAPE IN ALL TRENCHES DURING BACKFILLING. THIS TAPE SHALL BE INSTALLED APPROXIMATELY 24-INCHES ABOVE THE CABLES. THE TAPE SHALL BE 6" WIDE, RED WITH BLACK LETTERS, MARKED "CAUTION - BURIED ELECTRIC LINES BELOW".
8. EXCAVATED SOIL AND ROCK THAT IS NOT REUSED IN BACKFILLING THE TRENCHES IS TO BE DISTRIBUTED ACROSS THE SITE PER THE DIRECTION OF THE OWNER.
9. ALL EXCAVATION, TRENCHING AND ELECTRICAL SYSTEM CONSTRUCTION WILL BE DONE IN ACCORDANCE WITH THE FORMAL STORM WATER POLLUTION PREVENTION PLAN (SWPPP) FOR THE PROJECT.

Rev	Date	Drawn	Description	Ch'k'd	App'd
C	8/22/2018	JRR	Issued for Review	DH	SA
B	7/16/2018	BK	Issued for Review	MB	SA
A	5/04/2018	MB	Issued for Review	SA	SA

**M M**  
**MOTT**  
**MACDONALD**

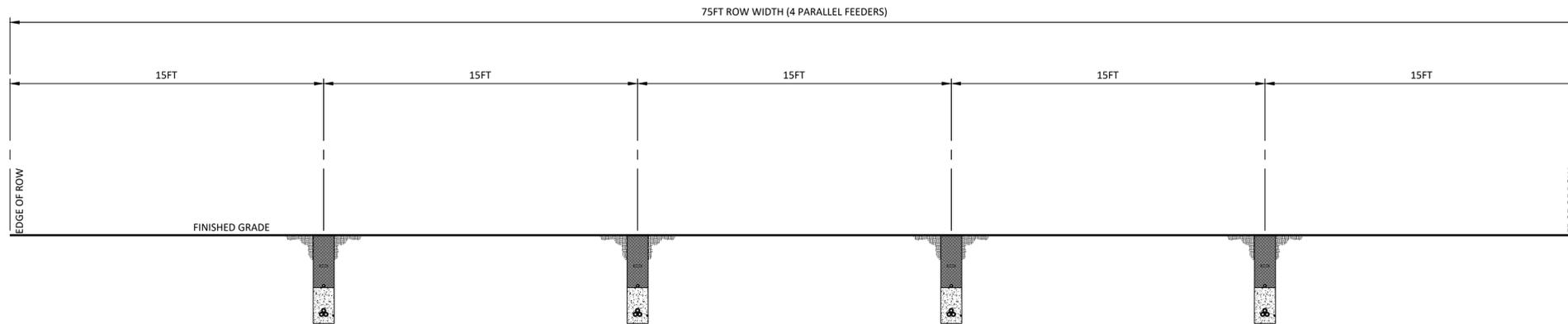
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T +1 (781) 915-0015  
F +1 (781) 915-0001  
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Client

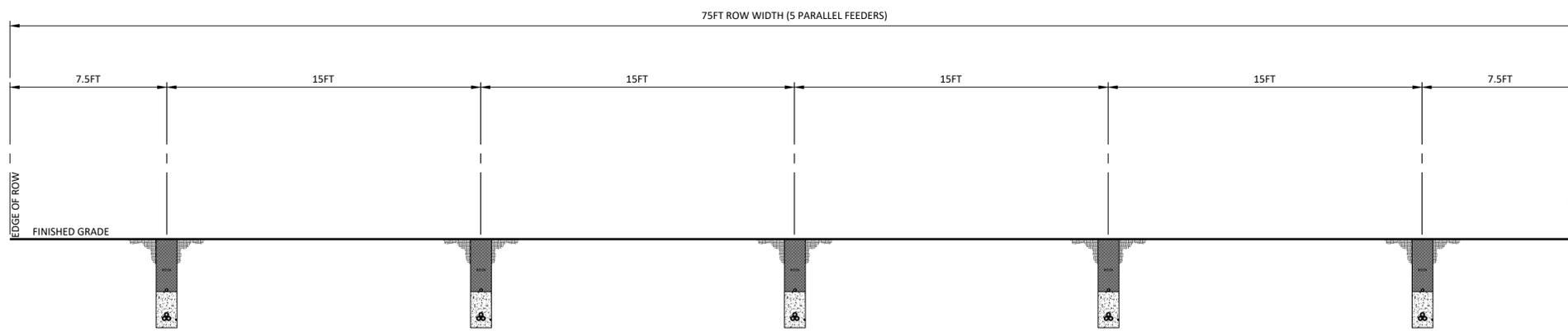
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**BLUESTONE WIND FARM  
UNDERGROUND COLLECTION  
CABLE TRENCH DETAILS**

PRELIMINARY NOT FOR CONSTRUCTION REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION	Designed	MB	Eng check	SA
	Drawn	MB	Approved	SA
	Dwg check	SA	Project Mngr	HM
	Scale at ANS I D	N.T.S.	Date	7/16/2018
	Drawing Number	BLS-E-520-02		

CONCEPTUAL - NOT FOR CONSTRUCTION



**J** TYPICAL 4 PARALLEL TRENCH SEPARATION  
Not to Scale



**K** TYPICAL 5 PARALLEL TRENCH SEPARATION  
Not to Scale

**NOTES**

1. ALL EXISTING UTILITIES MUST BE LOCATED BEFORE ANY EXCAVATION/TRENCHING IS STARTED. REGARDLESS OF OTHER UTILITY CONTACTS, CONTRACTOR MUST NOTIFY LOCAL LOCATING CLEARING HOUSE (I.E. ONECALL) OR OTHER STATE BODY.
2. ALL GRADE SURFACES THAT ARE DISTURBED SHALL BE RESTORED TO ESSENTIALLY ORIGINAL CONDITION AND TO THE SATISFACTION OF THE OWNER.
3. THE CABLE ROUTE TO BE FOLLOWED BY CONTRACTOR SHALL BE AS STAKED BY THE CONTRACTOR. ALL TRENCHES SHALL FOLLOW AS STRAIGHT A LINE AS PRACTICAL. ANY DEVIATION FROM THE ROUTING PROVIDED SHALL BE DISCUSSED WITH AND APPROVED BY THE OWNER PRIOR TO CONSTRUCTION. ROCK MAY BE REMOVED BY ANY MEANS CONTRACTOR PREFERS, EXCEPT BLASTING. BLASTING WILL NOT BE PERMITTED UNLESS SPECIFICALLY AUTHORIZED BY OWNER.
4. IF THE GROUND WATER LEVEL IS ABOVE THE BOTTOM OF THE TRENCH THE CONTRACTOR AND OWNER SHALL DISCUSS AND AGREE UPON AN ALTERNATIVE CABLE INSTALLATION METHOD. IF THE GROUND WATER LEVEL IS BELOW THE BOTTOM OF THE TRENCH THE FOLLOWING REQUIREMENTS SHALL BE SATISFIED:
  - 4.a. EVERY TRENCH MUST BE A MINIMUM OF 12-INCHES WIDE (WITH PROPER SLOPE FOR WEAK SOILS), AND MUST PROVIDE SUFFICIENT SPACE TO ALLOW COMPACTION AS SPECIFIED WITH THE EQUIPMENT BEING UTILIZED. THE CONTRACTOR SHALL ENSURE THAT SUFFICIENT AMOUNT OF FINE SOIL IS ADDED ABOVE CABLE FOR BACKFILL.
  - 4.b. THE TOP SOIL MUST BE PUSHED TO ONE SIDE OF THE TRENCH ROUTE AND KEPT SEPARATE FROM BASE MATERIAL. THE STORED TOP SOIL IS TO BE SPREAD UNIFORMLY OVER THE AREA DISTURBED BY TRENCHING FOLLOWING BACKFILL AND COMPACTION.
  - 4.c. CONTRACTOR SHALL PROTECT ALL TRENCHES AND OTHER EXCAVATIONS FROM SURFACE WATER RUNOFF. ANY WATER THAT HAS ACCUMULATED IN THE EXCAVATION SHALL BE REMOVED AND ANY SOFT TRENCH BOTTOM REMOVED AND REPLACED PRIOR TO THE INSTALLATION OF THE CABLES. THIS INCLUDES REMOVAL AND REPLACEMENT OF SAND BACKFILL THAT HAS BECOME CONTAMINATED WITH SILT, ROCKS, MUD, CLAY, ETC. THE REMOVAL OF WATER AND CORRECTION OF SOFT GROUND CONDITIONS DUE TO SURFACE WATER WILL BE THE RESPONSIBILITY OF CONTRACTOR.
  - 4.d. CONTRACTOR MUST PROTECT THE PUBLIC AND LIVESTOCK FROM ALL TRENCHES AND EXCAVATIONS BY UTILIZING SUITABLE BARRICADES OR OTHER WARNING DEVICES.
  - 4.e. ALL TRENCHES SHALL BE EXCAVATED TO DEPTH AS NECESSARY TO MAINTAIN THE SPECIFIED COVER OVER THE INSTALLED CABLE. IF THE BOTTOM OF THE TRENCH CONTAINS ROCKS, WOOD, VEGETATION MATERIAL OR OTHER HARD, ROUGH, OR SHARP MATERIALS THAT COULD DAMAGE THE CABLE, THE TRENCH SHALL BE OVER-EXCAVATED AND BACKFILLED WITH A 4-INCH LAYER OF COMPACTED FINE CLEAN SOIL (NOTHING LARGER THAN WHAT WOULD PASS THROUGH A 3/8-INCH SCREEN) OR SAND PRIOR TO THE CABLE BEING LAID IN PLACE.
5. ALL DIRECT BURIED POWER CABLES SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING:
  - 5.a. 34.5KV CABLES SHALL BE PLACED IN A TRIANGULAR CONFIGURATION, WITH NO INTENTIONAL SEPARATION, SECURED TOGETHER AS NEEDED WITH CABLE TIES TO ENSURE THEY REMAIN IN THIS CONFIGURATION DURING AND AFTER INSTALLATION & BACK-FILL. PROPER TIE-WRAP TOOLS SHALL BE USED TO PREVENT OVER-TIGHTENING OF THE CABLE TIE.
  - 5.b. A 4/0 BARE COPPER WIRE SHALL RUN IN THE TRENCH WITH THE POWER CABLES. THERE SHALL BE A MINIMUM OF 4 INCHES OF SEPARATION BETWEEN THIS WIRE AND THE POWER CONDUCTORS PER WIND TURBINE GENERATOR MANUFACTURER'S REQUIREMENT OF THERE BEING INTENTIONAL SEPARATION.
  - 5.c. WHEN INSTALLED ABOVE THE POWER CABLES, THE INNERDUCT FOR FIBER OPTIC COMMUNICATION CABLE SHALL BE LAID ON TOP OF THE PADDING MATERIAL. WHEN INSTALLED AT THE SAME DEPTH AS THE POWER CABLE, THE INNERDUCT AND THE POWER CABLE SHALL BE SEPARATED BY A MINIMUM OF 4 INCHES.
  - 5.d. WHERE TWO OR MORE PARALLEL COMMUNICATION CABLES ARE REQUIRED IN TRENCH, LAY EACH INNERDUCT NEXT TO EACH OTHER WHILE STILL MAINTAINING CLEARANCES SHOWN.
6. BACKFILL AND COMPACTION REQUIREMENTS ARE AS FOLLOWS:
  - 6.a. ALL EXCAVATED AREAS, INCLUDING TRENCHES AND BELL HOLES MUST BE THOROUGHLY COMPACTED TO NO LESS THAN 85% STANDARD PROCTOR OR 105% PCF, UNLESS OTHERWISE NOTED IN THE PROJECT GEO-TECHNICAL REPORT. COMPACTION SHALL BE BY PROVEN METHODOLOGY. SPECIAL CARE MUST BE TAKEN IN THE AREAS WHERE THE THERMAL TESTING OF SOILS IN THAT AREA INDICATES A POTENTIALLY HIGH RESISTIVITY. COMPACTION BY FLOODING WILL NOT BE PERMITTED.
  - 6.b. THE FIRST 12-INCHES OF BACKFILL ABOVE THE CABLE (THIS IS THE CABLE PADDING) MUST BE FREE OF ROCKS, TOP SOIL, ROOTS, AND OTHER ORGANIC MATTER (NOTHING LARGER THAN WHAT WOULD PASS THROUGH A 3/8-INCH SCREEN). IF HEAVY STIFF CLAY IS ENCOUNTERED, THE NATIVE MATERIAL MUST BE EITHER MIXED WITH SANDY SOIL FROM OTHER STRATA IN THE SAME TRENCH, MIXED WITH FINE GRADE SAND THAT IS IMPORTED, OR REPLACED WITH IMPORTED MATERIAL.
  - 6.c. SELECT NATIVE SOIL CAN BE USED FOR THE REMAINDER OF THE TRENCH BACKFILL EXCEPT THAT LARGE CLUMPS AND ROCKS LARGER THAN 4-INCHES MUST BE EXCLUDED AND SUFFICIENT FINES PROVIDED TO ELIMINATE VOIDS.
  - 6.d. AT THE BEGINNING OF THE TRENCH BACKFILLING OPERATION, THE CONTRACTOR AND THE OWNER SHALL DETERMINE THE SUITABILITY OF THE NATIVE SOIL FOR USE AS BACKFILL, AND ANY ADDITIONAL MEASURES THAT MAY BE REQUIRED TO ENSURE ADEQUATE COMPACTION.
  - 6.e. THE CONTRACTOR SHALL FILL THE TRENCH TO PRE-CONSTRUCTION GRADE WITH THE STOCKPILED TOP SOIL AND WITH ADDITIONAL BACKFILL ADDED TO ALLOW FOR SETTLING. CONTRACTOR MAY SLIGHTLY OVERFILL TRENCH IN ORDER TO ALLOW FOR SETTLING.
  - 6.f. CONTRACTOR SHALL PROVIDE AND INSTALL A PLASTIC WARNING TAPE IN ALL TRENCHES DURING BACKFILLING. THIS TAPE SHALL BE INSTALLED APPROXIMATELY 24-INCHES ABOVE THE CABLES. THE TAPE SHALL BE 6" WIDE, RED WITH BLACK LETTERS, MARKED "CAUTION - BURIED ELECTRIC LINES BELOW".
8. EXCAVATED SOIL AND ROCK THAT IS NOT REUSED IN BACKFILLING THE TRENCHES IS TO BE DISTRIBUTED ACROSS THE SITE PER THE DIRECTION OF THE OWNER.
9. ALL EXCAVATION, TRENCHING AND ELECTRICAL SYSTEM CONSTRUCTION WILL BE DONE IN ACCORDANCE WITH THE FORMAL STORM WATER POLLUTION PREVENTION PLAN (SWPPP) FOR THE PROJECT.

Rev	Date	Drawn	Description	Ch'k'd	App'd
C	8/22/2018	JRR	Issued for Review	DH	SA
B	8/17/2018	BK	Issued for Review	MB	SA
A	7/16/2018	BK	Issued for Review	MB	SA

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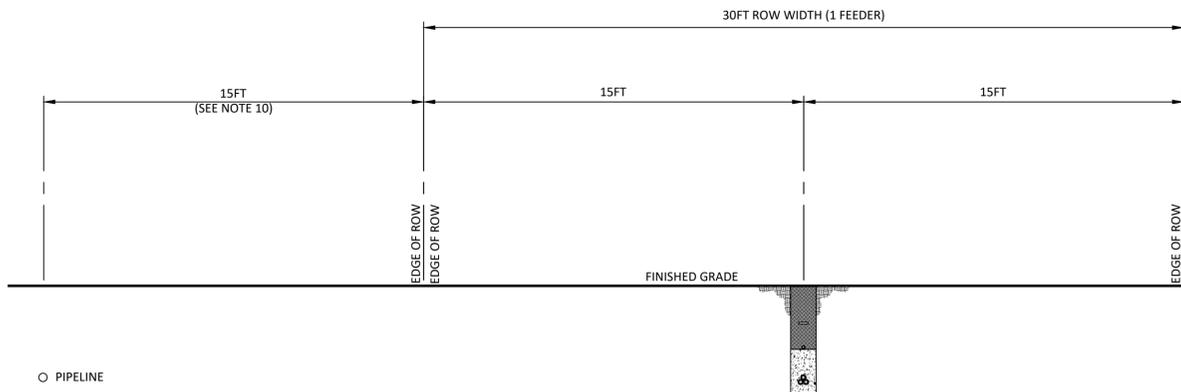
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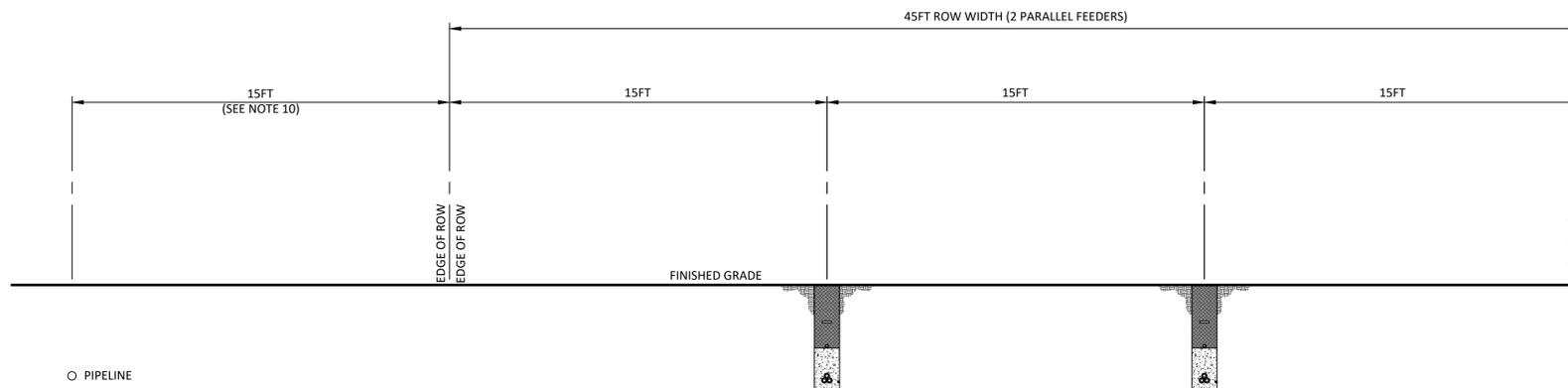
Title  
**BLUESTONE WIND FARM  
UNDERGROUND COLLECTION  
CABLE TRENCH DETAILS**

PRELIMINARY NOT FOR CONSTRUCTION REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION	Designed	BK	Eng check	MB
	Drawn	BK	Approved	SA
	Dwg check	MB	Project Mngr	HM
	Scale at ANS I D	N.T.S.	Date	8/17/2018
			Rev	C
Drawing Number	BLS-E-520-03			

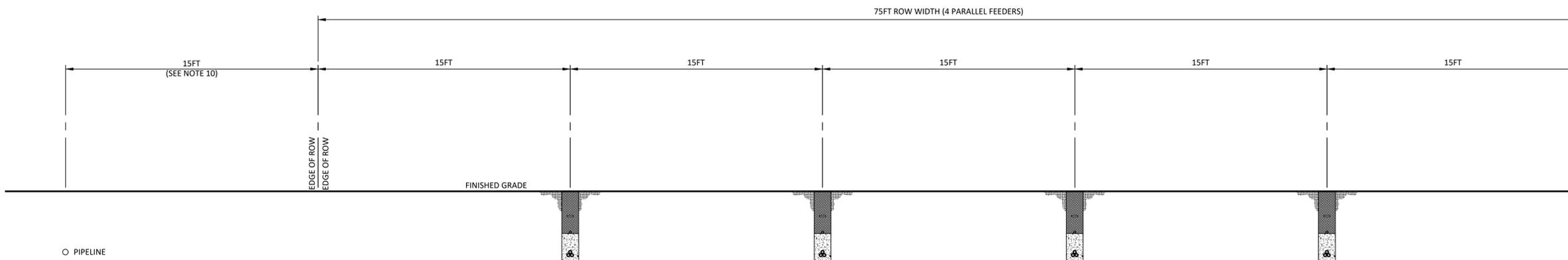
CONCEPTUAL - NOT FOR CONSTRUCTION



**G-13** SINGLE TRENCH PARALLEL PIPELINE SEPARATION  
Not to Scale



**H-2** 2 TRENCH PARALLEL PIPELINE SEPARATION  
Not to Scale



**J-3** 4 TRENCH PARALLEL PIPELINE SEPARATION  
Not to Scale

**NOTES**

- ALL EXISTING UTILITIES MUST BE LOCATED BEFORE ANY EXCAVATION/TRENCHING IS STARTED. REGARDLESS OF OTHER UTILITY CONTACTS, CONTRACTOR MUST NOTIFY LOCAL LOCATING CLEARING HOUSE (I.E. ONECALL) OR OTHER STATE BODY.
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- IF THE GROUND WATER LEVEL IS ABOVE THE BOTTOM OF THE TRENCH THE CONTRACTOR AND OWNER SHALL DISCUSS AND AGREE UPON AN ALTERNATIVE CABLE INSTALLATION METHOD. IF THE GROUND WATER LEVEL IS BELOW THE BOTTOM OF THE TRENCH THE FOLLOWING REQUIREMENTS SHALL BE SATISFIED:
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  - THE TOP SOIL MUST BE PUSHED TO ONE SIDE OF THE TRENCH ROUTE AND KEPT SEPARATE FROM BASE MATERIAL. THE STORED TOP SOIL IS TO BE SPREAD UNIFORMLY OVER THE AREA DISTURBED BY TRENCHING FOLLOWING BACKFILL AND COMPACTION.
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  - A 4/0 BARE COPPER WIRE SHALL RUN IN THE TRENCH WITH THE POWER CABLES. THERE SHALL BE A MINIMUM OF 4 INCHES OF SEPARATION BETWEEN THIS WIRE AND THE POWER CONDUCTORS PER WIND TURBINE GENERATOR MANUFACTURER'S REQUIREMENT OF THERE BEING INTENTIONAL SEPARATION.
  - WHEN INSTALLED ABOVE THE POWER CABLES, THE INNERDUCT FOR FIBER OPTIC COMMUNICATION CABLE SHALL BE LAID ON TOP OF THE PADDING MATERIAL. WHEN INSTALLED AT THE SAME DEPTH AS THE POWER CABLE, THE INNERDUCT AND THE POWER CABLE SHALL BE SEPARATED BY A MINIMUM OF 4 INCHES.
  - WHERE TWO OR MORE PARALLEL COMMUNICATION CABLES ARE REQUIRED IN TRENCH, LAY EACH INNERDUCT NEXT TO EACH OTHER WHILE STILL MAINTAINING CLEARANCES SHOWN.
- BACKFILL AND COMPACTION REQUIREMENTS ARE AS FOLLOWS:
  - ALL EXCAVATED AREAS, INCLUDING TRENCHES AND BELL HOLES MUST BE THOROUGHLY COMPACTED TO NO LESS THAN 85% STANDARD PROCTOR OR 105 PCF, UNLESS OTHERWISE NOTED IN THE PROJECT GEO-TECHNICAL REPORT. COMPACTION SHALL BE BY PROVEN METHODOLOGY. SPECIAL CARE MUST BE TAKEN IN THE AREAS WHERE THE THERMAL TESTING OF SOILS IN THAT AREA INDICATES A POTENTIALLY HIGH RESISTIVITY. COMPACTION BY FLOODING WILL NOT BE PERMITTED.
  - THE FIRST 12-INCHES OF BACKFILL ABOVE THE CABLE (THIS IS THE CABLE PADDING) MUST BE FREE OF ROCKS, TOP SOIL, ROOTS, AND OTHER ORGANIC MATTER (NOTHING LARGER THAN WHAT WOULD PASS THROUGH A 3/8-INCH SCREEN). IF HEAVY STIFF CLAY IS ENCOUNTERED, THE NATIVE MATERIAL MUST BE EITHER MIXED WITH SANDY SOIL FROM OTHER STRATA IN THE SAME TRENCH, MIXED WITH FINE GRADE SAND THAT IS IMPORTED, OR REPLACED WITH IMPORTED MATERIAL.
  - SELECT NATIVE SOIL CAN BE USED FOR THE REMAINDER OF THE TRENCH BACKFILL EXCEPT THAT LARGE CLUMPS AND ROCKS LARGER THAN 4-INCHES MUST BE EXCLUDED AND SUFFICIENT FINES PROVIDED TO ELIMINATE VOIDS.
  - AT THE BEGINNING OF THE TRENCH BACKFILLING OPERATION, THE CONTRACTOR AND THE OWNER SHALL DETERMINE THE SUITABILITY OF THE NATIVE SOIL FOR USE AS BACKFILL, AND ANY ADDITIONAL MEASURES THAT MAY BE REQUIRED TO ENSURE ADEQUATE COMPACTION.
  - THE CONTRACTOR SHALL FILL THE TRENCH TO PRE-CONSTRUCTION GRADE WITH THE STOCKPILED TOP SOIL AND WITH ADDITIONAL BACKFILL ADDED TO ALLOW FOR SETTLING. CONTRACTOR MAY SLIGHTLY OVERFILL TRENCH IN ORDER TO ALLOW FOR SETTLING.
- CONTRACTOR SHALL PROVIDE AND INSTALL A PLASTIC WARNING TAPE IN ALL TRENCHES DURING BACKFILLING. THIS TAPE SHALL BE INSTALLED APPROXIMATELY 24-INCHES ABOVE THE CABLES. THE TAPE SHALL BE 6" WIDE, RED WITH BLACK LETTERS, MARKED "CAUTION - BURIED ELECTRIC LINES BELOW".
- EXCAVATED SOIL AND ROCK THAT IS NOT REUSED IN BACKFILLING THE TRENCHES IS TO BE DISTRIBUTED ACROSS THE SITE PER THE DIRECTION OF THE OWNER.
- ALL EXCAVATION, TRENCHING AND ELECTRICAL SYSTEM CONSTRUCTION WILL BE DONE IN ACCORDANCE WITH THE FORMAL STORM WATER POLLUTION PREVENTION PLAN (SWPPP) FOR THE PROJECT.
- ESTIMATED DISTANCE FROM PIPELINE TO EDGE OF RIGHT-OF-WAY BASED ON AVAILABLE PUBLIC SOURCE DATA.

Rev	Date	Drawn	Description	Ch'k'd	App'd
B	8/22/2018	JRR	Issued for Review	DH	SA
A	8/17/2018	BK	Issued for Review	MB	SA

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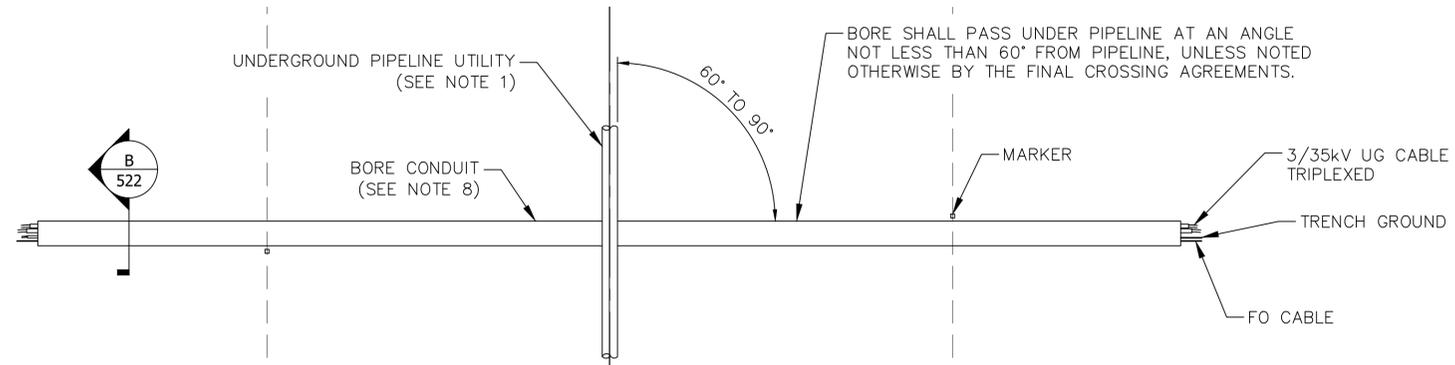
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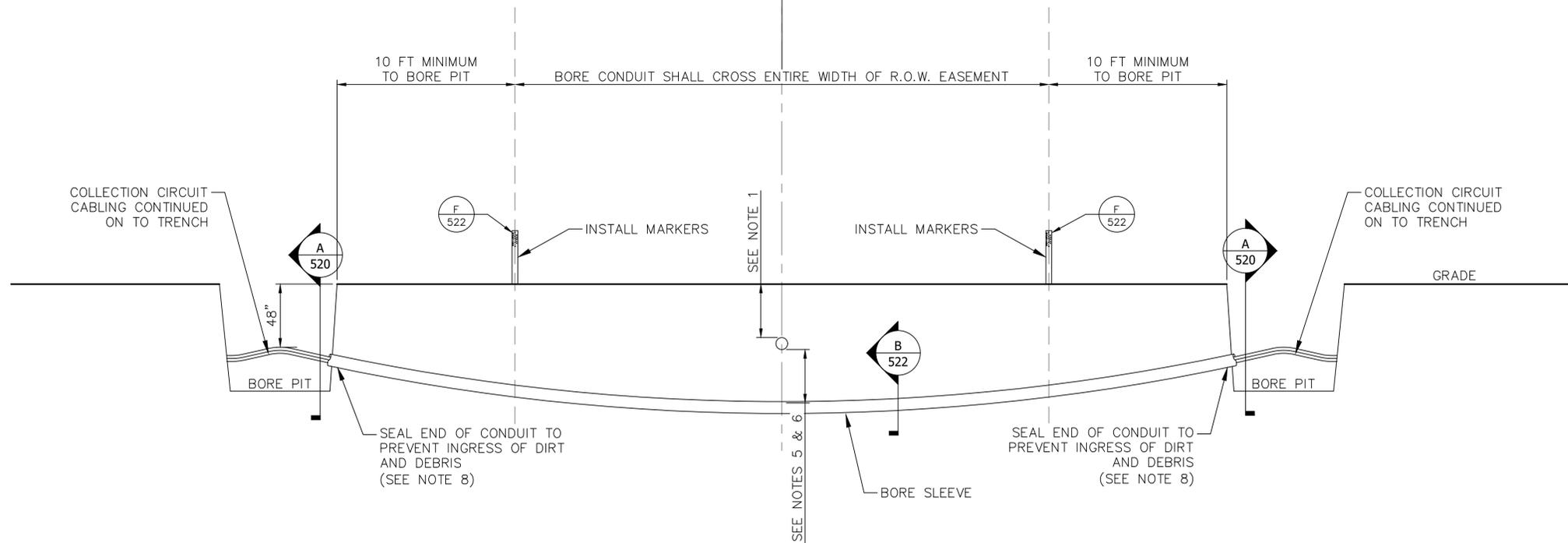
Title  
**BLUESTONE WIND FARM  
UNDERGROUND COLLECTION  
CABLE TRENCH DETAILS**

PRELIMINARY NOT FOR CONSTRUCTION REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION	Designed	BK	Eng check	MB
	Drawn	BK	Approved	SA
	Dwg check	MB	Project Mngr	HM
	Scale at ANSI D	N.T.S.	Date	8/17/2018
			Rev	B
	Drawing Number	BLS-E-520-04		

CONCEPTUAL - NOT FOR CONSTRUCTION



**C** FEEDER PIPELINE CROSSING - PLAN VIEW  
Not to Scale



**D** FEEDER PIPELINE CROSSING - PROFILE VIEW  
Not to Scale

NOTES

1. PRIOR TO EXCAVATION, CONTRACTOR SHALL CONTACT LOCAL ONE CALL UTILITY LOCATING SERVICES TO VERIFY DEPTH AND LOCATION OF ALL UTILITIES AT THE CROSSING LOCATION.
2. ALL PIPELINE CROSSINGS SHALL COMPLY WITH SPECIFIC AGREEMENTS AND PERMITS WITH PIPELINE OWNER/OPERATOR. IN THE CASE THAT THIS DOCUMENT CONFLICTS WITH THESE SPECIFIC AGREEMENTS AND/OR PERMITS, THE CONTRACTOR SHALL COMPLY WITH THE AGREEMENTS/PERMITS AND NOTIFY THE OWNER OF THE CONFLICT.
3. PERMANENT ABOVE GRADE ROUTE MARKERS SHALL BE INSTALLED AND MAINTAINED AT THE LIMITS OF THE PIPELINE EASEMENT UNLESS THE CROSSING IS IN A CULTIVATED FIELD. IF CROSSING IS IN A CULTIVATED FIELD, THEN UNDERGROUND EXTENDED-RANGE MARKER BALLS SHALL BE INSTALLED.
4. EACH INSTALLED CROSSING SHALL BE ENCASED THROUGHOUT THE WIDTH OF THE PIPELINE UTILITY EASEMENT.
5. CONTRACTOR SHALL MAINTAIN A SEPARATION OF NOT LESS THAN 12 INCHES WHEN PARALLELING GAS, WATER, OIL, OR OTHER PIPELINE SYSTEMS AND NOT LESS THAN 6 INCHES WHEN CROSSING THESE PIPELINE SYSTEMS BETWEEN THE BOTTOM OF THE PIPELINE SYSTEM AND THE TOP OF THE COLLECTION SYSTEM INSTALLATION CONDUIT, UNLESS OTHERWISE SPECIFICALLY AGREED UPON AND NOTED BY OWNER AND THE PIPELINE UTILITY PRIOR TO CONSTRUCTION.
6. COLLECTION SYSTEM CABLES SHALL BE SEPARATED FROM GAS TRANSMISSION LINES BY A CLEARANCE OF NOT LESS THAN 12 INCHES. IF THIS CLEARANCE CANNOT BE ATTAINED, THE GAS TRANSMISSION LINE SHALL BE PROTECTED FROM DAMAGE THAT MIGHT RESULT FROM THE PROXIMITY OF THE COLLECTION SYSTEM CABLES.
7. A THREE PHASE SPLICE CAN BE INSTALLED ON EITHER SIDE OF THE CROSSING FOR PULLING THROUGH THE CONDUIT. ALL SPLICES TO BE APPROVED BY THE OWNER PRIOR TO INSTALLATION.
8. COATED STEEL PIPE OR CONCRETE ENCASED HDPE PIPE CAN BE USED IN PLACE OF CONDUIT.

Rev	Date	Drawn	Description	Ch'k'd	App'd
C	8/22/2018	JRR	Issued for Review	DH	SA
B	8/17/2018	BK	Issued for Review	MB	SA
A	5/04/2018	MB	Issued for Review	SA	SA



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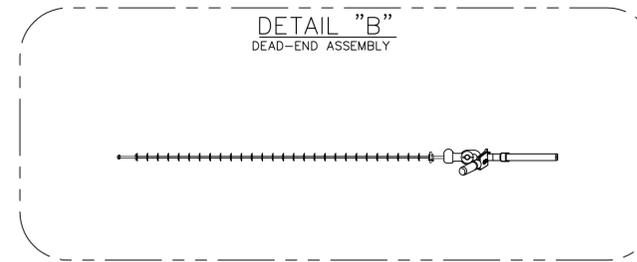
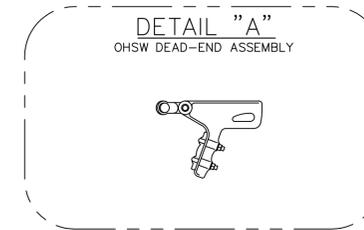
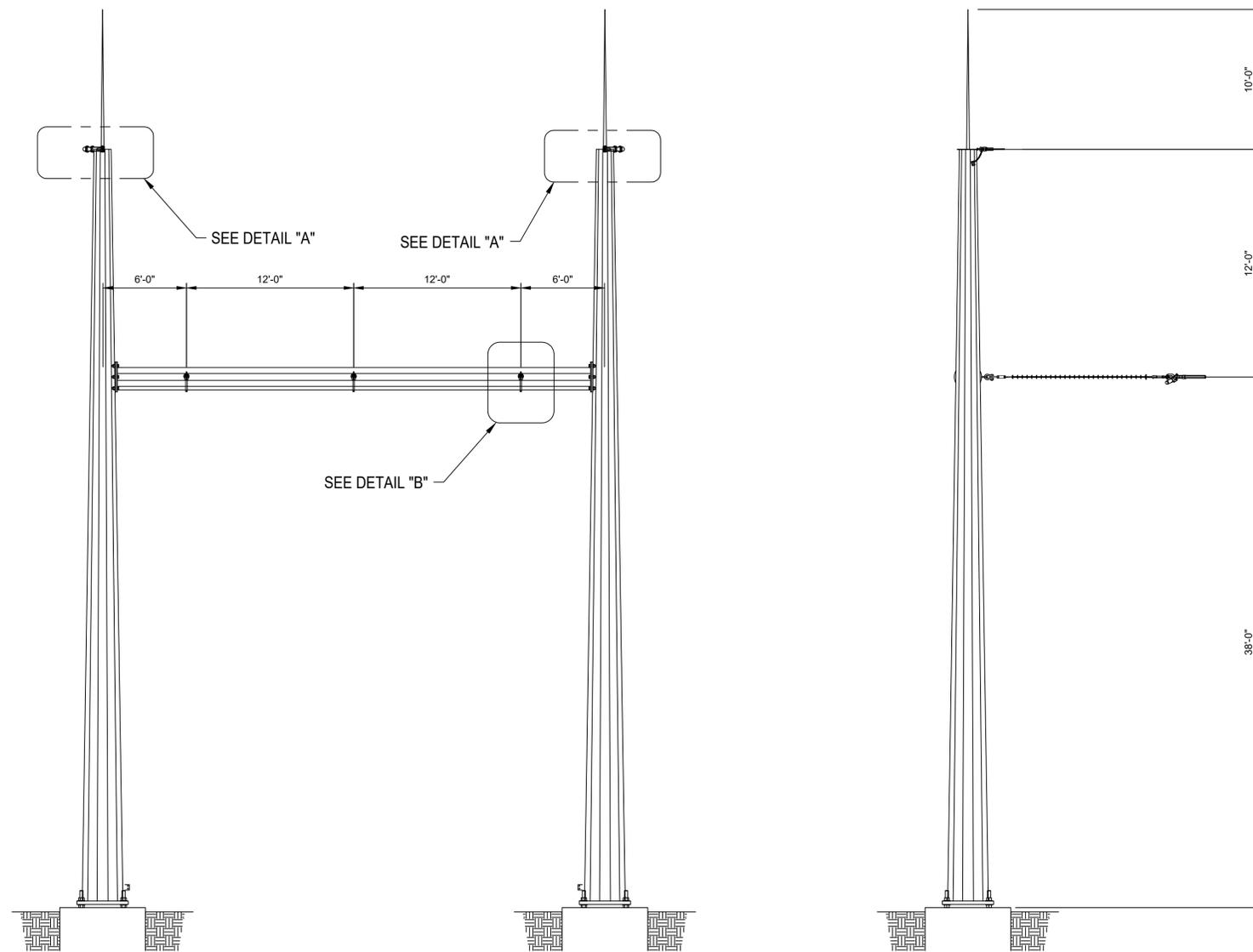
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Title  
**BLUESTONE WIND FARM  
UNDERGROUND COLLECTION  
PIPELINE CROSSING DETAILS**

Designed	MB	Eng check	SA
Drawn	MB	Approved	SA
Dwg check	SA	Project Mngr	HM
Scale at ANSI D	N.T.S.	Date	8/17/2018
AND/OR FABRICATION		Rev	C
Drawing Number		BLS-E-522-02	

NOTES

1. ALL INFORMATION SHOWN IS CONCEPTUAL ONLY.



Rev	Date	Drawn	Description	Ch'k'd	App'd
C	8/22/2018	JRR	Issued for Review	DH	SA
B	8/17/2018	BK	Issued for Review	MB	SA
A	7/16/2018	BK	Issued for Review	MB	SA

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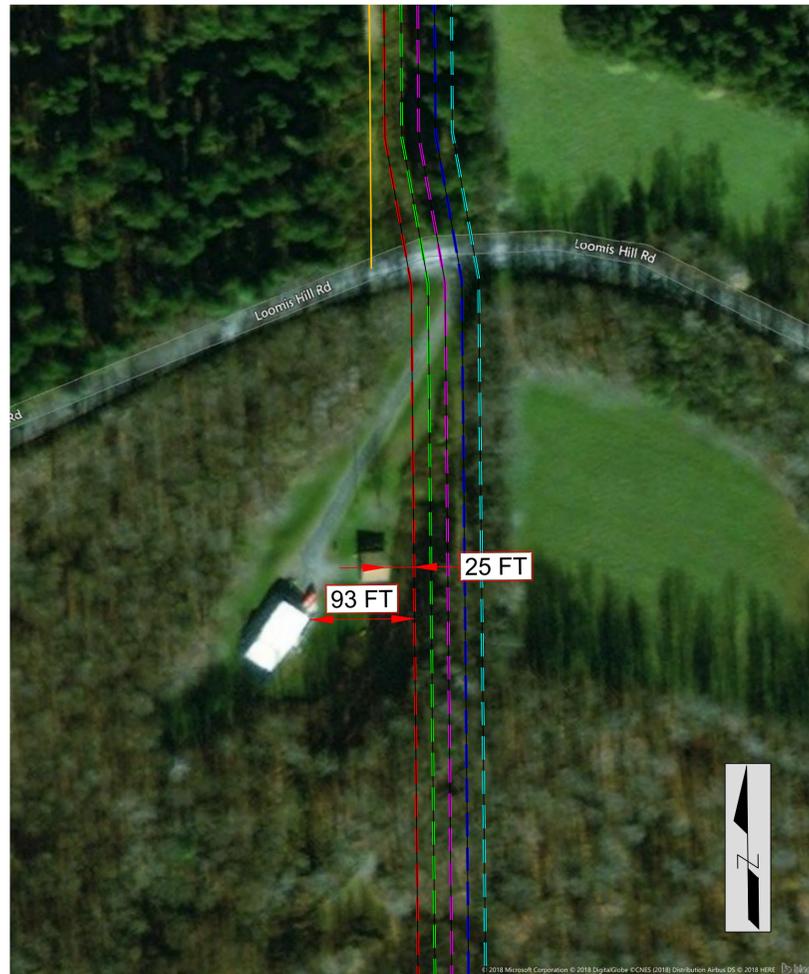
Title  
**BLUESTONE WIND FARM  
 115kV TRANSMISSION  
 SUBSTATION BAY DEAD-END**

PRELIMINARY NOT FOR CONSTRUCTION REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION	Designed	BK	Eng check	MB
	Drawn	BK	Approved	SA
	Dwg check	MB	Project Mngr	HM
	Scale at ANSI D	N.T.S.	Date	7/16/2018
			Rev	<b>C</b>
Drawing Number		<b>BLS-T-100-01</b>		

CONCEPTUAL - NOT FOR CONSTRUCTION

## **B. Residential Clearances**

- B1. BLS-E-550-01      Underground Collection Residential Clearances**
- B2. BLS-E-550-02      Underground Collection Residential Clearances**
- B3. BLS-E-550-03      Underground Collection Residential Clearances**



**LEGEND**

- ACCESS ROAD
- CIRCUIT 1
- CIRCUIT 2
- CIRCUIT 3
- CIRCUIT 4
- CIRCUIT 5
- EXISTING TRANSMISSION LINE

WIND TURBINE GENERATOR (WTG)

**NOTES**

- ALL INFORMATION SHOWN IS CONCEPTUAL IN NATURE.
- LAYOUT IS BASED ON VESTAS V150-4.2 TURBINES WHICH HAVE A 4.2MW OUTPUT EACH.

Rev	Date	Drawn	Description	Ch'k'd	App'd
B	8/22/2018	JRR	ISSUED FOR REVIEW	DH	SA
A	7/13/2018	BK	ISSUE TO CLIENT	MB	SA

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Client

Title **BLUESTONE WIND FARM  
UNDERGROUND COLLECTION  
RESIDENTIAL CLEARANCES**

<b>PRELIMINARY NOT FOR CONSTRUCTION</b> REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION	Designed	BK	Eng check	SA
	Drawn	BK	Approved	SA
	Dwg check	MB	Project Mngr	HM
	Scale at ANSI D	N.T.S.	Date	7/13/2018
			Rev	<b>B</b>
Drawing Number		<b>BLS-E-550-01</b>		

CONCEPTUAL - NOT FOR CONSTRUCTION



LEGEND

	ACCESS ROAD
	CIRCUIT 1
	CIRCUIT 2
	CIRCUIT 3
	CIRCUIT 4
	CIRCUIT 5
	EXISTING TRANSMISSION LINE
	WIND TURBINE GENERATOR (WTG)

NOTES

- ALL INFORMATION SHOWN IS CONCEPTUAL IN NATURE.
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Rev	Date	Drawn	Description	Ch'k'd	App'd
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A	7/13/2018	BK	ISSUE TO CLIENT	MB	SA

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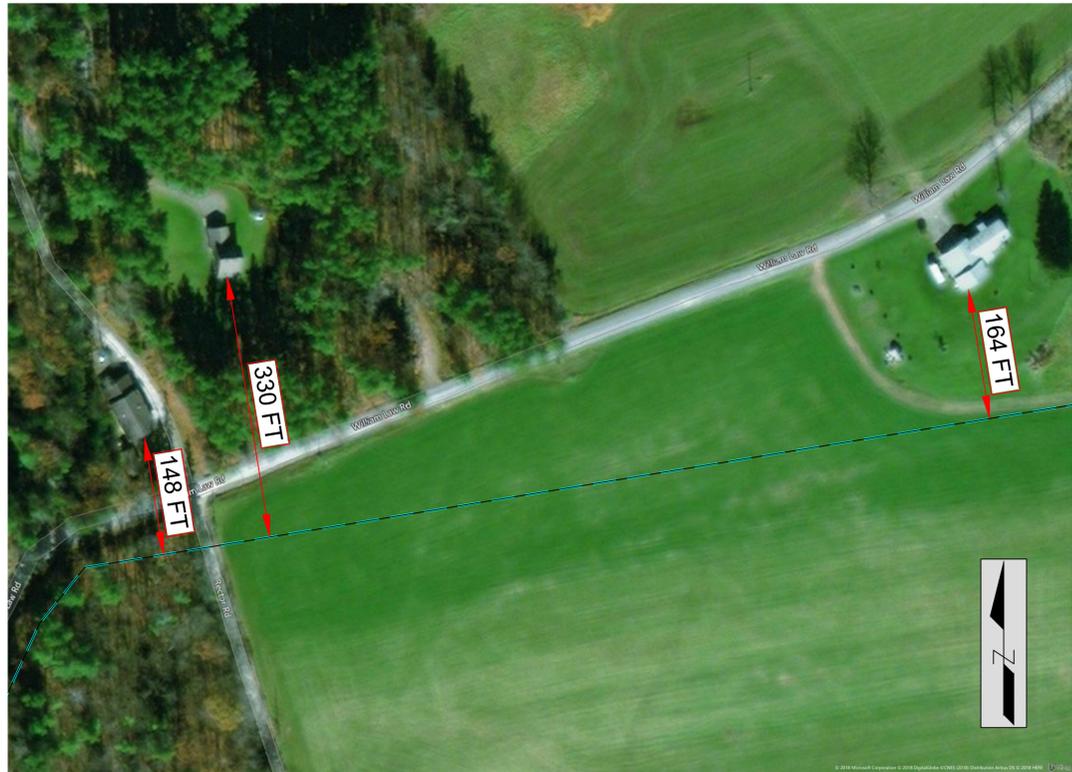
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Title  
**BLUESTONE WIND FARM  
UNDERGROUND COLLECTION  
RESIDENTIAL CLEARANCES**

<b>PRELIMINARY NOT FOR CONSTRUCTION</b> REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION	Designed	BK	Eng check	SA
	Drawn	BK	Approved	SA
	Dwg check	MB	Project Mngr	HM
	Scale at ANSI D	N.T.S.	Date	7/13/2018
			Rev	<b>B</b>
Drawing Number		<b>BLS-E-550-02</b>		

CONCEPTUAL - NOT FOR CONSTRUCTION

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LEGEND

- ACCESS ROAD
- CIRCUIT 1
- CIRCUIT 2
- CIRCUIT 3
- CIRCUIT 4
- CIRCUIT 5
- EXISTING TRANSMISSION LINE
- WIND TURBINE GENERATOR (WTG)

NOTES

- ALL INFORMATION SHOWN IS CONCEPTUAL IN NATURE.
- LAYOUT IS BASED ON VESTAS V150-4.2 TURBINES WHICH HAVE A 4.2MW OUTPUT EACH.

Rev	Date	Drawn	Description	Ch'k'd	App'd
B	8/22/2018	JRR	ISSUED FOR REVIEW	DH	SA
A	7/13/2018	BK	ISSUE TO CLIENT	MB	SA

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Client

Title  
**BLUESTONE WIND FARM  
UNDERGROUND COLLECTION  
RESIDENTIAL CLEARANCES**

PRELIMINARY NOT FOR CONSTRUCTION REPLACE WITH ENGINEERS STAMP AT CONSTRUCTION AND/OR FABRICATION	Designed	BK	Eng check	SA
	Drawn	BK	Approved	SA
	Dwg check	MB	Project Mngr	HM
	Scale at ANSI D	N.T.S.	Date	7/13/2018
			Rev	B
Drawing Number		BLS-E-550-03		

CONCEPTUAL - NOT FOR CONSTRUCTION

## C. Software Output Files

- C1. 1 x 1250kcmil, AI, 42in, 133NR, 257DR (Pages 1 – 4)
- C2. 2 x 1250kcmil, AI, 42in, 133NR, 257DR (Pages 1 – 4)
- C3. 3 x 1250kcmil, AI, 42in, 133NR, 257DR (Pages 1 – 4)
- C4. 4 x 1250kcmil, AI, 42in, 133NR, 257DR (Pages 1 – 4)
- C5. 5 x 1250kcmil, AI, 42in, 133NR, 257DR (Pages 1 – 4)
- C6. TLINE EMF Report, PLS-CADD (Pages 1 - 6)

1x1250kcml

MAGNETIC FLUX DENSITY [mG]

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Study : Bluestone  
Execution: 1250kcml, A1, 42in, 133NR, 257DR

Report created on: 08/06/18 3:33:50 PM

X (feet)	Y=3.28 (feet)	B(mG)
-500.0		0.0035
-495.0		0.0036
-490.0		0.0036
-485.0		0.0037
-480.0		0.0038
-475.0		0.0039
-470.0		0.004
-465.0		0.004
-460.0		0.0041
-455.0		0.0042
-450.0		0.0043
-445.0		0.0044
-440.0		0.0045
-435.0		0.0046
-430.0		0.0047
-425.0		0.0048
-420.0		0.005
-415.0		0.0051
-410.0		0.0052
-405.0		0.0053
-400.0		0.0055
-395.0		0.0056
-390.0		0.0057
-385.0		0.0059
-380.0		0.006
-375.0		0.0062
-370.0		0.0064
-365.0		0.0066
-360.0		0.0067
-355.0		0.0069
-350.0		0.0071
-345.0		0.0073
-340.0		0.0076
-335.0		0.0078
-330.0		0.008
-325.0		0.0083
-320.0		0.0085
-315.0		0.0088
-310.0		0.0091
-305.0		0.0094
-300.0		0.0097
-295.0		0.01
-290.0		0.0104
-285.0		0.0107
-280.0		0.0111
-275.0		0.0115
-270.0		0.012
-265.0		0.0124
-260.0		0.0129
-255.0		0.0134
-250.0		0.014
-245.0		0.0145
-240.0		0.0152

1x1250kcmil

-235.0	0.0158
-230.0	0.0165
-225.0	0.0172
-220.0	0.018
-215.0	0.0189
-210.0	0.0198
-205.0	0.0208
-200.0	0.0218
-195.0	0.0229
-190.0	0.0242
-185.0	0.0255
-180.0	0.0269
-175.0	0.0285
-170.0	0.0302
-165.0	0.032
-160.0	0.0341
-155.0	0.0363
-150.0	0.0387
-145.0	0.0415
-140.0	0.0445
-135.0	0.0478
-130.0	0.0515
-125.0	0.0557
-120.0	0.0605
-115.0	0.0658
-110.0	0.0719
-105.0	0.0789
-100.0	0.0869
-95.0	0.0963
-90.0	0.1072
-85.0	0.1201
-80.0	0.1354
-75.0	0.1539
-70.0	0.1765
-65.0	0.2044
-60.0	0.2394
-55.0	0.2841
-50.0	0.3426
-45.0	0.4211
-40.0	0.5296
-35.0	0.6854
-30.0	0.9201
-25.0	1.2952
-20.0	1.9437
-15.0	3.1832
-10.0	5.846
-5.0	11.7372
0.0	17.6742
5.0	11.7372
10.0	5.846
15.0	3.1832
20.0	1.9437
25.0	1.2952
30.0	0.9201
35.0	0.6854
40.0	0.5296
45.0	0.4211
50.0	0.3426
55.0	0.2841
60.0	0.2394
65.0	0.2044
70.0	0.1765
75.0	0.1539
80.0	0.1354
85.0	0.1201
90.0	0.1072
95.0	0.0963
100.0	0.0869

1x1250kcmil

105.0	0.0789
110.0	0.0719
115.0	0.0658
120.0	0.0605
125.0	0.0557
130.0	0.0515
135.0	0.0478
140.0	0.0445
145.0	0.0415
150.0	0.0387
155.0	0.0363
160.0	0.0341
165.0	0.032
170.0	0.0302
175.0	0.0285
180.0	0.0269
185.0	0.0255
190.0	0.0242
195.0	0.0229
200.0	0.0218
205.0	0.0208
210.0	0.0198
215.0	0.0189
220.0	0.018
225.0	0.0172
230.0	0.0165
235.0	0.0158
240.0	0.0152
245.0	0.0145
250.0	0.014
255.0	0.0134
260.0	0.0129
265.0	0.0124
270.0	0.012
275.0	0.0115
280.0	0.0111
285.0	0.0107
290.0	0.0104
295.0	0.01
300.0	0.0097
305.0	0.0094
310.0	0.0091
315.0	0.0088
320.0	0.0085
325.0	0.0083
330.0	0.008
335.0	0.0078
340.0	0.0076
345.0	0.0073
350.0	0.0071
355.0	0.0069
360.0	0.0067
365.0	0.0066
370.0	0.0064
375.0	0.0062
380.0	0.006
385.0	0.0059
390.0	0.0057
395.0	0.0056
400.0	0.0055
405.0	0.0053
410.0	0.0052
415.0	0.0051
420.0	0.005
425.0	0.0048
430.0	0.0047
435.0	0.0046
440.0	0.0045

1x1250kcm1

445.0	0.0044
450.0	0.0043
455.0	0.0042
460.0	0.0041
465.0	0.004
470.0	0.004
475.0	0.0039
480.0	0.0038
485.0	0.0037
490.0	0.0036
495.0	0.0036
500.0	0.0035

Peak value found at:

X	Y=3.28
(feet)	(feet)
	B(mG)
0.0	17.6742

2x1250kcmil

MAGNETIC FLUX DENSITY [mG]

=====

Study : Bluestone  
Execution: 2x1250kcmil, A1, 42in, 133NR, 257DR  
Report created on: 08/06/18 3:29:36 PM

X (feet)	Y=3.28 (feet)	B(mG)
-500.0		0.0069
-495.0		0.007
-490.0		0.0072
-485.0		0.0073
-480.0		0.0075
-475.0		0.0076
-470.0		0.0078
-465.0		0.008
-460.0		0.0081
-455.0		0.0083
-450.0		0.0085
-445.0		0.0087
-440.0		0.0089
-435.0		0.0091
-430.0		0.0093
-425.0		0.0095
-420.0		0.0098
-415.0		0.01
-410.0		0.0103
-405.0		0.0105
-400.0		0.0108
-395.0		0.0111
-390.0		0.0113
-385.0		0.0116
-380.0		0.0119
-375.0		0.0123
-370.0		0.0126
-365.0		0.0129
-360.0		0.0133
-355.0		0.0137
-350.0		0.0141
-345.0		0.0145
-340.0		0.0149
-335.0		0.0154
-330.0		0.0158
-325.0		0.0163
-320.0		0.0168
-315.0		0.0174
-310.0		0.018
-305.0		0.0185
-300.0		0.0192
-295.0		0.0198
-290.0		0.0205
-285.0		0.0212
-280.0		0.022
-275.0		0.0228
-270.0		0.0237
-265.0		0.0246
-260.0		0.0255
-255.0		0.0265
-250.0		0.0276
-245.0		0.0288
-240.0		0.03

2x1250kcmil

-235.0	0.0313
-230.0	0.0326
-225.0	0.0341
-220.0	0.0357
-215.0	0.0374
-210.0	0.0392
-205.0	0.0411
-200.0	0.0432
-195.0	0.0455
-190.0	0.0479
-185.0	0.0505
-180.0	0.0534
-175.0	0.0565
-170.0	0.0599
-165.0	0.0636
-160.0	0.0676
-155.0	0.0721
-150.0	0.077
-145.0	0.0824
-140.0	0.0884
-135.0	0.0952
-130.0	0.1027
-125.0	0.1111
-120.0	0.1206
-115.0	0.1315
-110.0	0.1438
-105.0	0.158
-100.0	0.1743
-95.0	0.1934
-90.0	0.2158
-85.0	0.2424
-80.0	0.2741
-75.0	0.3127
-70.0	0.36
-65.0	0.419
-60.0	0.4939
-55.0	0.5911
-50.0	0.7204
-45.0	0.8978
-40.0	1.1506
-35.0	1.5288
-30.0	2.1304
-25.0	3.1679
-20.0	5.1424
-15.0	9.1962
-10.0	15.3649
-5.0	11.6128
0.0	1.0623
5.0	11.6128
10.0	15.3649
15.0	9.1963
20.0	5.1424
25.0	3.1679
30.0	2.1304
35.0	1.5288
40.0	1.1506
45.0	0.8978
50.0	0.7204
55.0	0.5911
60.0	0.4939
65.0	0.419
70.0	0.36
75.0	0.3127
80.0	0.2741
85.0	0.2424
90.0	0.2158
95.0	0.1934
100.0	0.1743

2x1250kcmil

105.0	0.158
110.0	0.1438
115.0	0.1315
120.0	0.1206
125.0	0.1111
130.0	0.1027
135.0	0.0952
140.0	0.0884
145.0	0.0824
150.0	0.077
155.0	0.0721
160.0	0.0676
165.0	0.0636
170.0	0.0599
175.0	0.0565
180.0	0.0534
185.0	0.0505
190.0	0.0479
195.0	0.0455
200.0	0.0432
205.0	0.0411
210.0	0.0392
215.0	0.0374
220.0	0.0357
225.0	0.0341
230.0	0.0326
235.0	0.0313
240.0	0.03
245.0	0.0288
250.0	0.0276
255.0	0.0265
260.0	0.0255
265.0	0.0246
270.0	0.0237
275.0	0.0228
280.0	0.022
285.0	0.0212
290.0	0.0205
295.0	0.0198
300.0	0.0192
305.0	0.0185
310.0	0.018
315.0	0.0174
320.0	0.0168
325.0	0.0163
330.0	0.0158
335.0	0.0154
340.0	0.0149
345.0	0.0145
350.0	0.0141
355.0	0.0137
360.0	0.0133
365.0	0.0129
370.0	0.0126
375.0	0.0123
380.0	0.0119
385.0	0.0116
390.0	0.0113
395.0	0.0111
400.0	0.0108
405.0	0.0105
410.0	0.0103
415.0	0.01
420.0	0.0098
425.0	0.0095
430.0	0.0093
435.0	0.0091
440.0	0.0089

2x1250kcm1

445.0	0.0087
450.0	0.0085
455.0	0.0083
460.0	0.0081
465.0	0.008
470.0	0.0078
475.0	0.0076
480.0	0.0075
485.0	0.0073
490.0	0.0072
495.0	0.007
500.0	0.0069

Peak value found at:

X	Y=3.28
(feet)	(feet)
	B(mG)
-10.0	15.3649

3x1250kcml

MAGNETIC FLUX DENSITY [mG]  
=====

Study : Bluestone  
Execution: 3x1250kcml, A1, 42in, 133NR, 257DR

Report created on: 08/06/18 3:30:36 PM

X (feet)	Y=3.28 (feet)	B(mG)
-500.0		0.0102
-495.0		0.0104
-490.0		0.0106
-485.0		0.0109
-480.0		0.0111
-475.0		0.0113
-470.0		0.0116
-465.0		0.0118
-460.0		0.0121
-455.0		0.0123
-450.0		0.0126
-445.0		0.0129
-440.0		0.0132
-435.0		0.0135
-430.0		0.0138
-425.0		0.0142
-420.0		0.0145
-415.0		0.0148
-410.0		0.0152
-405.0		0.0156
-400.0		0.016
-395.0		0.0164
-390.0		0.0168
-385.0		0.0173
-380.0		0.0177
-375.0		0.0182
-370.0		0.0187
-365.0		0.0192
-360.0		0.0197
-355.0		0.0203
-350.0		0.0209
-345.0		0.0215
-340.0		0.0221
-335.0		0.0228
-330.0		0.0235
-325.0		0.0242
-320.0		0.025
-315.0		0.0258
-310.0		0.0267
-305.0		0.0275
-300.0		0.0285
-295.0		0.0294
-290.0		0.0305
-285.0		0.0316
-280.0		0.0327
-275.0		0.0339
-270.0		0.0352
-265.0		0.0365
-260.0		0.038
-255.0		0.0395
-250.0		0.0411
-245.0		0.0428
-240.0		0.0446

3x1250kcmil

-235.0	0.0465
-230.0	0.0486
-225.0	0.0508
-220.0	0.0531
-215.0	0.0557
-210.0	0.0584
-205.0	0.0613
-200.0	0.0644
-195.0	0.0678
-190.0	0.0714
-185.0	0.0754
-180.0	0.0797
-175.0	0.0844
-170.0	0.0895
-165.0	0.0951
-160.0	0.1012
-155.0	0.1079
-150.0	0.1154
-145.0	0.1236
-140.0	0.1328
-135.0	0.1431
-130.0	0.1545
-125.0	0.1675
-120.0	0.1821
-115.0	0.1988
-110.0	0.2179
-105.0	0.2399
-100.0	0.2655
-95.0	0.2954
-90.0	0.3308
-85.0	0.3731
-80.0	0.4242
-75.0	0.4869
-70.0	0.5648
-65.0	0.6636
-60.0	0.7916
-55.0	0.962
-50.0	1.1963
-45.0	1.5319
-40.0	2.0386
-35.0	2.8577
-30.0	4.3024
-25.0	7.1012
-20.0	12.3435
-15.0	14.6828
-10.0	4.84
-5.0	6.6307
0.0	13.2376
5.0	6.6307
10.0	4.84
15.0	14.6828
20.0	12.3435
25.0	7.1012
30.0	4.3024
35.0	2.8577
40.0	2.0386
45.0	1.5319
50.0	1.1963
55.0	0.962
60.0	0.7916
65.0	0.6636
70.0	0.5648
75.0	0.4869
80.0	0.4242
85.0	0.3731
90.0	0.3308
95.0	0.2954
100.0	0.2655

3x1250kcmil

105.0	0.2399
110.0	0.2179
115.0	0.1988
120.0	0.1821
125.0	0.1675
130.0	0.1545
135.0	0.1431
140.0	0.1328
145.0	0.1236
150.0	0.1154
155.0	0.1079
160.0	0.1012
165.0	0.0951
170.0	0.0895
175.0	0.0844
180.0	0.0797
185.0	0.0754
190.0	0.0714
195.0	0.0678
200.0	0.0644
205.0	0.0613
210.0	0.0584
215.0	0.0557
220.0	0.0531
225.0	0.0508
230.0	0.0486
235.0	0.0465
240.0	0.0446
245.0	0.0428
250.0	0.0411
255.0	0.0395
260.0	0.038
265.0	0.0365
270.0	0.0352
275.0	0.0339
280.0	0.0327
285.0	0.0316
290.0	0.0305
295.0	0.0294
300.0	0.0285
305.0	0.0275
310.0	0.0267
315.0	0.0258
320.0	0.025
325.0	0.0242
330.0	0.0235
335.0	0.0228
340.0	0.0221
345.0	0.0215
350.0	0.0209
355.0	0.0203
360.0	0.0197
365.0	0.0192
370.0	0.0187
375.0	0.0182
380.0	0.0177
385.0	0.0173
390.0	0.0168
395.0	0.0164
400.0	0.016
405.0	0.0156
410.0	0.0152
415.0	0.0148
420.0	0.0145
425.0	0.0142
430.0	0.0138
435.0	0.0135
440.0	0.0132

3x1250kcm1

445.0	0.0129
450.0	0.0126
455.0	0.0123
460.0	0.0121
465.0	0.0118
470.0	0.0116
475.0	0.0113
480.0	0.0111
485.0	0.0109
490.0	0.0106
495.0	0.0104
500.0	0.0102

Peak value found at:

X	Y=3.28
(feet)	(feet)
	B(mG)
-15.0	14.6828

4x1250kcmil

MAGNETIC FLUX DENSITY [mG]

=====

Study : Bluestone  
Execution: 4x1250kcmil, A1, 42in, 133NR, 257DR

Report created on: 8/7/2018 10:37:30 AM

X (feet)	Y=3.28 (feet)	B(mG)
-500.0		0.0136
-495.0		0.0139
-490.0		0.0142
-485.0		0.0145
-480.0		0.0148
-475.0		0.0151
-470.0		0.0154
-465.0		0.0157
-460.0		0.0161
-455.0		0.0164
-450.0		0.0168
-445.0		0.0172
-440.0		0.0176
-435.0		0.018
-430.0		0.0184
-425.0		0.0188
-420.0		0.0193
-415.0		0.0198
-410.0		0.0203
-405.0		0.0208
-400.0		0.0213
-395.0		0.0218
-390.0		0.0224
-385.0		0.023
-380.0		0.0236
-375.0		0.0242
-370.0		0.0249
-365.0		0.0256
-360.0		0.0263
-355.0		0.0271
-350.0		0.0278
-345.0		0.0287
-340.0		0.0295
-335.0		0.0304
-330.0		0.0313
-325.0		0.0323
-320.0		0.0333
-315.0		0.0344
-310.0		0.0356
-305.0		0.0367
-300.0		0.038
-295.0		0.0393
-290.0		0.0407
-285.0		0.0421
-280.0		0.0437
-275.0		0.0453
-270.0		0.047
-265.0		0.0488
-260.0		0.0507
-255.0		0.0528
-250.0		0.0549
-245.0		0.0572
-240.0		0.0596

4x1250kcmil

-235.0	0.0623
-230.0	0.065
-225.0	0.068
-220.0	0.0712
-215.0	0.0746
-210.0	0.0782
-205.0	0.0822
-200.0	0.0864
-195.0	0.091
-190.0	0.096
-185.0	0.1013
-180.0	0.1072
-175.0	0.1136
-170.0	0.1205
-165.0	0.1282
-160.0	0.1366
-155.0	0.1458
-150.0	0.1561
-145.0	0.1674
-140.0	0.1801
-135.0	0.1943
-130.0	0.2103
-125.0	0.2283
-120.0	0.2489
-115.0	0.2723
-110.0	0.2994
-105.0	0.3308
-100.0	0.3675
-95.0	0.4108
-90.0	0.4626
-85.0	0.5252
-80.0	0.6018
-75.0	0.6973
-70.0	0.8187
-65.0	0.9766
-60.0	1.1879
-55.0	1.4812
-50.0	1.9071
-45.0	2.5632
-40.0	3.6545
-35.0	5.6471
-30.0	9.5209
-25.0	14.7617
-20.0	9.9272
-15.0	3.0325
-10.0	10.8302
-5.0	10.0769
0.0	3.5443
5.0	10.0768
10.0	10.8302
15.0	3.0325
20.0	9.9272
25.0	14.7617
30.0	9.5209
35.0	5.6471
40.0	3.6545
45.0	2.5632
50.0	1.9071
55.0	1.4812
60.0	1.1879
65.0	0.9766
70.0	0.8187
75.0	0.6973
80.0	0.6018
85.0	0.5252
90.0	0.4626
95.0	0.4108
100.0	0.3675

## 4x1250kcmil

105.0	0.3308
110.0	0.2994
115.0	0.2723
120.0	0.2489
125.0	0.2283
130.0	0.2103
135.0	0.1943
140.0	0.1801
145.0	0.1674
150.0	0.1561
155.0	0.1458
160.0	0.1366
165.0	0.1282
170.0	0.1205
175.0	0.1136
180.0	0.1072
185.0	0.1013
190.0	0.096
195.0	0.091
200.0	0.0864
205.0	0.0822
210.0	0.0782
215.0	0.0746
220.0	0.0712
225.0	0.068
230.0	0.065
235.0	0.0623
240.0	0.0596
245.0	0.0572
250.0	0.0549
255.0	0.0528
260.0	0.0507
265.0	0.0488
270.0	0.047
275.0	0.0453
280.0	0.0437
285.0	0.0421
290.0	0.0407
295.0	0.0393
300.0	0.038
305.0	0.0367
310.0	0.0356
315.0	0.0344
320.0	0.0333
325.0	0.0323
330.0	0.0313
335.0	0.0304
340.0	0.0295
345.0	0.0287
350.0	0.0278
355.0	0.0271
360.0	0.0263
365.0	0.0256
370.0	0.0249
375.0	0.0242
380.0	0.0236
385.0	0.023
390.0	0.0224
395.0	0.0218
400.0	0.0213
405.0	0.0208
410.0	0.0203
415.0	0.0198
420.0	0.0193
425.0	0.0188
430.0	0.0184
435.0	0.018
440.0	0.0176

4x1250kcm1

445.0	0.0172
450.0	0.0168
455.0	0.0164
460.0	0.0161
465.0	0.0157
470.0	0.0154
475.0	0.0151
480.0	0.0148
485.0	0.0145
490.0	0.0142
495.0	0.0139
500.0	0.0136

Peak value found at:

X	Y=3.28
(feet)	(feet)
	B(mG)
25.0	14.7617

5x1250kcml 15ft

MAGNETIC FLUX DENSITY [mG]  
=====

Study : Bluestone  
Execution: 5x1250kcml, A1, 42in, 133NR, 257DR

Report created on: 8/16/2018 1:59:31 PM

X (feet)	Y=3.28 (feet)	B(mG)
-500.0		0.017
-495.0		0.0173
-490.0		0.0177
-485.0		0.018
-480.0		0.0184
-475.0		0.0188
-470.0		0.0192
-465.0		0.0196
-460.0		0.0201
-455.0		0.0205
-450.0		0.021
-445.0		0.0215
-440.0		0.0219
-435.0		0.0225
-430.0		0.023
-425.0		0.0235
-420.0		0.0241
-415.0		0.0247
-410.0		0.0253
-405.0		0.0259
-400.0		0.0266
-395.0		0.0273
-390.0		0.028
-385.0		0.0287
-380.0		0.0295
-375.0		0.0303
-370.0		0.0311
-365.0		0.032
-360.0		0.0329
-355.0		0.0338
-350.0		0.0348
-345.0		0.0358
-340.0		0.0369
-335.0		0.038
-330.0		0.0392
-325.0		0.0405
-320.0		0.0417
-315.0		0.0431
-310.0		0.0445
-305.0		0.046
-300.0		0.0476
-295.0		0.0492
-290.0		0.051
-285.0		0.0528
-280.0		0.0547
-275.0		0.0568
-270.0		0.0589
-265.0		0.0612
-260.0		0.0637
-255.0		0.0662
-250.0		0.069
-245.0		0.0719
-240.0		0.075

5x1250kcmil 15ft

-235.0	0.0783
-230.0	0.0818
-225.0	0.0856
-220.0	0.0896
-215.0	0.0939
-210.0	0.0986
-205.0	0.1036
-200.0	0.109
-195.0	0.1149
-190.0	0.1213
-185.0	0.1282
-180.0	0.1357
-175.0	0.1439
-170.0	0.1529
-165.0	0.1627
-160.0	0.1736
-155.0	0.1856
-150.0	0.199
-145.0	0.2138
-140.0	0.2305
-135.0	0.2492
-130.0	0.2703
-125.0	0.2943
-120.0	0.3218
-115.0	0.3534
-110.0	0.39
-105.0	0.433
-100.0	0.4837
-95.0	0.5443
-90.0	0.6177
-85.0	0.7079
-80.0	0.8207
-75.0	0.9647
-70.0	1.1535
-65.0	1.4089
-60.0	1.7684
-55.0	2.3012
-50.0	3.1458
-45.0	4.6041
-40.0	7.3597
-35.0	12.3298
-30.0	14.0128
-25.0	4.5042
-20.0	6.9456
-15.0	11.9702
-10.0	5.8723
-5.0	6.32
0.0	11.55
5.0	6.32
10.0	5.8723
15.0	11.9702
20.0	6.9456
25.0	4.5042
30.0	14.0128
35.0	12.3299
40.0	7.3597
45.0	4.6041
50.0	3.1458
55.0	2.3012
60.0	1.7684
65.0	1.4089
70.0	1.1535
75.0	0.9647
80.0	0.8207
85.0	0.7079
90.0	0.6177
95.0	0.5443
100.0	0.4837

5x1250kcmil 15ft

105.0	0.433
110.0	0.39
115.0	0.3534
120.0	0.3218
125.0	0.2943
130.0	0.2703
135.0	0.2492
140.0	0.2305
145.0	0.2138
150.0	0.199
155.0	0.1856
160.0	0.1736
165.0	0.1627
170.0	0.1529
175.0	0.1439
180.0	0.1357
185.0	0.1282
190.0	0.1213
195.0	0.1149
200.0	0.109
205.0	0.1036
210.0	0.0986
215.0	0.0939
220.0	0.0896
225.0	0.0856
230.0	0.0818
235.0	0.0783
240.0	0.075
245.0	0.0719
250.0	0.069
255.0	0.0662
260.0	0.0637
265.0	0.0612
270.0	0.0589
275.0	0.0568
280.0	0.0547
285.0	0.0528
290.0	0.051
295.0	0.0492
300.0	0.0476
305.0	0.046
310.0	0.0445
315.0	0.0431
320.0	0.0417
325.0	0.0405
330.0	0.0392
335.0	0.038
340.0	0.0369
345.0	0.0358
350.0	0.0348
355.0	0.0338
360.0	0.0329
365.0	0.032
370.0	0.0311
375.0	0.0303
380.0	0.0295
385.0	0.0287
390.0	0.028
395.0	0.0273
400.0	0.0266
405.0	0.0259
410.0	0.0253
415.0	0.0247
420.0	0.0241
425.0	0.0235
430.0	0.023
435.0	0.0225
440.0	0.0219

5x1250kcmil 15ft

445.0	0.0215
450.0	0.021
455.0	0.0205
460.0	0.0201
465.0	0.0196
470.0	0.0192
475.0	0.0188
480.0	0.0184
485.0	0.018
490.0	0.0177
495.0	0.0173
500.0	0.017

Peak value found at:

X	Y=3.28
(feet)	(feet)
	B(mG)
-30.0	14.0128

PLS-CADD Version 15.00x64 11:52:09 AM Monday, July 16, 2018  
Mott MacDonald - USA  
Project Name: 'c:\projects\calpine\bluestone\bluestone.DON'  
Line Title: 'BLUESTONE'

**Criteria Notes:**

Typical 2012 NESC C2-2012 Criteria File for PLS-CADD Created March 16, 2012  
Version 12.10

Assumed NESC Heavy Combined Ice and Wind District Loading (Rule 250B)

Assumed 90 MPH Extreme Wind Loading (Rule 250C); To be verified by the Engineer  
of Record

Assumed 1" Extreme Ice with 40 MPH Concurrent Wind Loading (Rule 250D); To be  
verified by the Engineer of Record

Assumed Maximum Operating Temperature of 212 F; To be verified by the Engineer  
of Record

Assumed 1/2" Extreme Ice (Non-NESC); To be verified by the Engineer of Record

Assumed Grade B Construction; To be verified by the Engineer of Record

<<Illustration of NESC provisions include>>

> Combined Ice and Wind District Loading NESC Heavy per Rule 250B, Page 191

> Extreme Wind Loading per Rule 250C, Page 191, Coefficients and Gust Response  
Factors per Equations in Tables 250-2 and 250-3

> Assumed 90 MPH Basic Wind Speed, 3 second Gust Wind Speed, Figure 250-2  
Beginning on Page 195

> Grade B Construction "Method A" per Table 253-1, Page 212 and Table 261-1,  
Page 222

> Extreme Ice with Concurrent Wind Loading per Rule 250D, Page 193

> Assumed 1" Basic Ice Diameter with Concurrent 40 MPH Basic Wind Speed, Figure  
250-3 Beginning on Page 199

> Cable Tension and Automatic Sagging Limits per Rule 261H1, Page 219

\*\*\*\* PLEASE NOTE - Many experts consider these limits to be high and could  
lead to severe aeolian vibration \*\*\*\*

\*\*\*\* PLS recommends checking with your cable manufacturer, damper  
manufacturer, and/or other standards for recommended values \*\*\*\*

> Insulator Mechanical Strengths per Rule 277, Page 228 - Important Note for  
Strength Check:

\*\*\*\* NESC Rule 277 specifically excludes Rule 253 Load Factors for checking  
the mechanical strength of insulators \*\*\*\*

\*\*\*\* This Criteria checks Insulators for ALL cases using a Strength Factor  
of 1.0 applied to insulator working load properties. This may be considered  
conservative by some. \*\*\*\*

\*\*\*\* When specifying the insulator strength properties in  
Components/Insulators in TOWER and PLS-POLE,

the manufacturer's recommended load capacities shall be used per NESC  
Table 277-1. This is normally the RTL and RCL

values published by the non-ceramic insulator manufacturers. See IEEE  
Std 1572-2004 IEEE Guide for Application of

Composite Line Post Insulators for further clarification. \*\*\*\*

\*\*\*\* Per Rule 277, the Engineer of Record should decide what "proper  
allowance" is for Rules 250C and 250D and modify load cases accordingly \*\*\*\*

\*\*\*\* User may prefer to add other specific load cases utilizing alternative  
Strength Factors \*\*\*\*

\*\*\*\* Coordination of Load Factors, Strength Factors, and Component strength  
properties is the responsibility of the Engineer of Record \*\*\*\*

\*\*\*\* See Tech Note at [http://www.powline.com/products/nesc\\_insulators.html](http://www.powline.com/products/nesc_insulators.html)  
for additional discussion \*\*\*\*

> Structure Loads criteria includes typical Full Structure DE cases

> Structure Loads criteria includes longitudinal extreme wind check per Rule 261A1c(Page 214), Rule 261A2e(Page 215), and Rule 261A3d(Page215)

POWER LINE SYSTEMS, INC. IS NOT RESPONSIBLE FOR THE ACCURACY OF THE CONTENT HEREIN OR RESULTS OBTAINED FROM ITS USE ON ANY PROJECT.

THIS FILE IS PROVIDED FOR ILLUSTRATION ONLY. CRITERIA SHOULD BE CHECKED AND MODIFIED AS NECESSARY BY THE AN ENGINEER IN RESPONSIBLE CHARGE,

FAMILIAR WITH THE NESC AND LOCAL REQUIREMENTS OF THE AREA IN WHICH THE PROJECT IS LOCATED, AND ITS APPLICATION.

ENGINEER OF RECORD MUST VERIFY EXTREME WIND, CONCURRENT ICE AND WIND, AND EXTREME ICE PARAMETERS FOR THEIR APPLICABLE REGION.

ENGINEER OF RECORD MUST VERIFY MAXIMUM OPERATING CONDITION FOR THEIR APPLICABLE PROJECT

ENGINEER OF RECORD MUST VERIFY CONDITIONS AND FACTORS USED FOR INSULATOR STRENGTH CHECKS

ENGINEER OF RECORD MUST ADD ANY ADDITIONAL CRITERIA THAT MAY BE REQUIRED BEYOND THE NESC

ENGINEER OF RECORD MUST REMOVE THIS DISCLAIMER AND MODIFY ALL NOTES ABOVE AS APPLICABLE WHEN ASSUMING CHARGE OF THIS CRITERIA

**EMF Calculation Notes:**

- 1) All calculations based on the EPRI Red Book methods (2nd Edition, 1982 - infinite straight wire with flat earth approximation).
- 2) These approximations are only valid for low frequency (50-60Hz) AC transmission lines.
- 3) Bundles are modeled with an equivalent conductor as per EPRI Red Book 8.3.1.
- 4) The effects of earth return currents (earth resistivity) are ignored when calculating the magnetic field.
- 5) Wire position is determined by the currently displayed weather case.
- 6) Wire height used is the height of the wire where the target point is projected upon it.
- 7) All calculations assume ground is flat with same elevation as that of centerline.

Meter height above centerline ground: 3.28 (ft)  
 Cross section offset for graph +/-: 500.00 (ft)  
 Result interval for graph: 5.00 (ft)  
 Electric field limit: 0.00 (kV/m)  
 Magnetic field limit: 0.00 (mG)

EMF calculation includes only wires going from structure COLLECTION BAY to structure POI BAY

**EMF Circuit Data:**

Set #	Phase #	Conductors Per Phase	Voltage Ph-Ph (kV)	Current (Amps)	Phase Angle (deg)	Bundle Diameter (in)
1	1	1	0	0.000	0	0.000
2	1	1	0	0.000	0	0.000
10	1	1	115	645.000	0	0.000
10	2	1	115	645.000	120	0.000
10	3	1	115	645.000	-120	0.000

**Calculated EMF Circuit Data For Last Point:**

Wire station and offset are based on alignment closest to point on wire.

In the case of wires that are not parallel, this may result in different stations for the wires and centerline.

Set Phase	Weather	Cable	Wind	Wire	Wire	Wire	Wire
Wire Eqv. #	Wire #	Voltage Case	Condition	From	X	Y	Z Station
Offset (ft)	Diameter (in)	To Gnd. (kV)			(ft)	(ft)	(ft)
1	1	Cold Uplift	Initial RS	Left	1128734.89	773458.33	152.94 1277.60
-23.00	0.691	0					
2	1	Cold Uplift	Initial RS	Left	1128757.34	773418.19	153.30 1277.60
23.00	0.495	0					
10	1	212 Deg F Max Sag	RS	Left	1128739.77	773449.61	143.09 1277.60
-13.00	1.108	66.4					
10	2	212 Deg F Max Sag	RS	Left	1128746.12	773438.26	143.09 1277.60
0.00	1.108	66.4					
10	3	212 Deg F Max Sag	RS	Left	1128752.46	773426.91	143.09 1277.60
13.00	1.108	66.4					

Maximum magnetic field of 55.30 (mG) found at station 1277.60, offset 0.00 (ft)  
 Maximum electric field of 0.468 (kV/m) found at station 1277.60, offset 25.00 (ft)

## EMF CALCULATION RESULTS:

Row #	Station (ft)	Offset (ft)	X (ft)	Y (ft)	Z (ft)	B Phase			E Phase			E Axis	E rms	
						B Real (mG)	B Img. (mG)	Angle (deg)	B rms Res. (mG)	E Real (kV/m)	E Img. (kV/m)	Angle (deg)	Angle (deg)	Res. (kV/m)
1	1277.6	-500	1128502	773874.7	100	0.331	0.18462	29.1	0.379	0.001	0.00007	4.9	88.9	0.001
2	1277.6	-495	1128504	773870.3	100	0.338	0.1883	29.1	0.387	0.001	0.00008	5.1	88.9	0.001
3	1277.6	-490	1128507	773865.9	100	0.345	0.19209	29.1	0.395	0.001	0.00008	5.3	88.9	0.001
4	1277.6	-485	1128509	773861.6	100	0.352	0.19599	29.1	0.403	0.001	0.00009	5.5	88.9	0.001
5	1277.6	-480	1128512	773857.2	100	0.359	0.20001	29.1	0.411	0.001	0.00009	5.7	88.9	0.001
6	1277.6	-475	1128514	773852.8	100	0.367	0.20416	29.1	0.42	0.001	0.0001	5.9	88.9	0.001
7	1277.6	-470	1128517	773848.5	100	0.375	0.20844	29.1	0.429	0.001	0.0001	6.1	88.8	0.001
8	1277.6	-465	1128519	773844.1	100	0.383	0.21285	29.1	0.438	0.001	0.00011	6.3	88.8	0.001
9	1277.6	-460	1128522	773839.7	100	0.391	0.21741	29.1	0.447	0.001	0.00012	6.5	88.8	0.001
10	1277.6	-455	1128524	773835.4	100	0.4	0.22211	29.1	0.457	0.001	0.00013	6.7	88.8	0.001
11	1277.6	-450	1128526	773831	100	0.409	0.22697	29.1	0.467	0.001	0.00013	6.9	88.8	0.001
12	1277.6	-445	1128529	773826.6	100	0.418	0.23198	29	0.478	0.001	0.00014	7.1	88.8	0.001
13	1277.6	-440	1128531	773822.3	100	0.427	0.23717	29	0.489	0.001	0.00015	7.3	88.8	0.001
14	1277.6	-435	1128534	773817.9	100	0.437	0.24253	29	0.5	0.001	0.00016	7.5	88.7	0.001
15	1277.6	-430	1128536	773813.6	100	0.447	0.24807	29	0.512	0.001	0.00017	7.7	88.7	0.001
16	1277.6	-425	1128539	773809.2	100	0.458	0.25381	29	0.524	0.001	0.00018	7.9	88.7	0.001
17	1277.6	-420	1128541	773804.8	100	0.469	0.25974	29	0.536	0.001	0.00019	8.1	88.7	0.001
18	1277.6	-415	1128544	773800.5	100	0.48	0.26589	29	0.549	0.001	0.0002	8.3	88.7	0.001
19	1277.6	-410	1128546	773796.1	100	0.492	0.27225	29	0.562	0.001	0.00022	8.5	88.7	0.001
20	1277.6	-405	1128548	773791.7	100	0.504	0.27885	28.9	0.576	0.001	0.00023	8.7	88.7	0.002
21	1277.6	-400	1128551	773787.4	100	0.517	0.28569	28.9	0.59	0.002	0.00024	8.9	88.6	0.002
22	1277.6	-395	1128553	773783	100	0.53	0.29278	28.9	0.605	0.002	0.00026	9.1	88.6	0.002
23	1277.6	-390	1128556	773778.6	100	0.543	0.30014	28.9	0.621	0.002	0.00027	9.3	88.6	0.002
24	1277.6	-385	1128558	773774.3	100	0.558	0.30778	28.9	0.637	0.002	0.00029	9.5	88.6	0.002
25	1277.6	-380	1128561	773769.9	100	0.572	0.31571	28.9	0.654	0.002	0.00031	9.7	88.6	0.002
26	1277.6	-375	1128563	773765.6	100	0.588	0.32395	28.9	0.671	0.002	0.00032	9.9	88.5	0.002
27	1277.6	-370	1128566	773761.2	100	0.604	0.33252	28.9	0.689	0.002	0.00034	10.1	88.5	0.002
28	1277.6	-365	1128568	773756.8	100	0.62	0.34143	28.8	0.708	0.002	0.00036	10.3	88.5	0.002
29	1277.6	-360	1128570	773752.5	100	0.637	0.3507	28.8	0.728	0.002	0.00039	10.5	88.5	0.002
30	1277.6	-355	1128573	773748.1	100	0.655	0.36036	28.8	0.748	0.002	0.00041	10.7	88.5	0.002
31	1277.6	-350	1128575	773743.7	100	0.674	0.37041	28.8	0.769	0.002	0.00044	10.8	88.4	0.002
32	1277.6	-345	1128578	773739.4	100	0.694	0.3809	28.8	0.791	0.002	0.00046	11	88.4	0.002
33	1277.6	-340	1128580	773735	100	0.714	0.39183	28.8	0.815	0.002	0.00049	11.2	88.4	0.003
34	1277.6	-335	1128583	773730.6	100	0.735	0.40323	28.7	0.839	0.003	0.00052	11.4	88.4	0.003
35	1277.6	-330	1128585	773726.3	100	0.758	0.41514	28.7	0.864	0.003	0.00055	11.6	88.3	0.003
36	1277.6	-325	1128587	773721.9	100	0.781	0.42759	28.7	0.89	0.003	0.00059	11.8	88.3	0.003
37	1277.6	-320	1128590	773717.6	100	0.806	0.44059	28.7	0.918	0.003	0.00062	12	88.3	0.003
38	1277.6	-315	1128592	773713.2	100	0.831	0.4542	28.7	0.947	0.003	0.00066	12.2	88.3	0.003
39	1277.6	-310	1128595	773708.8	100	0.858	0.46845	28.6	0.977	0.003	0.0007	12.3	88.2	0.003
40	1277.6	-305	1128597	773704.5	100	0.886	0.48337	28.6	1.009	0.003	0.00075	12.5	88.2	0.003
41	1277.6	-300	1128600	773700.1	100	0.916	0.49901	28.6	1.043	0.004	0.0008	12.7	88.2	0.004
42	1277.6	-295	1128602	773695.7	100	0.947	0.51542	28.6	1.078	0.004	0.00085	12.9	88.1	0.004
43	1277.6	-290	1128605	773691.4	100	0.979	0.53265	28.5	1.115	0.004	0.0009	13.1	88.1	0.004
44	1277.6	-285	1128607	773687	100	1.013	0.55075	28.5	1.153	0.004	0.00096	13.2	88.1	0.004
45	1277.6	-280	1128609	773682.6	100	1.05	0.56978	28.5	1.194	0.004	0.00103	13.4	88	0.004
46	1277.6	-275	1128612	773678.3	100	1.088	0.58981	28.5	1.237	0.005	0.0011	13.6	88	0.005
47	1277.6	-270	1128614	773673.9	100	1.128	0.61091	28.4	1.283	0.005	0.00117	13.7	88	0.005
48	1277.6	-265	1128617	773669.5	100	1.17	0.63315	28.4	1.331	0.005	0.00125	13.9	87.9	0.005
49	1277.6	-260	1128619	773665.2	100	1.215	0.65662	28.4	1.381	0.005	0.00134	14.1	87.9	0.005
50	1277.6	-255	1128622	773660.8	100	1.263	0.68141	28.4	1.435	0.006	0.00143	14.2	87.9	0.006
51	1277.6	-250	1128624	773656.5	100	1.313	0.70762	28.3	1.491	0.006	0.00153	14.4	87.8	0.006
52	1277.6	-245	1128627	773652.1	100	1.366	0.73535	28.3	1.552	0.006	0.00164	14.6	87.8	0.007
53	1277.6	-240	1128629	773647.7	100	1.423	0.76474	28.3	1.615	0.007	0.00176	14.7	87.7	0.007
54	1277.6	-235	1128631	773643.4	100	1.483	0.79591	28.2	1.683	0.007	0.00189	14.9	87.7	0.007
55	1277.6	-230	1128634	773639	100	1.547	0.829	28.2	1.755	0.008	0.00203	15	87.6	0.008
56	1277.6	-225	1128636	773634.6	100	1.615	0.86418	28.1	1.832	0.008	0.00219	15.2	87.6	0.008
57	1277.6	-220	1128639	773630.3	100	1.688	0.90163	28.1	1.914	0.009	0.00235	15.3	87.5	0.009
58	1277.6	-215	1128641	773625.9	100	1.766	0.94153	28.1	2.001	0.009	0.00254	15.5	87.5	0.01
59	1277.6	-210	1128644	773621.5	100	1.849	0.98412	28	2.094	0.01	0.00274	15.6	87.4	0.01
60	1277.6	-205	1128646	773617.2	100	1.938	1.02962	28	2.195	0.011	0.00296	15.7	87.4	0.011
61	1277.6	-200	1128648	773612.8	100	2.034	1.07832	27.9	2.302	0.011	0.0032	15.9	87.3	0.012
62	1277.6	-195	1128651	773608.5	100	2.136	1.13051	27.9	2.417	0.012	0.00347	16	87.3	0.013
63	1277.6	-190	1128653	773604.1	100	2.247	1.18653	27.8	2.541	0.013	0.00376	16.1	87.2	0.014
64	1277.6	-185	1128656	773599.7	100	2.366	1.24675	27.8	2.675	0.014	0.00408	16.2	87.1	0.015
65	1277.6	-180	1128658	773595.4	100	2.495	1.31161	27.7	2.819	0.015	0.00444	16.3	87	0.016
66	1277.6	-175	1128661	773591	100	2.635	1.38158	27.7	2.975	0.016	0.00484	16.4	87	0.017

67	1277.6	-170	1128663	773586.6	100	2.787	1.4572	27.6	3.145	0.018	0.00528	16.5	86.9	0.019
68	1277.6	-165	1128666	773582.3	100	2.951	1.53909	27.5	3.328	0.019	0.00578	16.6	86.8	0.02
69	1277.6	-160	1128668	773577.9	100	3.131	1.62794	27.5	3.529	0.021	0.00633	16.7	86.7	0.022
70	1277.6	-155	1128670	773573.5	100	3.326	1.72455	27.4	3.747	0.023	0.00694	16.8	86.6	0.024
71	1277.6	-150	1128673	773569.2	100	3.541	1.82984	27.3	3.986	0.025	0.00763	16.8	86.5	0.026
72	1277.6	-145	1128675	773564.8	100	3.776	1.94483	27.3	4.247	0.028	0.00841	16.9	86.4	0.029
73	1277.6	-140	1128678	773560.5	100	4.035	2.07073	27.2	4.535	0.03	0.00929	17.0	86.3	0.032
74	1277.6	-135	1128680	773556.1	100	4.32	2.20893	27.1	4.852	0.034	0.01028	17	86.2	0.035
75	1277.6	-130	1128683	773551.7	100	4.636	2.36103	27	5.203	0.037	0.01141	17.1	86.1	0.039
76	1277.6	-125	1128685	773547.4	100	4.987	2.52888	26.9	5.591	0.041	0.01269	17.1	86	0.043
77	1277.6	-120	1128688	773543	100	5.377	2.71467	26.8	6.023	0.046	0.01415	17.1	85.9	0.048
78	1277.6	-115	1128690	773538.6	100	5.813	2.92093	26.7	6.505	0.051	0.01583	17.1	85.7	0.054
79	1277.6	-110	1128692	773534.3	100	6.301	3.15064	26.6	7.045	0.058	0.01777	17.1	85.6	0.06
80	1277.6	-105	1128695	773529.9	100	6.85	3.40732	26.4	7.651	0.065	0.02	17.1	85.5	0.068
81	1277.6	-100	1128697	773525.5	100	7.47	3.69512	26.3	8.334	0.073	0.02259	17.1	85.3	0.077
82	1277.6	-95	1128700	773521.2	100	8.172	4.01897	26.2	9.107	0.083	0.0256	17.1	85.2	0.087
83	1277.6	-90	1128702	773516.8	100	8.971	4.38473	26	9.985	0.095	0.02912	17.1	85	0.099
84	1277.6	-85	1128705	773512.5	100	9.882	4.79936	25.9	10.986	0.108	0.03324	17.1	84.9	0.113
85	1277.6	-80	1128707	773508.1	100	10.925	5.27119	25.8	12.13	0.124	0.0381	17	84.8	0.13
86	1277.6	-75	1128710	773503.7	100	12.123	5.81013	25.6	13.444	0.143	0.04384	17	84.7	0.15
87	1277.6	-70	1128712	773499.4	100	13.503	6.42797	25.5	14.955	0.165	0.05064	17.1	84.6	0.173
88	1277.6	-65	1128714	773495	100	15.095	7.13869	25.3	16.698	0.191	0.05872	17.1	84.6	0.199
89	1277.6	-60	1128717	773490.6	100	16.932	7.95867	25.2	18.709	0.22	0.06831	17.2	84.6	0.231
90	1277.6	-55	1128719	773486.3	100	19.048	8.9068	25.1	21.028	0.254	0.07968	17.4	84.7	0.266
91	1277.6	-50	1128722	773481.9	100	21.476	10.00434	25	23.691	0.291	0.09306	17.7	85	0.306
92	1277.6	-45	1128724	773477.5	100	24.236	11.27405	24.9	26.73	0.331	0.10863	18.2	85.4	0.348
93	1277.6	-40	1128727	773473.2	100	27.33	12.73835	25	30.153	0.369	0.12633	18.9	86.1	0.39
94	1277.6	-35	1128729	773468.8	100	30.722	14.41558	25.1	33.936	0.403	0.14568	19.9	87.1	0.428
95	1277.6	-30	1128731	773464.4	100	34.316	16.31354	25.4	37.996	0.424	0.16544	21.3	88.6	0.455
96	1277.6	-25	1128734	773460.1	100	37.943	18.41933	25.9	42.177	0.423	0.18315	23.4	90.7	0.461
97	1277.6	-20	1128736	773455.7	100	41.358	20.68556	26.6	46.242	0.393	0.19479	26.4	93.6	0.438
98	1277.6	-15	1128739	773451.4	100	44.261	23.01522	27.5	49.887	0.329	0.19483	30.6	97.7	0.382
99	1277.6	-10	1128741	773447	100	46.355	25.25183	28.6	52.787	0.234	0.17728	37.1	104.4	0.292
100	1277.6	-5	1128744	773442.6	100	47.415	27.18545	29.8	54.656	0.128	0.13846	47.3	297.7	0.183
101	1277.6	0	1128746	773438.3	100	47.341	28.58434	31.1	55.302	0.096	0.08345	41	185.1	0.1
102	1277.6	5	1128749	773433.9	100	46.17	29.25073	32.4	54.656	0.184	0.06027	18.1	243.1	0.189
103	1277.6	10	1128751	773429.5	100	44.053	29.08139	33.4	52.787	0.275	0.12137	23.8	255.9	0.299
104	1277.6	15	1128753	773425.2	100	41.218	28.10312	34.3	49.887	0.338	0.19316	29.7	262.4	0.389
105	1277.6	20	1128756	773420.8	100	37.922	26.46327	34.9	46.242	0.371	0.24833	33.8	266.5	0.446
106	1277.6	25	1128758	773416.4	100	34.417	24.38083	35.3	42.177	0.376	0.27994	36.7	269.3	0.468
107	1277.6	30	1128761	773412.1	100	30.919	22.0844	35.5	37.996	0.36	0.28903	38.7	271.4	0.462
108	1277.6	35	1128763	773407.7	100	27.586	19.76475	35.6	33.936	0.333	0.28073	40.1	272.8	0.435
109	1277.6	40	1128766	773403.4	100	24.517	17.55416	35.6	30.153	0.299	0.26133	41.1	273.9	0.397
110	1277.6	45	1128768	773399	100	21.757	15.52809	35.5	26.73	0.264	0.2363	41.8	274.6	0.354
111	1277.6	50	1128771	773394.6	100	19.316	13.7183	35.4	23.691	0.231	0.2096	42.3	275	0.312
112	1277.6	55	1128773	773390.3	100	17.178	12.12795	35.2	21.028	0.2	0.18369	42.6	275.3	0.272
113	1277.6	60	1128775	773385.9	100	15.316	10.74403	35	18.709	0.173	0.15987	42.7	275.4	0.236
114	1277.6	65	1128778	773381.5	100	13.7	9.54595	34.9	16.698	0.15	0.1387	42.8	275.4	0.204
115	1277.6	70	1128780	773377.2	100	12.297	8.51085	34.7	14.955	0.129	0.12025	42.9	275.4	0.177
116	1277.6	75	1128783	773372.8	100	11.078	7.61641	34.5	13.444	0.112	0.10436	42.9	275.3	0.153
117	1277.6	80	1128785	773368.4	100	10.016	6.84227	34.3	12.13	0.098	0.09077	42.9	275.2	0.133
118	1277.6	85	1128788	773364.1	100	9.089	6.17053	34.2	10.986	0.085	0.07919	42.9	275	0.116
119	1277.6	90	1128790	773359.7	100	8.276	5.58579	34	9.985	0.075	0.06933	42.8	274.9	0.102
120	1277.6	95	1128792	773355.4	100	7.562	5.075	33.9	9.107	0.066	0.06092	42.8	274.8	0.09
121	1277.6	100	1128795	773351	100	6.932	4.62714	33.7	8.334	0.058	0.05374	42.8	274.6	0.079
122	1277.6	105	1128797	773346.6	100	6.373	4.23298	33.6	7.651	0.051	0.04758	42.8	274.5	0.07
123	1277.6	110	1128800	773342.3	100	5.877	3.88475	33.5	7.045	0.046	0.0423	42.8	274.3	0.062
124	1277.6	115	1128802	773337.9	100	5.434	3.57597	33.3	6.505	0.041	0.03774	42.8	274.2	0.056
125	1277.6	120	1128805	773333.5	100	5.038	3.30116	33.2	6.023	0.037	0.0338	42.8	274.1	0.05
126	1277.6	125	1128807	773329.2	100	4.682	3.05572	33.1	5.591	0.033	0.03037	42.8	274	0.045
127	1277.6	130	1128810	773324.8	100	4.362	2.83579	33	5.203	0.03	0.02739	42.8	273.8	0.04
128	1277.6	135	1128812	773320.4	100	4.072	2.63805	32.9	4.852	0.027	0.02477	42.8	273.7	0.036
129	1277.6	140	1128814	773316.1	100	3.81	2.45972	32.8	4.535	0.024	0.02248	42.8	273.6	0.033
130	1277.6	145	1128817	773311.7	100	3.572	2.29841	32.8	4.247	0.022	0.02046	42.9	273.5	0.03
131	1277.6	150	1128819	773307.3	100	3.355	2.15208	32.7	3.986	0.02	0.01867	42.9	273.4	0.027
132	1277.6	155	1128822	773303	100	3.156	2.01898	32.6	3.747	0.018	0.01709	43	273.3	0.025
133	1277.6	160	1128824	773298.6	100	2.975	1.89759	32.5	3.529	0.017	0.01568	43	273.2	0.023
134	1277.6	165	1128827	773294.3	100	2.808	1.78662	32.5	3.328	0.015	0.01442	43.1	273.2	0.021
135	1277.6	170	1128829	773289.9	100	2.655	1.68492	32.4	3.145	0.014	0.01329	43.2	273.1	0.019
136	1277.6	175	1128832	773285.5	100	2.514	1.59151	32.3	2.975	0.013	0.01228	43.3	273	0.018

137	1277.6	180	1128834	773281.2	100	2.383	1.50554	32.3	2.819	0.012	0.01137	43.4	272.9	0.017
138	1277.6	185	1128836	773276.8	100	2.263	1.42623	32.2	2.675	0.011	0.01055	43.4	272.8	0.015
139	1277.6	190	1128839	773272.4	100	2.151	1.35294	32.2	2.541	0.01	0.00981	43.5	272.8	0.014
140	1277.6	195	1128841	773268.1	100	2.047	1.28508	32.1	2.417	0.01	0.00914	43.6	272.7	0.013
141	1277.6	200	1128844	773263.7	100	1.951	1.22213	32.1	2.302	0.009	0.00852	43.7	272.6	0.012
142	1277.6	205	1128846	773259.3	100	1.861	1.16364	32	2.195	0.008	0.00797	43.9	272.6	0.011
143	1277.6	210	1128849	773255	100	1.777	1.10919	32	2.094	0.008	0.00746	44	272.5	0.011
144	1277.6	215	1128851	773250.6	100	1.698	1.05844	31.9	2.001	0.007	0.00699	44.1	272.5	0.01
145	1277.6	220	1128854	773246.3	100	1.625	1.01106	31.9	1.914	0.007	0.00657	44.2	272.4	0.009
146	1277.6	225	1128856	773241.9	100	1.556	0.96675	31.9	1.832	0.006	0.00617	44.3	272.4	0.009
147	1277.6	230	1128858	773237.5	100	1.491	0.92526	31.8	1.755	0.006	0.00581	44.4	272.3	0.008
148	1277.6	235	1128861	773233.2	100	1.431	0.88637	31.8	1.683	0.006	0.00548	44.6	272.3	0.008
149	1277.6	240	1128863	773228.8	100	1.374	0.84985	31.7	1.615	0.005	0.00517	44.7	272.2	0.007
150	1277.6	245	1128866	773224.4	100	1.32	0.81552	31.7	1.552	0.005	0.00489	44.8	272.2	0.007
151	1277.6	250	1128868	773220.1	100	1.269	0.78322	31.7	1.491	0.005	0.00463	45	272.1	0.007
152	1277.6	255	1128871	773215.7	100	1.221	0.75278	31.6	1.435	0.004	0.00438	45.1	92.1	0.006
153	1277.6	260	1128873	773211.3	100	1.176	0.72407	31.6	1.381	0.004	0.00416	45.2	92.1	0.006
154	1277.6	265	1128875	773207	100	1.133	0.69696	31.6	1.331	0.004	0.00395	45.4	92	0.006
155	1277.6	270	1128878	773202.6	100	1.093	0.67133	31.6	1.283	0.004	0.00375	45.5	92	0.005
156	1277.6	275	1128880	773198.3	100	1.055	0.64708	31.5	1.237	0.003	0.00357	45.7	92	0.005
157	1277.6	280	1128883	773193.9	100	1.018	0.62411	31.5	1.194	0.003	0.0034	45.8	91.9	0.005
158	1277.6	285	1128885	773189.5	100	0.984	0.60233	31.5	1.153	0.003	0.00324	46	91.9	0.005
159	1277.6	290	1128888	773185.2	100	0.951	0.58167	31.5	1.115	0.003	0.00309	46.1	91.9	0.004
160	1277.6	295	1128890	773180.8	100	0.92	0.56205	31.4	1.078	0.003	0.00295	46.2	91.8	0.004
161	1277.6	300	1128893	773176.4	100	0.89	0.5434	31.4	1.043	0.003	0.00282	46.4	91.8	0.004
162	1277.6	305	1128895	773172.1	100	0.862	0.52565	31.4	1.009	0.003	0.0027	46.5	91.8	0.004
163	1277.6	310	1128897	773167.7	100	0.835	0.50876	31.4	0.977	0.002	0.00258	46.7	91.7	0.004
164	1277.6	315	1128900	773163.3	100	0.809	0.49266	31.3	0.947	0.002	0.00247	46.9	91.7	0.003
165	1277.6	320	1128902	773159	100	0.784	0.47732	31.3	0.918	0.002	0.00237	47	91.7	0.003
166	1277.6	325	1128905	773154.6	100	0.761	0.46267	31.3	0.89	0.002	0.00227	47.2	91.7	0.003
167	1277.6	330	1128907	773150.2	100	0.738	0.44868	31.3	0.864	0.002	0.00218	47.3	91.6	0.003
168	1277.6	335	1128910	773145.9	100	0.717	0.43532	31.3	0.839	0.002	0.00209	47.5	91.6	0.003
169	1277.6	340	1128912	773141.5	100	0.696	0.42254	31.2	0.815	0.002	0.00201	47.6	91.6	0.003
170	1277.6	345	1128915	773137.2	100	0.677	0.41032	31.2	0.791	0.002	0.00193	47.8	91.6	0.003
171	1277.6	350	1128917	773132.8	100	0.658	0.39861	31.2	0.769	0.002	0.00186	47.9	91.5	0.003
172	1277.6	355	1128919	773128.4	100	0.64	0.3874	31.2	0.748	0.002	0.00179	48.1	91.5	0.002
173	1277.6	360	1128922	773124.1	100	0.622	0.37665	31.2	0.728	0.002	0.00173	48.3	91.5	0.002
174	1277.6	365	1128924	773119.7	100	0.606	0.36634	31.2	0.708	0.001	0.00166	48.4	91.5	0.002
175	1277.6	370	1128927	773115.3	100	0.59	0.35645	31.1	0.689	0.001	0.0016	48.6	91.4	0.002
176	1277.6	375	1128929	773111	100	0.574	0.34695	31.1	0.671	0.001	0.00155	48.7	91.4	0.002
177	1277.6	380	1128932	773106.6	100	0.56	0.33782	31.1	0.654	0.001	0.00149	48.9	91.4	0.002
178	1277.6	385	1128934	773102.2	100	0.545	0.32905	31.1	0.637	0.001	0.00144	49	91.4	0.002
179	1277.6	390	1128936	773097.9	100	0.532	0.32062	31.1	0.621	0.001	0.0014	49.2	91.4	0.002
180	1277.6	395	1128939	773093.5	100	0.518	0.3125	31.1	0.605	0.001	0.00135	49.4	91.4	0.002
181	1277.6	400	1128941	773089.2	100	0.506	0.30469	31.1	0.59	0.001	0.0013	49.5	91.3	0.002
182	1277.6	405	1128944	773084.8	100	0.494	0.29716	31.1	0.576	0.001	0.00126	49.7	91.3	0.002
183	1277.6	410	1128946	773080.4	100	0.482	0.28991	31	0.562	0.001	0.00122	49.8	91.3	0.002
184	1277.6	415	1128949	773076.1	100	0.47	0.28292	31	0.549	0.001	0.00118	50	91.3	0.002
185	1277.6	420	1128951	773071.7	100	0.459	0.27618	31	0.536	0.001	0.00115	50.2	91.3	0.001
186	1277.6	425	1128954	773067.3	100	0.449	0.26968	31	0.524	0.001	0.00111	50.3	91.3	0.001
187	1277.6	430	1128956	773063	100	0.439	0.2634	31	0.512	0.001	0.00108	50.5	91.2	0.001
188	1277.6	435	1128958	773058.6	100	0.429	0.25734	31	0.5	0.001	0.00105	50.6	91.2	0.001
189	1277.6	440	1128961	773054.2	100	0.419	0.25149	31	0.489	0.001	0.00101	50.8	91.2	0.001
190	1277.6	445	1128963	773049.9	100	0.41	0.24583	31	0.478	0.001	0.00099	51	91.2	0.001
191	1277.6	450	1128966	773045.5	100	0.401	0.24036	30.9	0.467	0.001	0.00096	51.1	91.2	0.001
192	1277.6	455	1128968	773041.2	100	0.392	0.23507	30.9	0.457	0.001	0.00093	51.3	91.2	0.001
193	1277.6	460	1128971	773036.8	100	0.384	0.22996	30.9	0.447	0.001	0.0009	51.4	91.2	0.001
194	1277.6	465	1128973	773032.4	100	0.376	0.22501	30.9	0.438	0.001	0.00088	51.6	91.1	0.001
195	1277.6	470	1128976	773028.1	100	0.368	0.22021	30.9	0.429	0.001	0.00085	51.8	91.1	0.001
196	1277.6	475	1128978	773023.7	100	0.36	0.21557	30.9	0.42	0.001	0.00083	51.9	91.1	0.001
197	1277.6	480	1128980	773019.3	100	0.353	0.21107	30.9	0.411	0.001	0.00081	52.1	91.1	0.001
198	1277.6	485	1128983	773015	100	0.346	0.20671	30.9	0.403	0.001	0.00079	52.2	91.1	0.001
199	1277.6	490	1128985	773010.6	100	0.339	0.20249	30.9	0.395	0.001	0.00077	52.4	91.1	0.001
200	1277.6	495	1128988	773006.2	100	0.332	0.19839	30.9	0.387	0.001	0.00075	52.6	91.1	0.001
201	1277.6	500	1128990	773001.9	100	0.325	0.19442	30.9	0.379	0.001	0.00073	52.7	91.1	0.001

