EXHIBIT AA – Request for Amendment No. 1

ELECTRIC AND MAGNETIC FIELDS

OAR 345-021-0010(1)(aa)

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APPENDICES

AA.1 INTRODUCTION

OAR 345-021-0010(1)(aa) *If the proposed facility includes an electric transmission line:*

Response: This exhibit provides the information required by Oregon Administrative Rules 345-021-0010(1)(aa) in support of the Request for Amendment No. 1 of the Site Certificate for the Carty Generating Station (RFA). This exhibit evaluates electric and magnetic fields (EMF) for the proposed Carty Solar Farm interconnection transmission line to reflect changes proposed under this RFA. The Application for Site Certificate contains information regarding EMF for Unit 1 of the Carty Generating Station as originally proposed (also referred to as Carty 1 in Figure AA-1 and Appendix AA-1).

AA.2 SUMMARY

Response: Oscillating EMF at power frequency are generated by all electrical devices. The earth itself has naturally occurring steady-state EMF. This exhibit addresses the estimates of the maximum possible EMF strengths that would be produced by distributing energy and power flow from the Carty Solar Farm.

This exhibit describes four scenarios. The conductor arrangements for all four scenarios are provided in Appendix AA-1, the 2016 *Carty Expansion Electric and Magnetic Fields (EMF) Study Rev 4,* prepared by Sargent & Lundy LLC.

All scenarios consider the effects of the following connections to the Grassland Switchyard:

- Unit 1 – Grassland, existing 500 kilovolt (kV) single circuit;
- Boardman – Grassland, existing 500 kV single circuit;
- Carty Solar Farm – Grassland, proposed 34.5 kV single circuit; and
- Grassland – Slatt, existing 500 kV single circuit.

The four scenarios are:

- Scenario 1: One existing 500 kV single circuit (Unit 1 – Grassland) and one existing 500 kV circuit (Boardman – Grassland).
- Scenario 2: One existing 500 kV circuit (Grassland – Slatt) and one proposed 34.5 kV single circuit (Carty Solar Farm – Grassland).
- Scenario 3: Five existing Bonneville Power Administration (BPA) circuits, two existing Iberdrola circuits, and one existing Portland General Electric Company (PGE) (Grassland – Slatt) circuit.

- Scenario 4: Carty Solar Farm – Grassland, one proposed 34.5 kV single circuit.

When a conductor is energized, an electric field is formed around the conductor that is proportionate to the voltage. The strength of the electric field is independent of the current flowing in the conductor. When alternating current (AC) flows through a conductor, an alternating magnetic field is created around the conductor. Areas of equal magnetic field intensity can be envisioned as concentric cylinders with the conductor at the center. The magnetic field intensity drops rapidly with distance from the conductor.

The EMF estimates are computed for a height of 1 meter (3.3 feet) aboveground and include the canceling effects of other electrical transmission lines existing along the proposed transmission line rights-of-way (ROWs) and study area. Radio interference is computed at a single measurement frequency of 1 megahertz (MHz) at 2 meters (6.6 feet) aboveground. Television interference is computed at a single measurement frequency of 75 MHz at 3 meters (9.8 feet) aboveground.

In AC power systems, voltage swings positive to negative and back to positive, in a 360-degree cycle, 60 times every second. Current follows the voltage, flowing forward, reversing direction, and returning to the forward direction, again in a 360-degree cycle, 60 times every second. Each AC transmission circuit carries power over three conductors. One phase of the circuit is carried by each of the three conductors. The AC voltage and current in each phase conductor is out of sync with the other two phases by 120 degrees, or one-third of the 360-degree cycle. The fields from these conductors tend to cancel out because of the phase difference, which is referred to as phase cancellation. However, a person standing on the ROW under a transmission line will not be equidistant from all conductors, which results in a net field at the person's location. The strength of the magnetic field depends on the current in the conductor, the geometry of the structures, the degree of cancellation from other conductors, and the distance from the conductors.

Figures 2 and 3 in Appendix AA-1 provide the typical proposed structural configurations pertaining to Section Cuts 1 and 2 nearest the Grassland Switchyard. Figure 4 in Appendix AA-1 provides the typical proposed structural configurations pertaining to Section Cut 3 nearest the existing Slatt Substation. Figure 5 in Appendix AA-1 provides the typical proposed structural configuration pertaining to Section Cut 4 nearest the Carty Solar Farm substation.

Except for special construction required for crossing under other transmission lines, the ground-level magnetic field intensity across the corridor is determined by the currents and geometry of these facilities.

Figure AA-1 provides the section cuts associated with the four scenarios.

The loading assumptions are:

- The Boardman Plant is generating until 2020;
- Unit 1 is generating at full nameplate; and
- The Carty Solar Farm is generating at full nameplate.

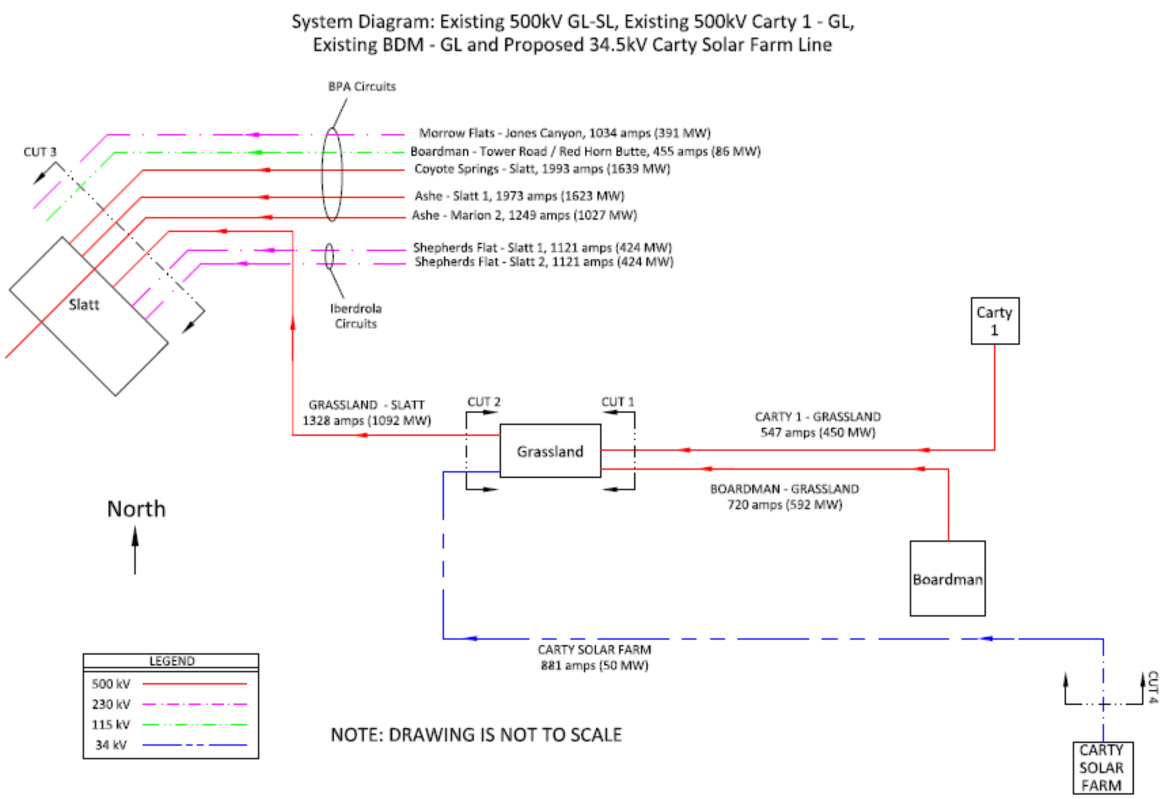

Figure AA-1 System Diagram

AA.3 INFORMATION ABOUT THE EXPECTED ELECTRIC AND MAGNETIC FIELDS

OAR 345-021-0010(1) (aa)(A) *Information about the expected electric and magnetic fields, including:*

(i) The distance in feet from the proposed centerline of each proposed transmission line to the edge of the right-of-way;

Response: Scenario 1 evaluates a cut that is 500 feet to the east of the Grassland Switchyard. Scenario 1's study area encompasses 200 feet north and south of the Unit 1 – Grassland and Boardman – Grassland transmission lines, respectively. Total width of the study area is 490 feet and is shown on Figure 2 in Appendix AA-1. There is no ROW associated with Scenario 1, as the study area is wholly contained on property belonging to PGE.

Scenario 2 evaluates a cut that is 100 feet west of the Grassland Switchyard. Scenario 2's study area encompasses 200 feet north of Grassland – Slatt and 200 feet south of Carty Solar Farm – Grassland. The total width of the study area is 590 feet and is shown on Figure 4 in Appendix AA-1. There is no ROW associated with Scenario 2, as the study area is wholly contained on PGE property.

Scenario 3 evaluates a cut that is 3,000 feet northeast of the Slatt Substation. There are five existing BPA circuits, two existing Iberdrola circuits, and one existing PGE (Grassland – Slatt) circuit contained within this cut. Scenario 3's study area encompasses 200 feet north of Morrow Flats–Jones Canyon #1 and 200 feet south of Shepherds Flat–Slatt 2. The total width of the study area is 1,520 feet and is shown on Figure 4 in Appendix AA-1. The existing ROW contained within this study area has a width of 525 feet, which extends 75 feet to the right of the centerline of the existing Grassland – Slatt transmission line and 450 feet to the left of the existing Grassland – Slatt transmission line when viewed looking southwest.

Scenario 4 evaluates a cut that is 3,000 feet northwest of the Carty Solar Farm substation. Scenario 4's study area encompasses 200 feet east and 200 feet west of the proposed Carty Solar Farm transmission line. The total width of the study area is 400 feet and is shown on Figure 5in Appendix AA-1. The proposed ROW would be contained within this study area and would have a width of 80 feet centered on the Carty Solar Farm – Grassland transmission line.

Figures 2 through 5 in Appendix AA-1 show the centerline of the proposed and existing transmission lines to the edge of the study area.

(ii) The type of each occupied structure, including, but not limited to, residences, commercial establishments, industrial facilities, schools, daycare centers and hospitals, within 200 feet on each side of the proposed centerline of each proposed transmission line;

Response: There are no existing occupied structures within 200 feet on either side of the proposed centerlines.

(iii) The approximate distance in feet from the proposed centerline to each structure identified in OAR 345-021-0010(1)(aa)(A);

Response: There are no existing occupied structures within 200 feet on either side of the proposed centerlines.

(iv) At representative locations along each proposed transmission line, a graph of the predicted electric and magnetic fields levels from the proposed centerline to 200 feet on each side of the proposed centerline;

Response: Appendix A of the *Carty Expansion Electric and Magnetic Fields (EMF) Study Rev 4* (see Appendix AA-1 for this exhibit) provides graphs of the predicted EMF levels from the scenarios evaluated. Calculations were completed for EMF. Additionally, calculations were completed for radio and television noise during both dry and wet weather to determine potential interference impact. Television interference was calculated for a single measurement frequency of 75 MHz at 3 meters (9.8 feet) aboveground, and radio interference was calculated for a single measurement frequency of 1 MHz at 2 meters (6.6 feet) aboveground.

Values for 200 feet north and south of the study area, as well as the maximum value for each parameter within the study area, were tabulated. Table AA-1 illustrates the EMF as well as the radio and television noise resulting from the Carty Generating Station expansion.

Maximum magnetic fields are produced at the maximum conductor currents. The outputs used for calculating the EMF strengths are assumed to be typical peak-load outputs from the generators and are therefore higher than the nominal outputs. In the worst-case scenario, the field strengths at 200 feet north and south of the study area are within the requirements of Oregon Administrative Rules 345-024-0090, as they do not exceed 9 kV per meter.

As shown in Tables AA-1, induced currents resulting from the transmission line and related or supporting facilities would be as low as reasonably achievable. By phasing the proposed new circuit to maximize field cancellation, EMF are minimized.

Table AA-1 Electric and Magnetic Field Cuts at the Grassland Switchyard (Cuts 1 and 2), Slatt Substation (Cut 3), and Carty Solar Farm (Cut 4)

Case Designation	South Edge of the Study Area	Maximum within the Study Area	North Edge of the Study Area
Electric Field (kV/m)			
Scenario 1, Cut 1	0.21	8.50	0.1
Scenario 2, Cut 2	0.03	8.30	0.17

Table AA-1 Electric and Magnetic Field Cuts at the Grassland Switchyard (Cuts 1 and 2), Slatt Substation (Cut 3), and Carty Solar Farm (Cut 4)

Case Designation	South Edge of the Study Area	Maximum within the Study Area	North Edge of the Study Area
Scenario 3, Cut 3	0.03	8.83	0.07
Scenario 4, Cut 4	0.01	0.4	0.01
Magnetic Field (mG)			
Scenario 1, Cut 1	5.14	125.42	1.42
Scenario 2, Cut 2	2.49	231.32	9.49
Scenario 3, Cut 3	3.47	343.09	2.94
Scenario 4, Cut 4	28.7	235.47	28.72
Radio Noise during Fair Weather (dBµV/m)			
Scenario 1, Cut 1	40.3	67.5	33.7
Scenario 2, Cut 2	33.6	64.6	40.5
Scenario 3, Cut 3	27.1	67.2	25.4
Scenario 4, Cut 4	N/A	N/A	N/A
Radio Noise during Rain (dBµV/m)			
Scenario 1, Cut 1	57.3	84.5	50.7
Scenario 2, Cut 2	50.6	81.6	57.5
Scenario 3, Cut 3	44.1	84.2	42.4
Scenario 4, Cut 4	N/A	N/A	N/A
Television Interference during Rain (dBµV/m)			
Scenario 1, Cut 1	23.1	42	18.1
Scenario 2, Cut 2	16.3	39.1	22.4
Scenario 3, Cut 3	8.7	41.6	5.5
Scenario 4, Cut 4	N/A	N/A	N/A

Key:
dBµV/m = decibel-microvolts per meter
kV/m = kilovolts per meter
mG = milligauss
N/A = not applicable

(v) Any measure applicant proposes to reduce electric or magnetic field levels;

Response: Operators of transmission lines attempt to organize the conductors attached to structures in ways that are consistent and intuitive so that line workers are less apt to make mistakes in operations. The peak voltage of each conductor is, nominally, one-third or 120 degrees out of phase with the voltages of the other conductors. For the 500 kV transmission lines proposed, the most common single-circuit transmission conductor arrangement would place the B-phase conductor at the top position, the C-phase conductor at the bottom left, and the A-phase conductor at the bottom right position when looking west along the ROW and the study area. Due to the configuration of the tower, the distance between the three phases on this delta configured tower would be equally spaced and more compact than the standard horizontal tower.

The middle phase with the increased elevation to ground would reduce the fields produced by the B-phase. This configuration has been shown to reduce both electric and magnetic fields at the centerline and towards the edge of the study area. A comparative study by Argonne National Laboratories has indicated that this delta design tower is one of the most effective solutions to minimize and reduce EMF.

(vi) The assumptions and methods used in the electric and magnetic field analysis, including the current amperes on each proposed transmission line;

Response: To estimate the maximum EMF, calculations are performed at mid-span where the conductor is positioned at its lowest point between structures (the estimated maximum sag point). The magnetic fields are computed at 1 meter (3.28 feet) aboveground using the Corona and Field Effects Program developed by the BPA. This program has been used to predict EMF levels for many years and has been confirmed by field measurements by numerous utilities.

Calculations use 1.05 per unit of nominal voltage for the 230 kV, 115 kV, and 34.5 kV circuits and 1.10 per unit of normal voltage for the 500 kV circuits. All loads on all circuits are assumed to be maximum and coincident. This condition would occur rarely and is therefore a conservative assumption.

Electric fields are voltage dependent and will remain the same when a transmission line is operated at a given voltage, regardless of load. Magnetic fields vary proportionally with current. They are higher when the current is higher and produce higher ground-level magnetic fields. Since the average loads would be less than the maximum operating current, the proposed transmission line typically would produce lower EMF than predicted for the maximum condition. The dimensions of the existing BPA and Iberdrola power lines were extracted from a previous study that contained the same circuits.

The distances between the centerlines of the various circuits and the edge of the study area are shown in Figures 2 through 5 in Appendix AA-1. The circuit spacing used for these estimates is representative of the minimum spacing.

In this EMF analysis, the existing Boardman Plant is assumed to be generating through 2020. The power factor is assumed to be 95% for all circuit loads. Table AA-2 shows the circuit loading assumed for this study.

Table AA-2 Circuit Loading

Circuit Designation	Amps	kV	MW	MVA
Existing Grassland – Slatt 1 500 kV	1328	500	1092	1150
Existing Unit 1 – Grassland 500 kV	547	500	450	474
Existing Boardman – Grassland 500 kV	720	500	592	623
Proposed Carty Solar Farm – Grassland 34.5 kV	881	34.5	50	53
Existing Ashe – Marion 2 500 kV	1249	500	1027	1081
Existing Ashe – Slatt 1 500 kV	1973	500	1623	1708
Existing Coyote Springs – Slatt 500 kV	1993	500	1639	1725
Existing Boardman – Tower Road/Red Horn Butte 115 kV	455	115	86	91
Existing Morrow Flats – Jones Canyon 230 kV	1034	230	391	412
Existing Shepherds Flat – Slatt 1 230 kV	1121	230	424	446
Existing Shepherds Flat – Slatt 2 230 kV	1121	230	424	446

Key:
kV = kilovolt
MVA = megavolt ampere
MW = megawatt

(vii) *The applicant's proposed monitoring program, if any, for actual electric and magnetic field levels.*

Response: There are no monitoring programs proposed to measure the actual EMF levels generated by the proposed construction.

AA.4 ALTERNATIVE METHODS TO REDUCE RADIO INTERFERENCE

OAR 345-021-0010(1)(aa)(B) *An evaluation of alternative methods and costs of reducing radio interference likely to be caused by the transmission line in the primary reception area near interstate, U.S. and state highways.*

Response: Based on analysis provided in Appendix AA-1, no alternative methods to reduce radio and television interference are necessary.

Appendix AA-1

Carty Expansion Electric and Magnetic Fields (EMF) Study Rev 4

PORTLAND GENERAL ELECTRIC
CARTY EXPANSION PROJECT

CARTY EXPANSION ELECTRIC AND MAGNETIC FIELDS (EMF) STUDY

REVISION: 4
DATED: 01/30/2018

PREPARED BY: Sargent & Lundy LLC

55 East Monroe Street
Chicago, IL 60603
Project No. 12265-022

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1.0 PURPOSE AND SCOPE

The purpose of this calculation is to determine the calculated electric fields, magnetic fields, radio interference and television interference within the boundaries of the study area. There are four unique scenarios included in this calculation, all pertaining to the Portland General Electric Carty Expansion Project.

The Carty Expansion EMF, RI and TVI study includes analysis of the study area of four (4) section cuts outside of the Grassland Switchyard, Slatt Substation and Carty Solar Farm as described below:

- Cut 1 is 500 feet east of Grassland Switchyard – looking west
- Cut 2 is 100 feet west of Grassland Switchyard – looking east
- Cut 3 is 3000 feet northeast of Slatt Substation – looking southwest
- Cut 4 is 3000 feet northwest of Carty Solar Farm Substation – looking north

The above described section cuts resulted in four (4) unique scenarios, as described below:

- **Scenario 1:** Cut 1– includes one existing 500 kV single circuit (Carty 1 – Grassland) and one existing 500 kV circuit (Boardman – Grassland).
- **Scenario 2:** Cut 2 – includes one existing 500 kV circuit (Grassland – Slatt) and one proposed 34.5 kV single circuit (Carty Solar Farm – Grassland).
- **Scenario 3:** Cut 3 – includes five existing BPA circuits, two existing Iberdrola circuits, and 1 existing PGE (Grassland – Slatt) circuit.
- **Scenario 4:** Cut 4 – Carty Solar Farm - Grassland, proposed 34.5 kV single circuit

Maximum effects will be reported within the study area, and 200' north and south of the last structure inside the study area. Radio Noise will be reported for both fair weather and rain conditions and Television Interference will be reported for rain conditions.

2.0 DESIGN INPUTS

General

- Carty Expansion - EMF Study RFP dated March 23, 2016
- Local Computer: ZL11091
- Bonneville Power Adminstrative (BPA) Corona and Field Effects Program (Version 3.1)
- pge_grassland transmission line_final model_ifc.bak (PLS CADD back-up file)
- PLS CADD v.14.2 (V&V # 03.7.893-14.20)
- AutoCAD 2014 (V&V # 03.2.085-14.0)
- MS Office (V&V # 03.2.435-14.0)

Verified Inputs

- A-3081-1_RA, A-3082-1_RA, A-3083-1_RA - phasing diagrams
- Carty Geotech Report Final REV2
- SCADA data provided by PGE (for conductor voltages and currents)

Load data and wire types for all circuits were provided in the RFP. BPA provided SCADA data for the circuits that terminate at the Slatt Substation.

The "Two Year Maximum" values were used for the BPA lines in the Scenario 3 Section 3 study, and the original values were used for the PGE lines in all calculations.

The following are notable inputs:

Weather Conditions:

The wind input was entered as 0.5 miles per hour.

Profile probe characteristic:

Probe characteristics for the calculations of Electric Field and Magnetic Field will be measured at 1 meter (3.3 ft) above ground. Radio Interference will be determined at a single measurement frequency of 1 MHz at 2 meters (6.6 ft) above ground. Television Interference will be determined at a single measurement frequency of 75 MHz at 3 meters (9.8 ft) above ground.

Soil Conditions:

The top layer calculated value from the grounding study was used as a basis for the soil conductivity input. The grounding study indicated the highest resistivity value of 107.1396 Ω·m. The noted ground resistivity was then converted into the required ground conductivity input value as follows:

The inputs to the BPA programs requires the ground conductivity to be entered (mmhos/m = mS/m). Therefore, the reciprocal of the ground resistivity of 107.14 ohms * m = the ground conductivity of 9.3336 mS/m

Ground resistivity surrounding the Slatt substation is assumed to be 2 mS/m (500 ohm*m) for Scenario 3 provided in the Carty 1 study.

Circuit Requirements:

Calculations use 1.05 per unit of nominal voltage for the 34.5 kV, 115 kV, and 230 kV lines and 1.10 per unit for the 500-kV lines for determining maximum voltage.

Circuit Designation	Amps	kV	MW	MVA
Existing Grassland - Slatt 1 500kV	1328	500	1092	1150
Existing Carty 1 - Grassland 500kV	547	500	450	474
Existing Boardman - Grassland 500 kV	720	500	592	623
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Existing Shepherds Flat - Slatt 1 230kV	1121	230	424	446
Existing Shepherds Flat - Slatt 2 230kV	1121	230	424	446

3.0 ASSUMPTIONS

- Boardman Plant will be generating until 2020.
- Carty 1 is generating at full nameplate.
- Carty Solar Farm is generating at full nameplate.
- Grassland – Slatt carry the entire load.
- Assume a power factor (pf) of 0.95.
- Calculation uses a power factor of 0.95
- Electric and Magnetic Field effects will be calculated at a height at 3.28 feet (1 meter) above ground
- Corona-generated audible noise analysis is not required for the 34.5kV line
- Radio Interference (dBμV/m) determined at a single measurement frequency of 1 MHz at 6.6 feet (2 meters) above ground
- Radio Interference will be reported for both fair weather and rainy conditions
- Television Interference (dBμV/m) determined at a single measurement frequency of 75 MHz at 9.8 feet (3 meters) above ground
- Maximum effects will be reported 200 feet on each side of the proposed center line
- Maximum elevation of 800 ft was used for all Scenarios.
- Soil electrical resistivity noted in the geotechnical report is for the Grassland Switchyard area.
- Soil conditions were taken from the previous EMF report, for the Slatt Substation.
- Minimum ground clearances matched previous EMF report.

- BPA circuit phasing has not been field verified.
- Rain rate (used for computing corona losses in the ozone subroutine) was assumed to be 1 in/hr.
- The transmission line will utilized the maximum voltage to calculate the electric fields. For 500 kV transmission lines, this calculates to a 1.1 pu over voltage or 550 kV. For voltages less than 500 kV, the over voltage is 1.05 pu. The transmission lines will utilize the nominal voltage that is expected on the transmission lines to calculate the ampacity for the magnetic field calculations. The nominal voltage for 500kV is set at 525 kV. The other voltages will be at their rated voltage of 34.5, 115, and 230 kV.

4.0 METHODOLOGY AND ACCEPTANCE CRITERIA

Methodology

Cross Sections

AutoCAD was utilized to create drawings of the four (4) Scenarios as noted above. These cross section drawings are intended only to present the dimensional locations of the line positions and are not intended to accurtately depict the framing/construction of the existing or proposed structures.

Circuit Specifications:

The circuit inputs were entered into an MS Excel spreadsheet and then saved as a comma delimited (.csv) text file. The .csv files required minimal editing and are utilized directly by the BPA Corona and Field Effects Program. Editing largely consisted of removing additional commas which were generated by the conversion from MS Excel.

Acceptance Criteria

The State of Oregon has placed limits that alternating current electric fields do not exceed 9 kV/m at one (1) meter (3.3 ft) above ground for surface in areas accessible to the public, within the ROW. The study area presented in this study encompasses the ROW per each Scenario.

5.0 CALCULATIONS

See Attachments section of this document for all Reports

- Table and Graph of calculated values for each study area
- Corona and Field Effects – Input and Output text files for each study area

6.0 ELECTRICAL EFFECTS

The electrical effects of a transmission line are those associated with electrical field, magnetic field, and corona. Electric and magnetic fields can result in induced voltage on objects near a transmission line. Corona effects are manifested in audible noise (AN), radio interference (RI) and television interference (TVI). The effects will be minimized by line location, line design, and construction practices.

CORONA

Corona is a partial electrical breakdown that results in the transformation of energy into very small amounts of light, sound, radio noise, chemical reaction, and heat. Corona results when the voltage gradient surrounding energized conductors or hardware exceeds the breakdown strength of air, resulting in electrical discharges. It is more severe during rainy or damp weather.

Corona is a recognized phenomenon, and it is considered in the design of electrical hardware and equipment as well as in the specific design of a transmission line. To reduce the surface voltage gradient for the line, a double bundle configuration, or two conductors per phase, has been selected. By using a bundle configuration, the "effective" conductor diameter and surface area is significantly increased, thus lowering the surface voltage gradient. The effects of corona were analyzed in the RI analysis at 1,000 kilohertz (kHz) and television interference at 75,000 kilohertz (kHz).

RADIO & TELEVISION INTERFERENCE

Overhead transmissions lines generally do not interfere with normal radio reception. Corona and gap discharges, however, are two potential sources of interference. Corona, as described above, may affect radio reception. However, due to the conductor hardware that will be used and the bundled conductor design, the corona, and thus interference, will be minimal and is not expected to be a problem.

Gap discharges result from electrical discharges between broken or poorly fitting hardware, such as insulators, clamps, and brackets. The hardware is designed to prevent gap discharges; however, mechanical damage due to wind induced (aeolian) vibration, corrosion, gunshot, or other causes may create a condition where gap discharges can occur. Gaps between contact points on hardware, at which small electrical discharges can occur, are created. This phenomenon can be found on lines of all voltages, and sometimes occurs when "slack" or low tension spans result in insufficient tension to keep hardware firmly in contact. The discharge across the small gap acts as a low power electrical transmitter and may interfere with some radio or television signals.

A much more likely source of radio or television interference arises through electrical equipment in the home itself. The line voltage and the distance of prospective line routes from residences minimize the likelihood of objectionable audible noise, radio interference, or television interference from the line.

ELECTRIC AND MAGNETIC FIELDS

The change in voltage over distance is known as the electric field. The units describing an electric field are volts per meter (V/m) or kilovolts per meter (kV/m). The electric field becomes stronger near a charged object and decreases with distance away from the object.

Electric fields are a very common phenomenon. Static electric fields can result from friction generated when taking off a sweater or walking across a carpet. Almost all household appliances and other devices that operate on electricity create electric fields.

An electric current flowing in a conductor (electric equipment, household appliance, or otherwise) creates a magnetic field. The most commonly used magnetic field intensity unit is the Gauss or milliGauss (mG), which is a measure of the magnetic flux density (intensity of magnetic field per unit area).

The magnetic fields under transmission and distribution lines and near substations are relatively low, at least in comparison with measurements near many household appliances and other equipment. The magnetic field near an appliance decreases with distance away from the device. The magnetic field also decreases with distance away from electrical power lines and substation equipment (such as transformers and capacitor banks).

There are no national or federal government standards in the United States for EMF exposure. A few states have some type of electric field guideline and two states have a magnetic field standard. Please note that the State of Oregon specifies that the Electric Field must not exceed 9kV/m within the ROW.

The International Commission on Non-Ionizing Radiation Protection has published “Guidelines for Limiting Exposure to Time Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz) in the April 1998 issue of Health Physics.

7.0 RESULTS

Table AA-1 EMF Cuts at Grassland Switchyard (Cuts 1 and 2), Slatt Substation (Cut 3) and Carty Solar Farm (Cut 4)

Case Designation	South Edge of Study Area	Maximum within Study Area	North Edge of Study Area
Electric Field (kV/m)			
Scenario 1 Cut 1	0.21	8.5	0.1
Scenario 2 Cut 2	0.03	8.3	0.17
Scenario 3 Cut 3	0.03	8.83	0.07
Scenario 4 Cut 4	0.01	0.4	0.01

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Scenario 3 Cut 3	3.47	343.09	2.94
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Radio Noise during Fair Weather (dBμV/m)			
Scenario 1 Cut 1	40.3	67.5	33.7
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Scenario 1 Cut 1	57.3	84.5	50.7
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Scenario 4 Cut 4	N/A	N/A	N/A
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Scenario 1 Cut 1	23.1	42	18.1
Scenario 2 Cut 2	16.3	39.1	22.4
Scenario 3 Cut 3	8.7	41.6	5.5
Scenario 4 Cut 4	N/A	N/A	N/A

In conclusion, the results of the study show that the calculated electric and magnetic fields are acceptable when compared to the State of Oregon's 9 kV/m requirement within the ROW. The ROW for these four (4) scenarios are contained within the study area listed above.

8.0 EMF HEALTH EFFECTS

The issue of health effects due to exposure to EMF is always a subject of discussion. EMF exposure in residential and occupational situations has been studied for a wide variety of sources, including transmission lines, distribution lines, household wiring, electric appliances, electrically operated equipment or machinery, and others. A number of studies over the last 20 years or so generally have found no conclusive evidence of harmful effects from typical power line and substation EMF. Some studies during this period did report the potential for harmful effects. The evidence for such an association is inconclusive, and the most recent independent comprehensive review of the scientific literature by the National Academy of Sciences, Possible Health Effects of Exposure to Residential Electric and Magnetic Fields (1997), reached the following conclusions:

> ***"Based on a comprehensive evaluation of published studies relating to the effects of power-frequency electric and magnetic fields on cells, tissues, and organisms (including humans), the conclusion of the committee is that the current body of evidence does not show that exposure to these fields presents a human-health hazard. Specifically, no conclusive and consistent evidence shows that exposures to residential electric and magnetic fields produce cancer, adverse neurobehavioral effects, or reproductive and developmental effects.***
>
> ***The committee reviewed residential exposure levels to electric and magnetic fields, evaluated the available epidemiological studies, and examined laboratory investigations that used cells, isolated tissues, and animals. At exposure levels well above those normally encountered in residences, electric and magnetic fields can produce biologic effects (promotion of bone healing is an example), but these effects do not provide a consistent picture of a relationship between the biologic effects of these fields and health hazards. An association between residential wiring configurations (called wire codes) and childhood leukemia persists in multiple studies, although the causative factor responsible for that statistical association has not been identified. No evidence links contemporary measurements of magnetic-field levels to childhood leukemia."***

9.0 REFERENCES

Carty Geotechnical Report Final REV 2
027 Exhibit AA – Electric and Magnetic Fields (OAR 345-021-0010(1)(aa)) – Previous Study

10.0 ATTACHMENTS

- Attachment 1: Circuit Specifications Summary
- Attachment 2: Cross Section Drawings
- Attachment 3: Bonneville Power Adminstrative (BPA) Corona and Field Effects Program (Results)
- Attachment 4: AFL DNO-8234 specifications

Attachment 1: Circuit Spec. Summary

System Diagram: Existing 500kV GL-SL, Existing 500kV Carty 1 - GL, Existing BDM - GL and Proposed 34.5kV Carty Solar Farm Line

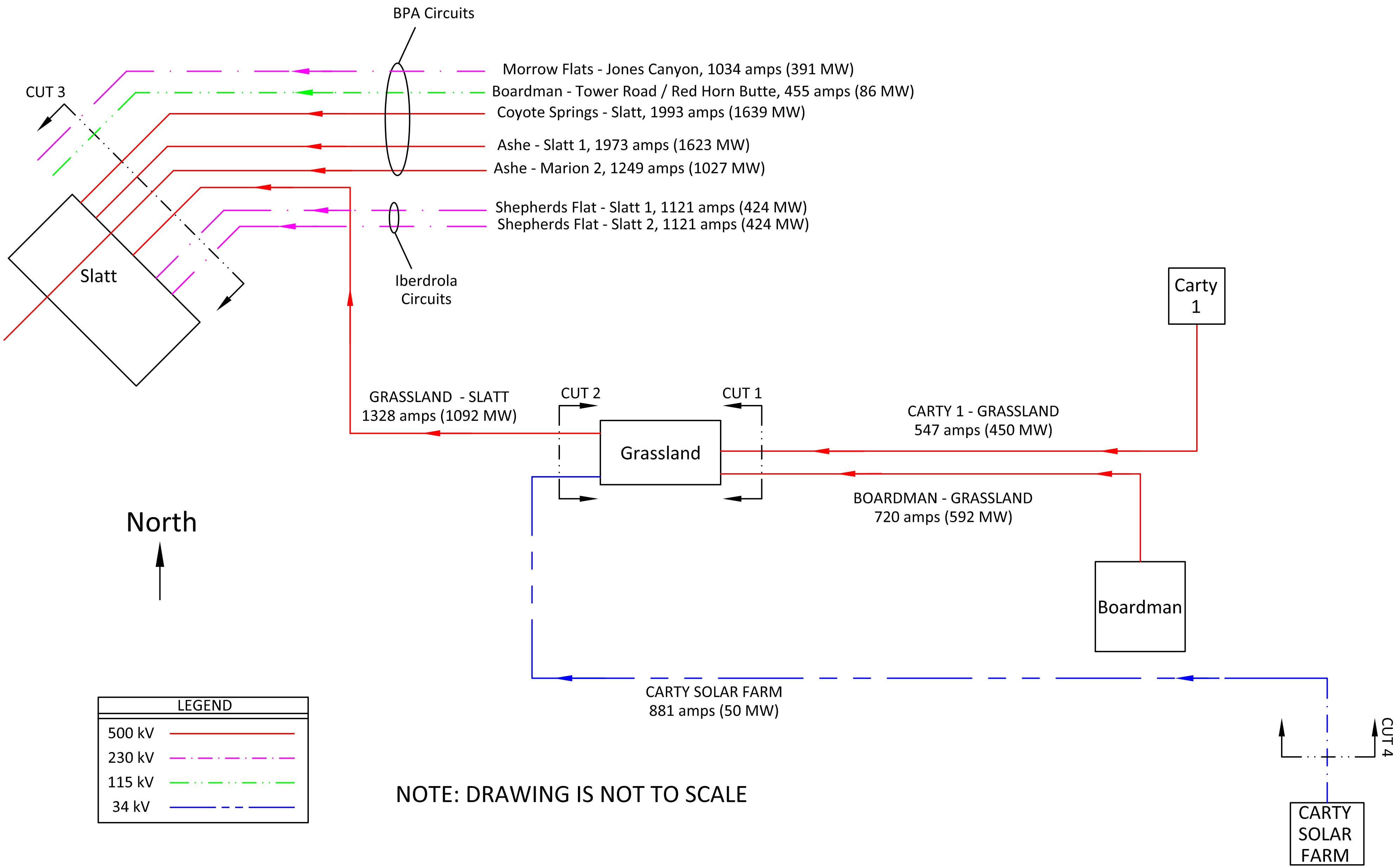

FIGURE 1

Attachment 2: Cross Section Drawings

SCENARIO 1

EXISTING 500kV CARTY 1 - GRASSLAND AND EXISTING 500kV BOARDMAN - GRASSLAND

CUT 1: 500ft EAST OF GRASSLAND SWITCHYARD - LOOKING WEST

Loading Assumptions
- Boardman Plant will be generating until 2020
- Carty 1 is generating at full nameplate

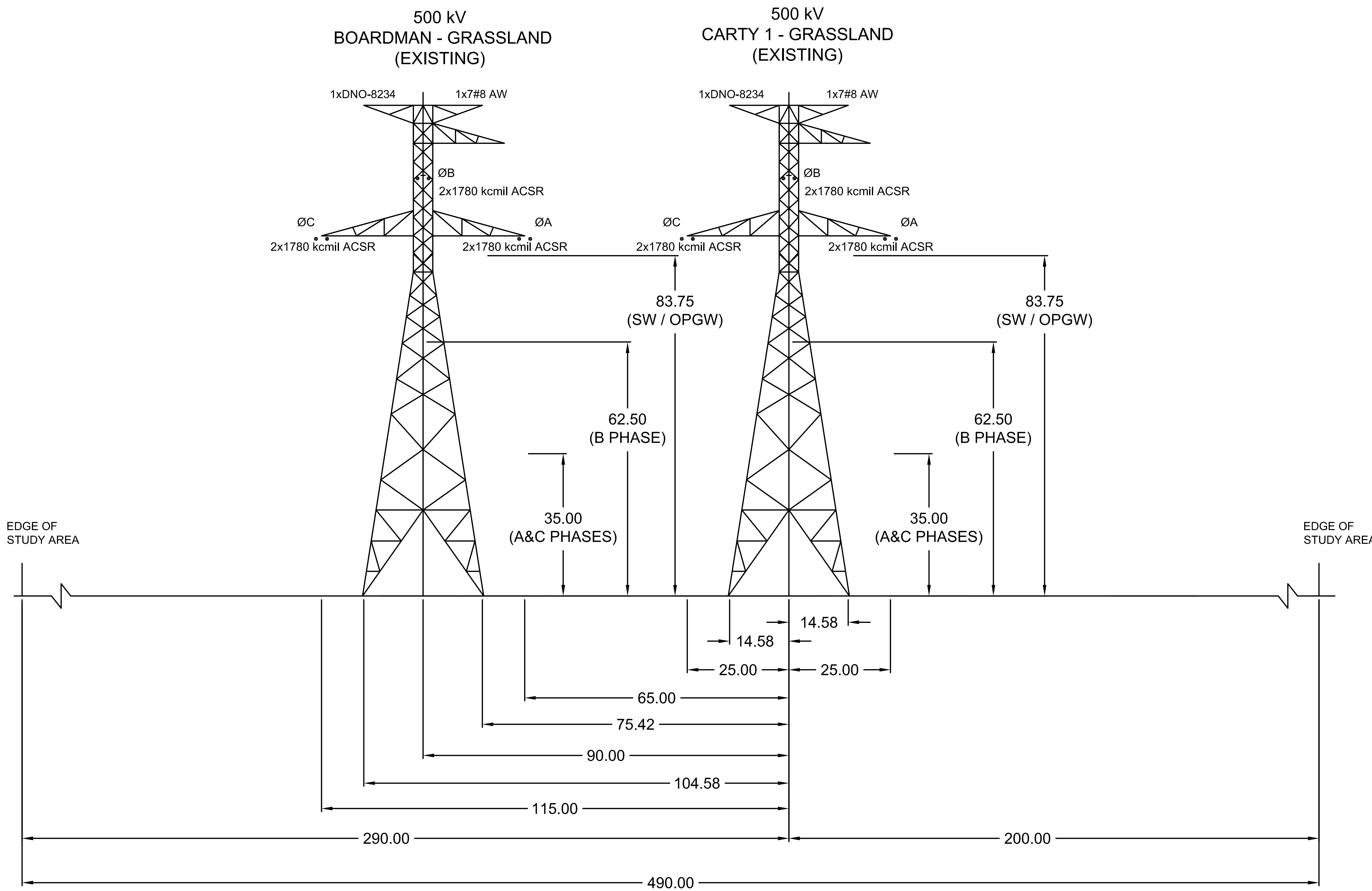

FIGURE 2

SCENARIO 2

EXISTING 500kV GRASSLAND - SLATT AND NEW 34.5kV SOLAR LINE

CUT 2: 100ft WEST OF GRASSLAND SWITCHYARD - LOOKING EAST

Loading Assumptions
- Carty Solar Farm is generating at full nameplate
- Grassland - Slatt Line carries all the load from Grassland

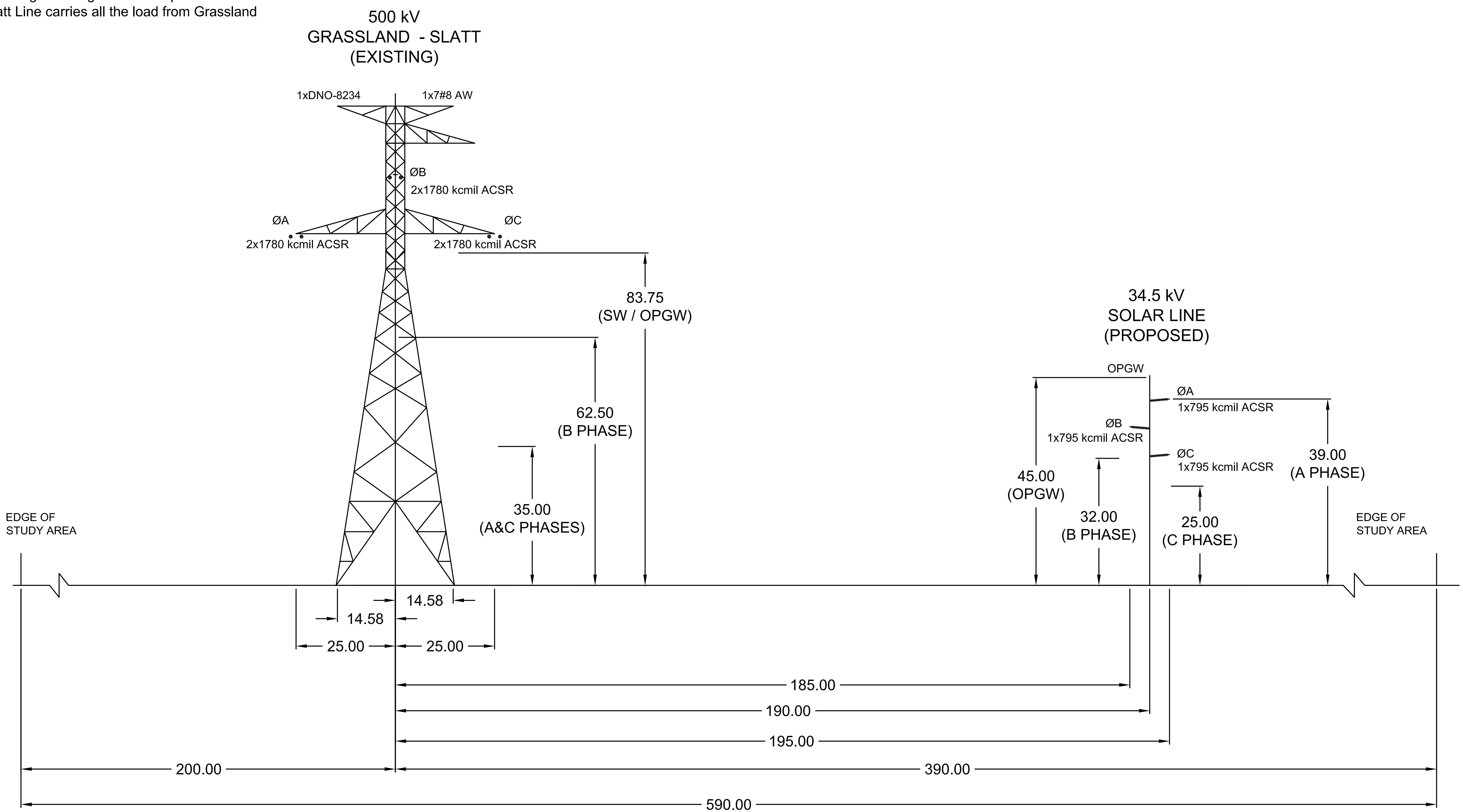

FIGURE 3

SCENARIO 3

EXISTING 500kV GRASSLAND - SLATT

CUT 3: 3000ft NORTHEAST OF SLATT SUBSTATION CAPACITOR YARD - LOOKING SOUTHWEST

Loading Assumptions
- Grassland - Slatt Line carries all the load from Grassland
- Carty 1 is generating at full nameplate

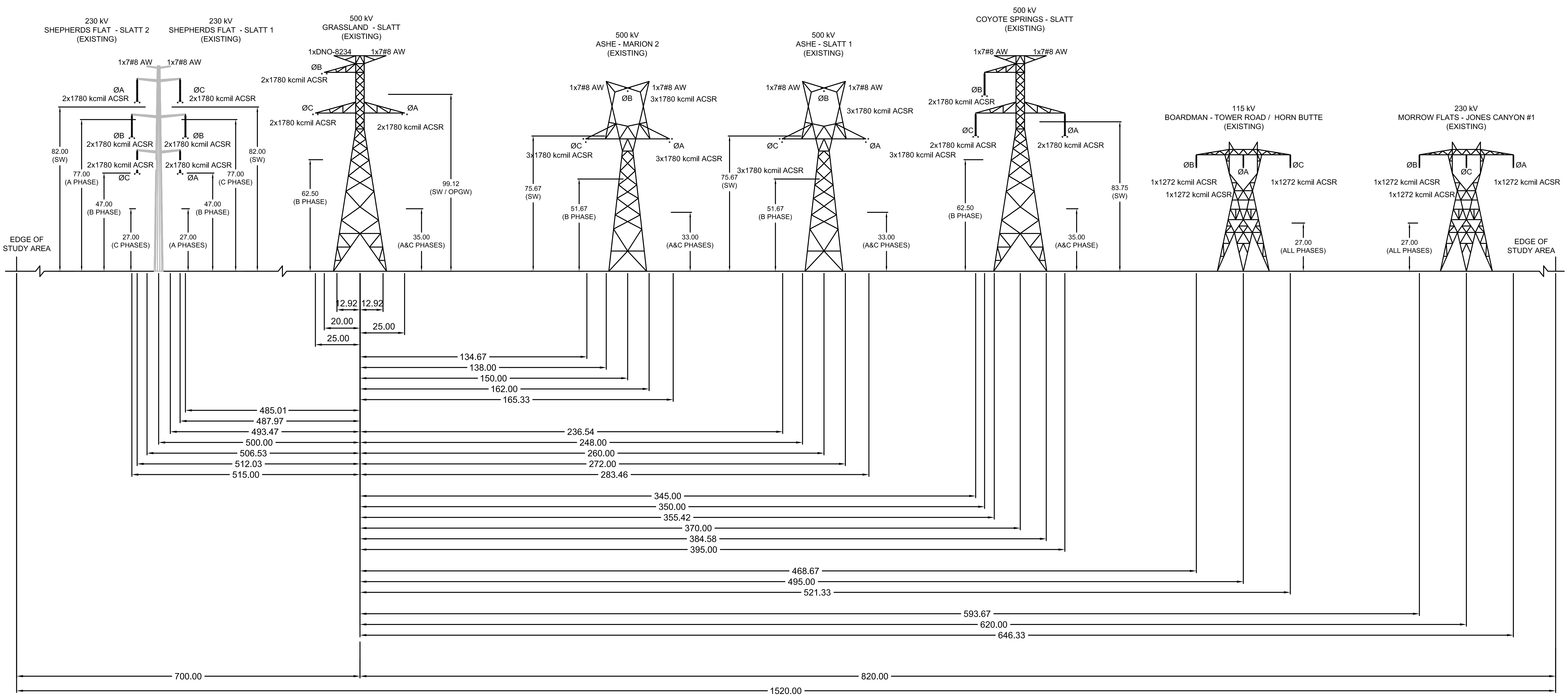

FIGURE 4

SCENARIO 4

NEW 34.5kVCARTY SOLAR FARM LINE

CUT 4: 3000ft NORTHWEST OF CARTY SOLAR FARM SUBSTATION - LOOKING NORTH

Loading Assumptions

- Carty Solar Farm is generating at full nameplate

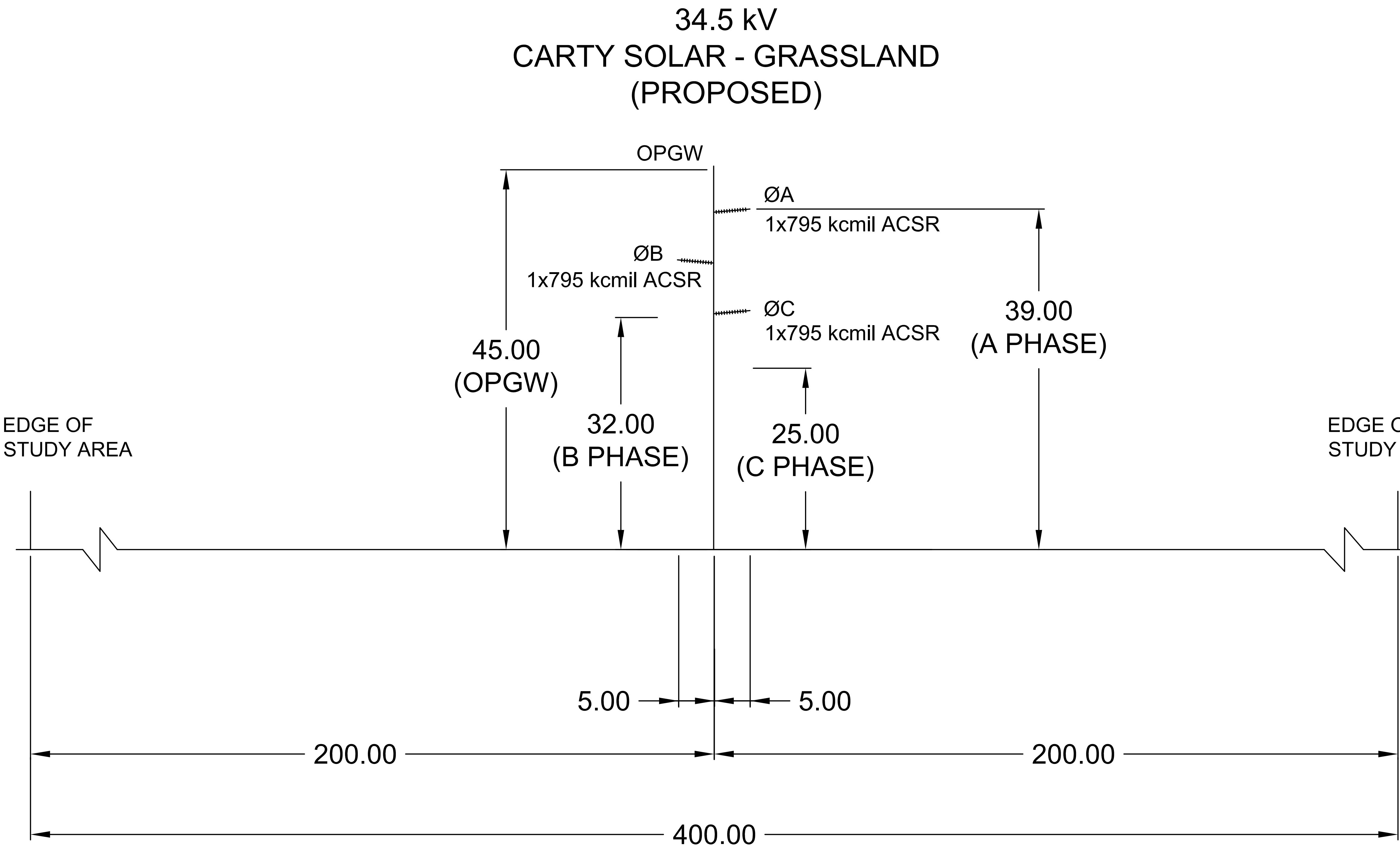

FIGURE 5

Attachment 3: BPA Corona & Field Effects Results

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Û       C O R O N A   A N D   F I E L D         Û
Û E F F E C T S   P R O G R A M   V E R. 3.1   Û
Û   Source: Bonneville Power Administration    Û
ÛÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÛ

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(ENGLISH UNITS OPTION)

(GRADIENTS ARE COMPUTED BY PROGRAM)

PHYSICAL SYSTEM CONSISTS OF 10 CONDUCTORS, OF WHICH  6 ARE ENERGIZED PHASES

OPTIONS: 'COMB','XX','XX','XX','XX','XX','XX','XX',,,
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'BDMGSSW'','A',  -75.42,   83.75, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'BDM-GLB'','A',  -90.00,   62.50, 2,   1.600,  18.000, 317.550, 240.000,   0.720,   0.000
'BDM-GLC'','A', -115.00,   35.00, 2,   1.600,  18.000, 317.550, 120.000,   0.720,   0.000
'BDM-GLA'','A',  -65.00,   35.00, 2,   1.600,  18.000, 317.550,   0.000,   0.720,   0.000
'CT1GSDNO','A',  -14.58,   83.75, 1,   0.510,   0.000,   0.000,   0.000,   0.000,   0.000
'CT1GSSW'','A',   14.58,   83.75, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'CT1-GLB'','A',    0.00,   62.50, 2,   1.600,  18.000, 317.550, 240.000,   0.547,   0.000
'CT1-GLC'','A',  -25.00,   35.00, 2,   1.600,  18.000, 317.550, 120.000,   0.547,   0.000
'CT1-GLA'','A',   25.00,   35.00, 2,   1.600,  18.000, 317.550,   0.000,   0.547,   0.000
 60 -300.0   10.0
  0    0.0    0.0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
SCENARIO 1,,,,,,,,,,
 CUT 1,,,,,,,,,,
```

	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
BDMGSDNO	-104.58	83.75	10.02	0.51	1	0.00	0.00	0.00	0.00	0.011
BDMGSSW'	-75.42	83.75	12.55	0.39	1	0.00	0.00	0.00	0.00	0.016
BDM-GLB'	-90.00	62.50	18.34	1.60	2	18.00	317.55	240.00	0.72	134.503
BDM-GLC'	-115.00	35.00	17.97	1.60	2	18.00	317.55	120.00	0.72	117.573
BDM-GLA'	-65.00	35.00	19.12	1.60	2	18.00	317.55	0.00	0.72	176.188
CT1GSDNO	-14.58	83.75	9.97	0.51	1	0.00	0.00	0.00	0.00	0.011
CT1GSSW'	14.58	83.75	12.64	0.39	1	0.00	0.00	0.00	0.00	0.000
CT1-GLB'	0.00	62.50	18.34	1.60	2	18.00	317.55	240.00	0.55	0.000
CT1-GLC'	-25.00	35.00	19.12	1.60	2	18.00	317.55	120.00	0.55	0.000

CT1-GLA' 25.00 35.00 17.97 1.60 2 18.00 317.55 0.00 0.55 0.000
AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 6.6 FT, TV ANT. HT.= 9.8 FT, ALTITUDE= 800.0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ)= 0.500 MPH, GROUND CONDUCTIVITY = 9.3 MMHOS/M
E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT.= 3.3FT

LATERAL DIST	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	OZONE		
FROM	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL	FOR RAIN RATE OF	ELECTRIC	MAGNETIC
REFERENCE	L50	L50	L50	L50	RAIN	1.00 IN/HR AT 0. FT LEVEL	FIELD	FIELD
(FEET)	DBA	DBA	DBUV/M	DBUV/M	DBUV/M	PPB	KV/M	GAUSS
-300.0	55.1	30.1	56.8	39.8	22.7	0.000000	0.190	0.00467
-290.0	55.3	30.3	57.3	40.3	23.1	0.000000	0.211	0.00514
-280.0	55.6	30.6	57.9	40.9	23.5	0.000000	0.237	0.00570
-270.0	55.8	30.8	58.5	41.5	23.9	0.000000	0.268	0.00635
-260.0	56.1	31.1	59.1	42.1	24.3	0.000000	0.306	0.00712
-250.0	56.4	31.4	59.8	42.8	24.8	0.000000	0.354	0.00803
-240.0	56.7	31.7	60.6	43.6	25.3	0.000000	0.414	0.00913
-230.0	57.0	32.0	61.3	44.3	25.8	0.000000	0.492	0.01047
-220.0	57.3	32.3	62.2	45.2	26.3	0.000000	0.593	0.01212
-210.0	57.7	32.7	63.1	46.1	27.1	0.000000	0.729	0.01418
-200.0	58.1	33.1	64.1	47.1	28.0	0.000000	0.915	0.01680
-190.0	58.5	33.5	65.1	48.1	29.0	0.000000	1.175	0.02017
-180.0	58.9	33.9	66.3	49.3	30.1	0.000000	1.548	0.02461
-170.0	59.4	34.4	68.5	51.5	31.3	0.000000	2.091	0.03054
-160.0	60.0	35.0	71.0	54.0	32.7	0.000000	2.891	0.03862
-150.0	60.6	35.6	73.7	56.7	34.3	0.000000	4.053	0.04968
-140.0	61.2	36.2	76.7	59.7	36.0	0.000000	5.631	0.06458
-130.0	61.8	36.8	79.4	62.4	37.6	0.000000	7.397	0.08326
-120.0	62.3	37.3	81.3	64.3	38.8	0.000000	8.488	0.10278
-110.0	62.7	37.7	81.3	64.3	38.8	1.032222	7.774	0.11728
-100.0	62.9	37.9	79.4	62.4	37.6	Infinity	5.335	0.12392
-90.0	63.1	38.1	79.9	62.9	39.2	Infinity	3.013	0.12542
-80.0	63.4	38.4	82.7	65.7	40.9	Infinity	4.279	0.12392
-70.0	63.5	38.5	84.5	67.5	42.0	Infinity	6.256	0.11728
-60.0	63.3	38.3	84.5	67.5	42.0	Infinity	6.433	0.10278
-50.0	62.8	37.8	82.7	65.7	40.9	Infinity	5.162	0.08326
-40.0	62.2	37.2	79.9	62.9	39.2	Infinity	5.161	0.06458
-30.0	61.5	36.5	77.0	60.0	37.5	Infinity	6.432	0.04968
-20.0	60.8	35.8	74.2	57.2	36.0	Infinity	6.255	0.03862
-10.0	60.2	35.2	71.7	54.7	34.6	Infinity	4.278	0.03054
0.0	59.6	34.6	69.5	52.5	33.3	Infinity	3.012	0.02461
10.0	59.1	34.1	67.6	50.6	32.2	Infinity	5.336	0.02017
20.0	58.6	33.6	65.9	48.9	31.2	Infinity	7.775	0.01680
30.0	58.2	33.2	64.4	47.4	30.4	Infinity	8.489	0.01418
40.0	57.8	32.8	63.0	46.0	29.5	Infinity	7.397	0.01212
50.0	57.4	32.4	61.8	44.8	28.8	Infinity	5.632	0.01047
60.0	57.1	32.1	60.7	43.7	28.1	Infinity	4.054	0.00913
70.0	56.8	31.8	59.8	42.8	27.4	Infinity	2.892	0.00803
80.0	56.4	31.4	59.1	42.1	26.8	Infinity	2.093	0.00712
90.0	56.2	31.2	58.5	41.5	26.3	Infinity	1.549	0.00635
100.0	55.9	30.9	57.9	40.9	25.8	Infinity	1.177	0.00570
110.0	55.6	30.6	57.3	40.3	25.3	Infinity	0.916	0.00514
120.0	55.4	30.4	56.8	39.8	24.8	Infinity	0.730	0.00467
130.0	55.2	30.2	56.3	39.3	24.3	Infinity	0.595	0.00425
140.0	54.9	29.9	55.8	38.8	23.9	Infinity	0.493	0.00389

150.0	54.7	29.7	55.4	38.4	23.5	Infinity	0.416	0.00357
160.0	54.5	29.5	54.9	37.9	23.1	Infinity	0.355	0.00329
170.0	54.3	29.3	54.5	37.5	22.7	Infinity	0.308	0.00304
180.0	54.1	29.1	54.1	37.1	22.4	Infinity	0.269	0.00282
190.0	53.9	28.9	53.8	36.8	22.0	Infinity	0.238	0.00262
200.0	53.8	28.8	53.4	36.4	21.7	Infinity	0.212	0.00244
210.0	53.6	28.6	53.0	36.0	21.4	Infinity	0.190	0.00228
220.0	53.4	28.4	52.7	35.7	21.1	Infinity	0.172	0.00214
230.0	53.3	28.3	52.4	35.4	20.8	Infinity	0.156	0.00200
240.0	53.1	28.1	52.1	35.1	20.5	Infinity	0.143	0.00188
250.0	53.0	28.0	51.8	34.8	20.1	Infinity	0.131	0.00178
260.0	52.8	27.8	51.5	34.5	19.6	Infinity	0.121	0.00168
270.0	52.7	27.7	51.2	34.2	19.1	Infinity	0.112	0.00158
280.0	52.5	27.5	51.0	34.0	18.6	Infinity	0.104	0.00150
290.0	52.4	27.4	50.7	33.7	18.1	Infinity	0.097	0.00142

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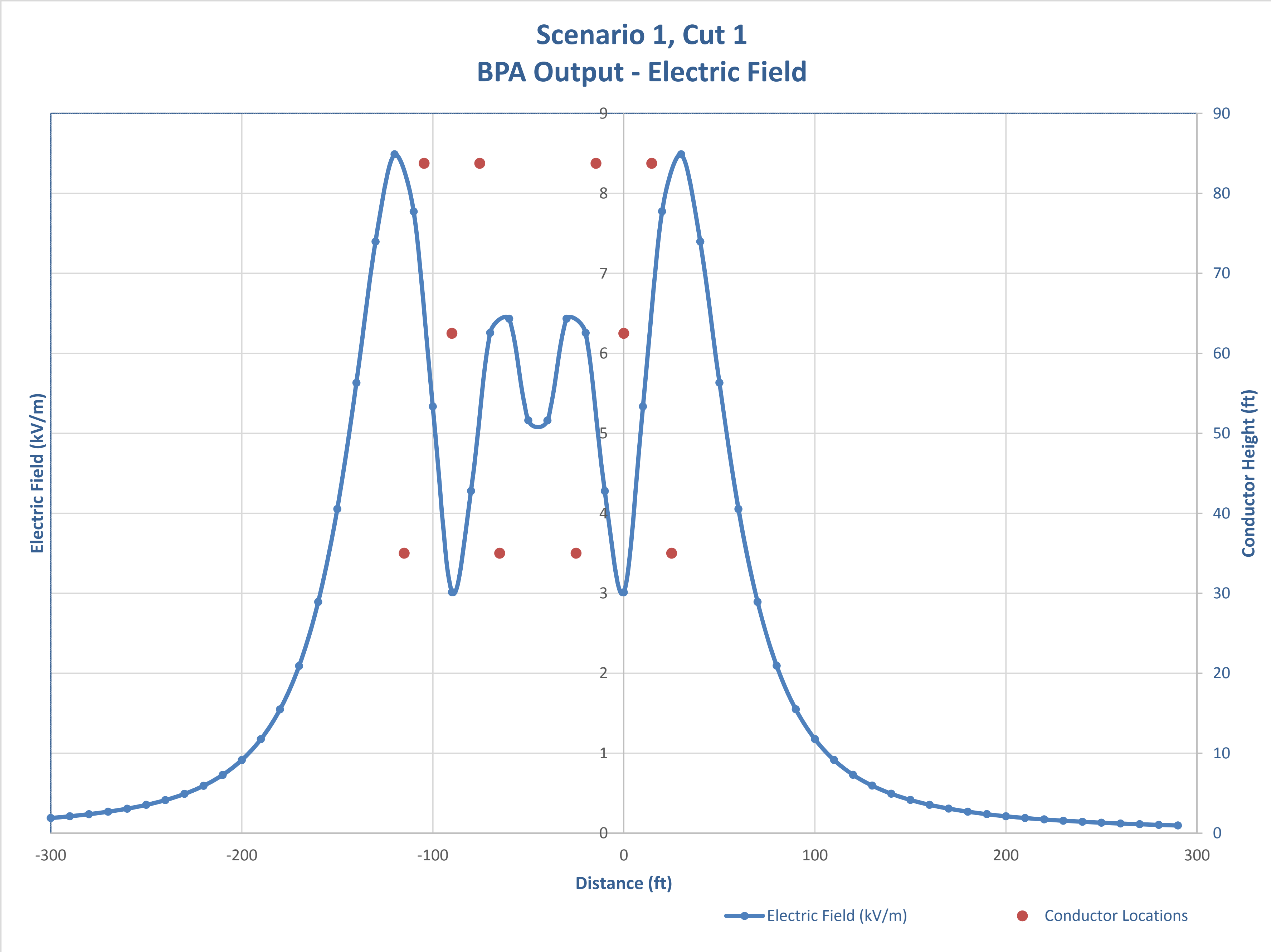
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Distance (ft)
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-200
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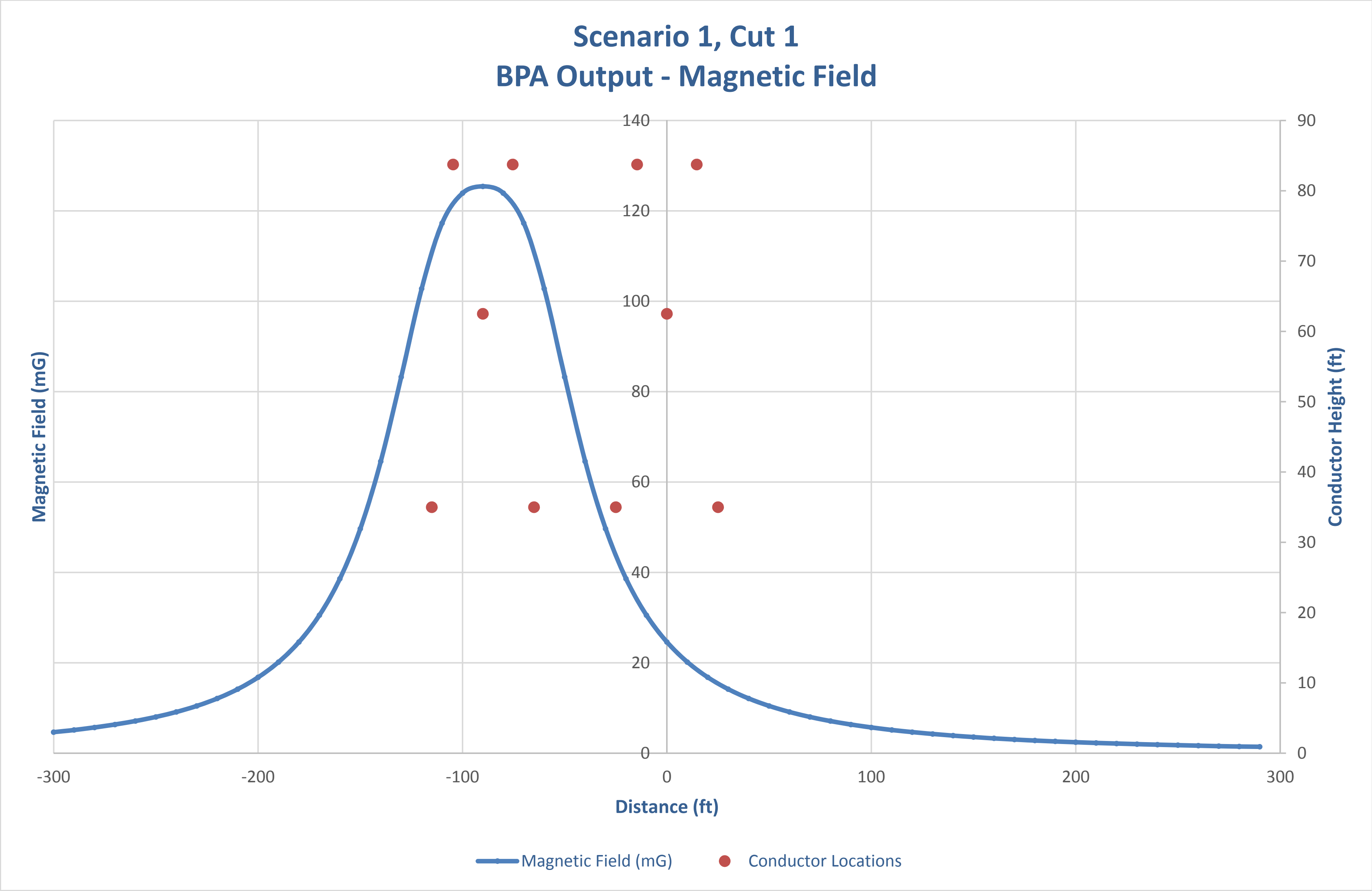
100
200
300
0
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
90
Electric Field (kV/m)
Conductor Locations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Magnetic Field (mG)
Conductor Height (ft)
Distance (ft)
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120
100
80
60
40
20
0
90
80
70
60
50
40
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20
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-200
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100
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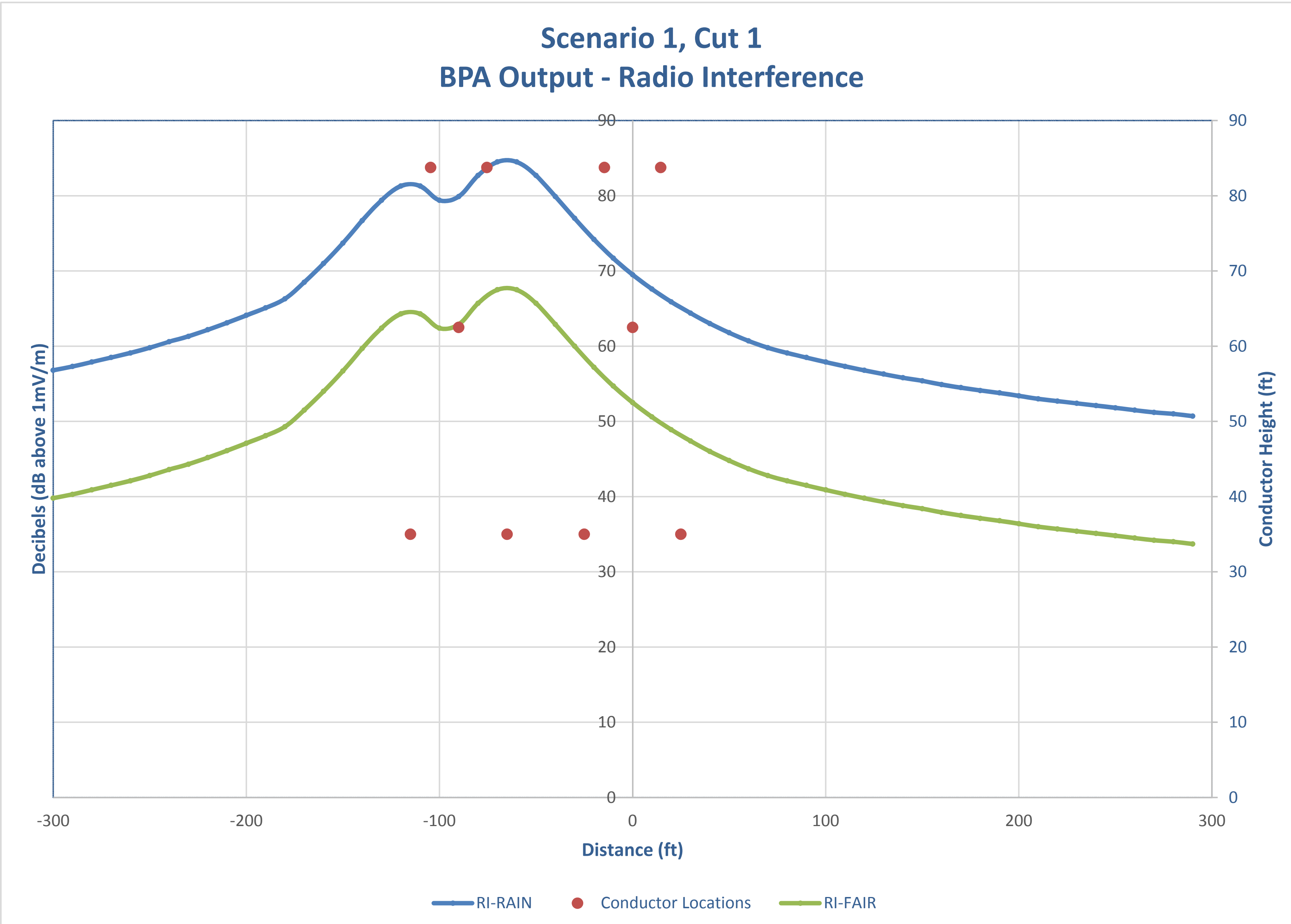
Magnetic Field (mG)
Conductor Locations



Scenario 1, Cut 1
BPA Output - Radio Interference
Decibels (dB above 1mV/m)
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Distance (ft)
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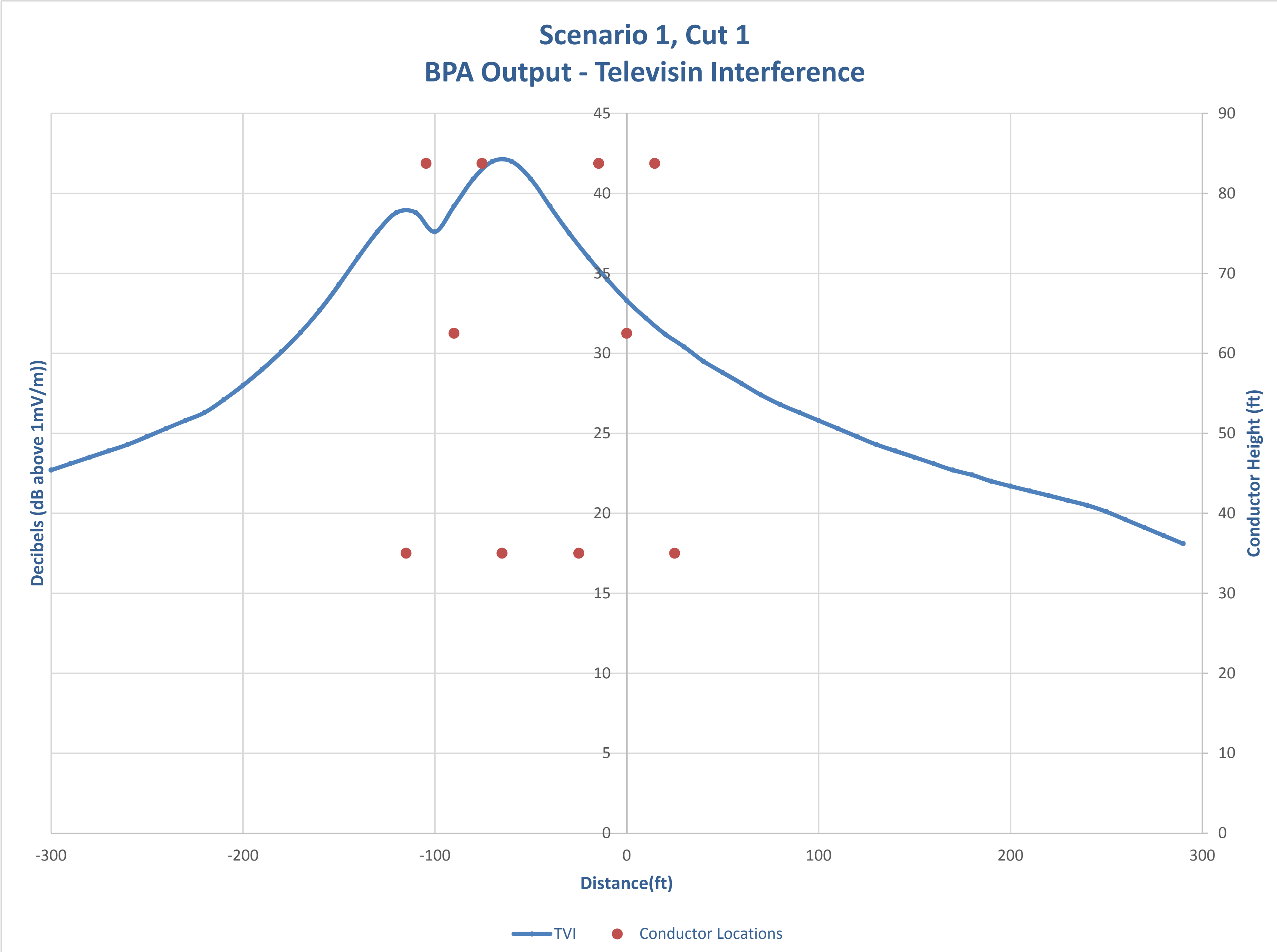
10
20
30
40
50
60
70
80
90
-300
-200
-100
0
100
200
300
RI-RAIN
Conductor Locations
RI-FAIR



Scenario 1, Cut 1
BPA Output - Televisin Interference
Decibels (dB above 1mV/m))
Conductor Height (ft)
Distance(ft)
0
5
10
15
20
25
30
35
40
45
0
10
20
30
40
50
60
70
80
90
-300
-200
-100
0
100
200
300
TVI
Conductor Locations

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ÛßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßÛ
Û       C O R O N A   A N D   F I E L D       Û
Û E F F E C T S   P R O G R A M   V E R. 3.1  Û
Û   Source: Bonneville Power Administration   Û
ÛÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÛ
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 (ENGLISH UNITS OPTION)

 (GRADIENTS ARE COMPUTED BY PROGRAM)

 PHYSICAL SYSTEM CONSISTS OF  9 CONDUCTORS, OF WHICH  6 ARE ENERGIZED PHASES

 OPTIONS: 'COMB','XX','XX','XX','XX','XX','XX','XX',,,
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 'GL-SL1SW','A',   14.58,   83.75, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
 'GL-SL1B'','A',    0.00,   62.50, 2,   1.600,  18.000, 317.550, 240.000,   1.328,   0.000
 'GL-SL1C'','A',   25.00,   35.00, 2,   1.600,  18.000, 317.550, 120.000,   1.328,   0.000
 'GL-SL1A'','A',  -25.00,   35.00, 2,   1.600,  18.000, 317.550,   0.000,   1.328,   0.000
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 'SLRB    ','A',  185.00,   32.00, 1,   1.100,   0.000,  20.920,-240.000,   0.881,   0.000
 'SLRC    ','A',  195.00,   25.00, 1,   1.100,   0.000,  20.920,-120.000,   0.881,   0.000
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   0    0.0    0.0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
 SCENARIO 2,,,,,,,,,,
  CUT 2,,,,,,,,,,
```

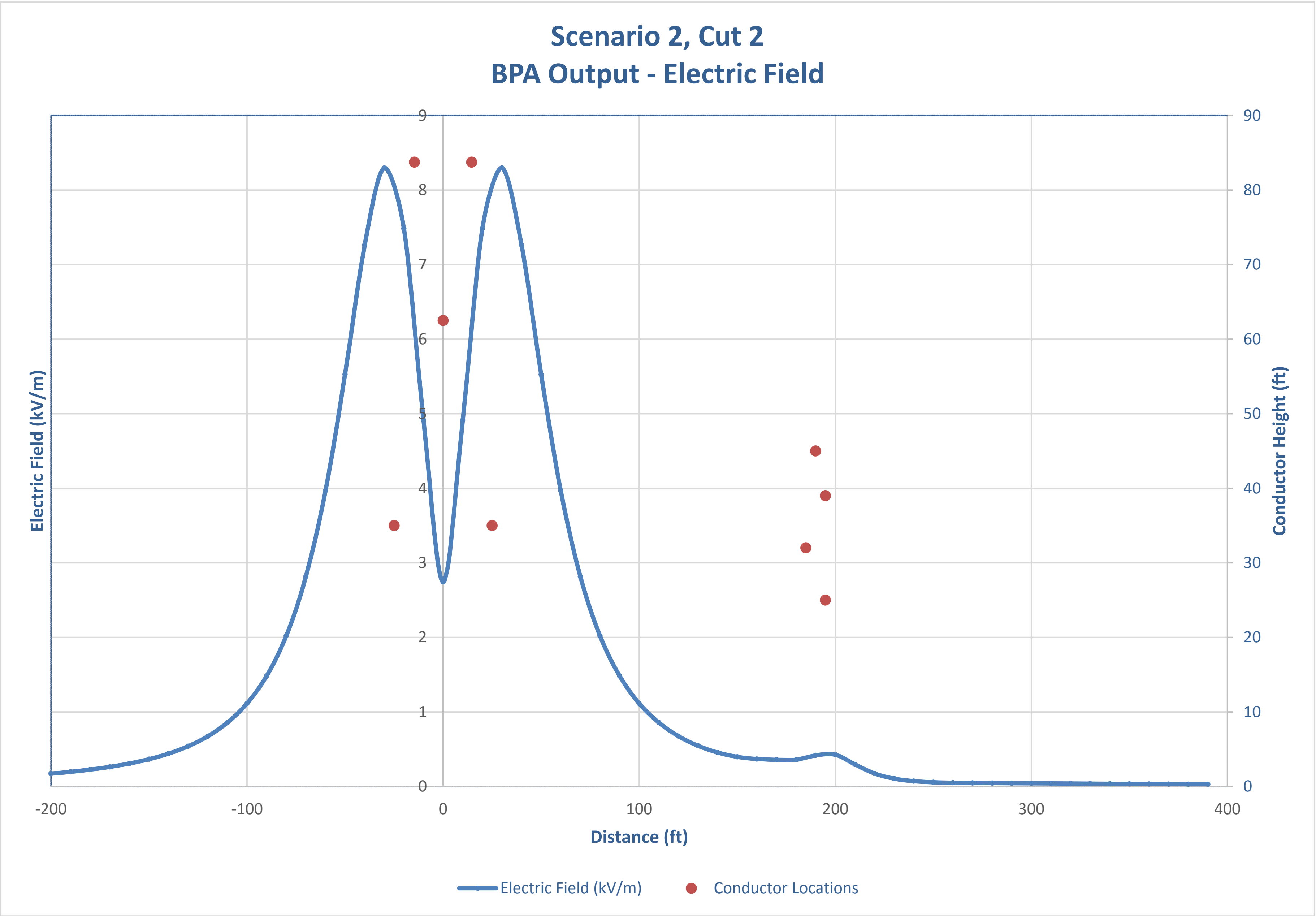
	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
GL-SL1DN	-14.58	83.75	9.26	0.51	1	0.00	0.00	0.00	0.00	0.007
GL-SL1SW	14.58	83.75	11.66	0.39	1	0.00	0.00	0.00	0.00	0.010
GL-SL1B'	0.00	62.50	18.40	1.60	2	18.00	317.55	240.00	1.33	137.431
GL-SL1C'	25.00	35.00	18.09	1.60	2	18.00	317.55	120.00	1.33	123.048
GL-SL1A'	-25.00	35.00	18.09	1.60	2	18.00	317.55	0.00	1.33	123.035
SLRDNO	190.00	45.00	0.43	0.51	1	0.00	0.00	0.00	0.00	0.000
SLRB	185.00	32.00	2.62	1.10	1	0.00	20.92	-240.00	0.88	0.000
SLRC	195.00	25.00	2.65	1.10	1	0.00	20.92	-120.00	0.88	0.000

SLRA 195.00 39.00 2.81 1.10 1 0.00 20.92 0.00 0.88 0.000
AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 6.6 FT, TV ANT. HT.= 9.8 FT, ALTITUDE= 800.0 FT
RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ)= 0.500 MPH, GROUND CONDUCTIVITY = 9.3 MMHOS/M
E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT.= 3.3FT

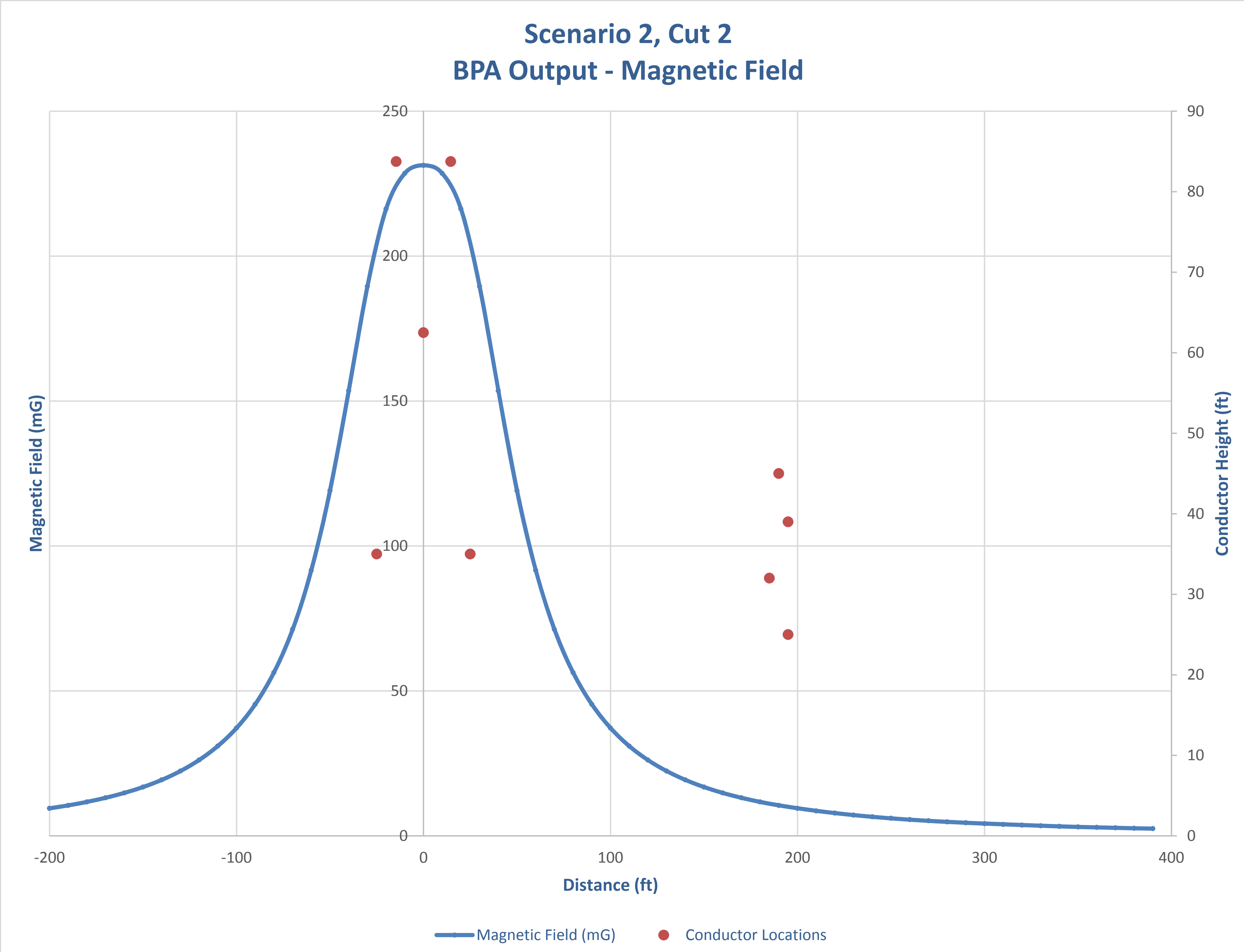
LATERAL DIST	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	OZONE		
FROM	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL	FOR RAIN RATE OF	ELECTRIC	MAGNETIC
REFERENCE	L50	L50	L50	L50	RAIN	1.00 IN/HR AT 0. FT LEVEL	FIELD	FIELD
(FEET)	DBA	DBA	DBUV/M	DBUV/M	DBUV/M	PPB	KV/M	GAUSS
-200.0	54.5	29.5	57.5	40.5	22.4	0.000000	0.172	0.00949
-190.0	54.7	29.7	58.1	41.1	22.9	0.000000	0.196	0.01051
-180.0	55.0	30.0	58.7	41.7	23.4	0.000000	0.226	0.01171
-170.0	55.3	30.3	59.3	42.3	24.0	0.000000	0.262	0.01313
-160.0	55.6	30.6	60.0	43.0	24.6	0.000000	0.308	0.01482
-150.0	55.9	30.9	60.7	43.7	25.2	0.000000	0.366	0.01685
-140.0	56.2	31.2	61.5	44.5	25.9	0.000000	0.441	0.01931
-130.0	56.5	31.5	62.4	45.4	26.7	0.000000	0.540	0.02236
-120.0	56.9	31.9	63.3	46.3	27.5	0.000000	0.674	0.02616
-110.0	57.3	32.3	64.3	47.3	28.4	0.000000	0.857	0.03098
-100.0	57.8	32.8	65.3	48.3	29.4	0.000000	1.114	0.03721
-90.0	58.2	33.2	66.7	49.7	30.5	0.000000	1.483	0.04539
-80.0	58.8	33.8	68.8	51.8	31.7	0.000000	2.022	0.05634
-70.0	59.3	34.3	71.3	54.3	33.1	0.000000	2.815	0.07123
-60.0	59.9	34.9	74.1	57.1	34.6	0.000000	3.966	0.09163
-50.0	60.6	35.6	77.0	60.0	36.3	0.000000	5.528	0.11911
-40.0	61.2	36.2	79.8	62.8	38.0	0.000000	7.263	0.15357
-30.0	61.7	36.7	81.6	64.6	39.1	0.000000	8.297	0.18956
-20.0	62.0	37.0	81.6	64.6	39.1	1.095366	7.484	0.21632
-10.0	62.0	37.0	79.8	62.8	38.0	Infinity	4.914	0.22856
0.0	62.0	37.0	77.0	60.0	36.3	Infinity	2.744	0.23132
10.0	62.0	37.0	79.8	62.8	38.0	Infinity	4.914	0.22856
20.0	62.0	37.0	81.6	64.6	39.1	Infinity	7.484	0.21632
30.0	61.7	36.7	81.6	64.6	39.1	Infinity	8.297	0.18956
40.0	61.2	36.2	79.8	62.8	38.0	Infinity	7.263	0.15357
50.0	60.6	35.6	77.0	60.0	36.3	Infinity	5.527	0.11911
60.0	59.9	34.9	74.1	57.1	34.6	Infinity	3.966	0.09163
70.0	59.3	34.3	71.3	54.3	33.1	Infinity	2.815	0.07123
80.0	58.8	33.8	68.8	51.8	31.7	Infinity	2.021	0.05634
90.0	58.2	33.2	66.7	49.7	30.5	Infinity	1.483	0.04539
100.0	57.8	32.8	65.3	48.3	29.4	Infinity	1.114	0.03721
110.0	57.3	32.3	64.3	47.3	28.4	Infinity	0.857	0.03098
120.0	56.9	31.9	63.3	46.3	27.5	Infinity	0.675	0.02616
130.0	56.5	31.5	62.4	45.4	26.7	Infinity	0.546	0.02236
140.0	56.2	31.2	61.5	44.5	25.9	Infinity	0.455	0.01931
150.0	55.9	30.9	60.7	43.7	25.2	Infinity	0.397	0.01685
160.0	55.6	30.6	60.0	43.0	24.6	Infinity	0.368	0.01482
170.0	55.3	30.3	59.3	42.3	24.0	Infinity	0.359	0.01313
180.0	55.0	30.0	58.7	41.7	23.4	Infinity	0.358	0.01171
190.0	54.7	29.7	58.1	41.1	22.9	Infinity	0.417	0.01051
200.0	54.5	29.5	57.5	40.5	22.4	Infinity	0.426	0.00949
210.0	54.3	29.3	57.0	40.0	21.9	Infinity	0.297	0.00860
220.0	54.0	29.0	56.5	39.5	21.5	Infinity	0.174	0.00784

230.0	53.8	28.8	56.0	39.0	21.0	Infinity	0.105	0.00717
240.0	53.6	28.6	55.5	38.5	20.6	Infinity	0.071	0.00658
250.0	53.4	28.4	55.1	38.1	20.2	Infinity	0.056	0.00607
260.0	53.2	28.2	54.7	37.7	19.9	Infinity	0.050	0.00561
270.0	53.0	28.0	54.3	37.3	19.5	Infinity	0.047	0.00520
280.0	52.8	27.8	53.9	36.9	19.2	Infinity	0.045	0.00483
290.0	52.7	27.7	53.6	36.6	18.8	Infinity	0.044	0.00450
300.0	52.5	27.5	53.2	36.2	18.5	Infinity	0.043	0.00421
310.0	52.4	27.4	52.9	35.9	18.3	Infinity	0.041	0.00394
320.0	52.2	27.2	52.6	35.6	18.0	Infinity	0.039	0.00370
330.0	52.0	27.0	52.3	35.3	17.7	Infinity	0.038	0.00348
340.0	51.9	26.9	52.0	35.0	17.5	Infinity	0.036	0.00327
350.0	51.8	26.8	51.7	34.7	17.2	Infinity	0.035	0.00309
360.0	51.6	26.6	51.4	34.4	17.0	Infinity	0.033	0.00292
370.0	51.5	26.5	51.1	34.1	16.8	Infinity	0.032	0.00276
380.0	51.4	26.4	50.9	33.9	16.5	Infinity	0.030	0.00262
390.0	51.2	26.2	50.6	33.6	16.3	Infinity	0.029	0.00249

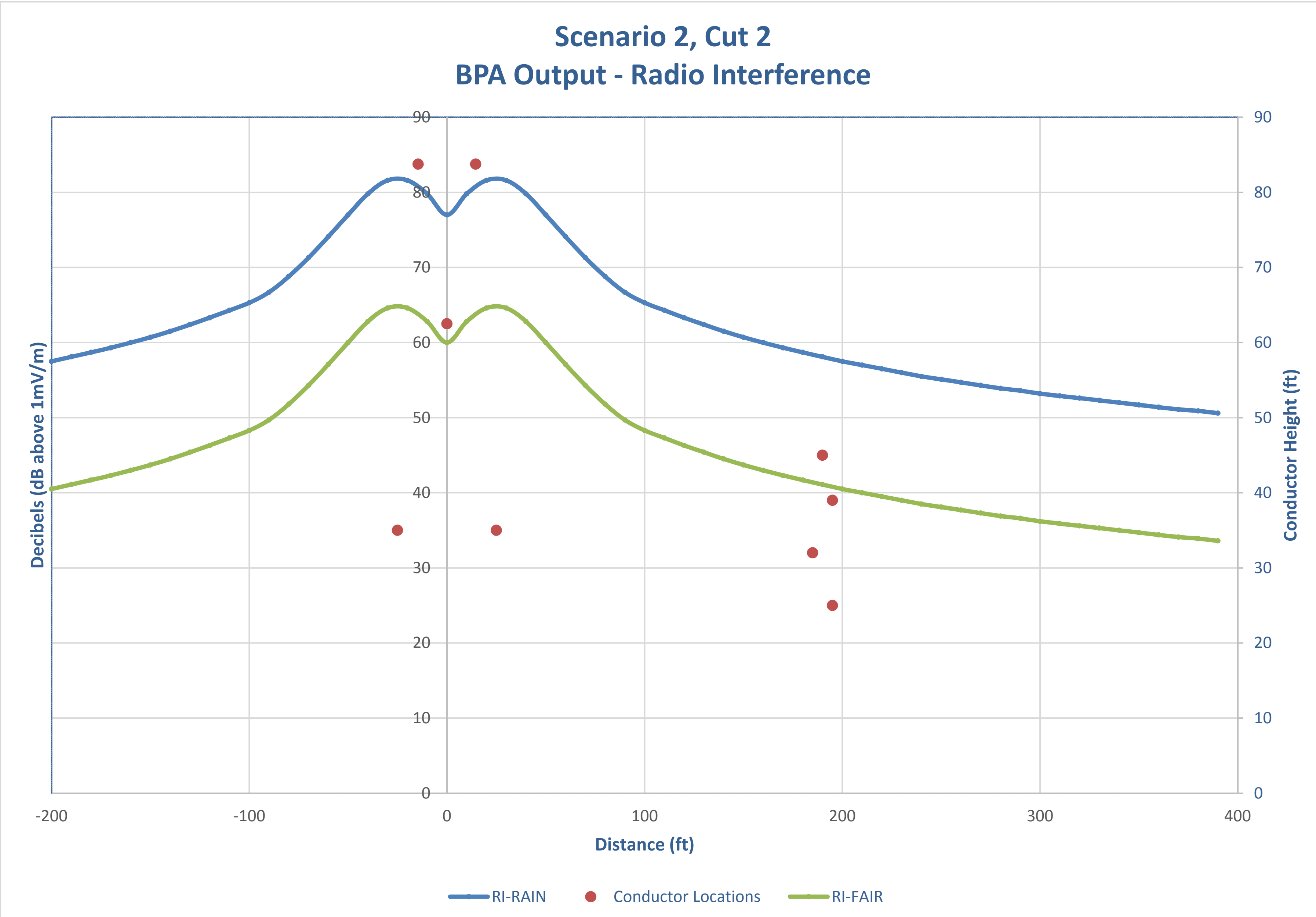
1



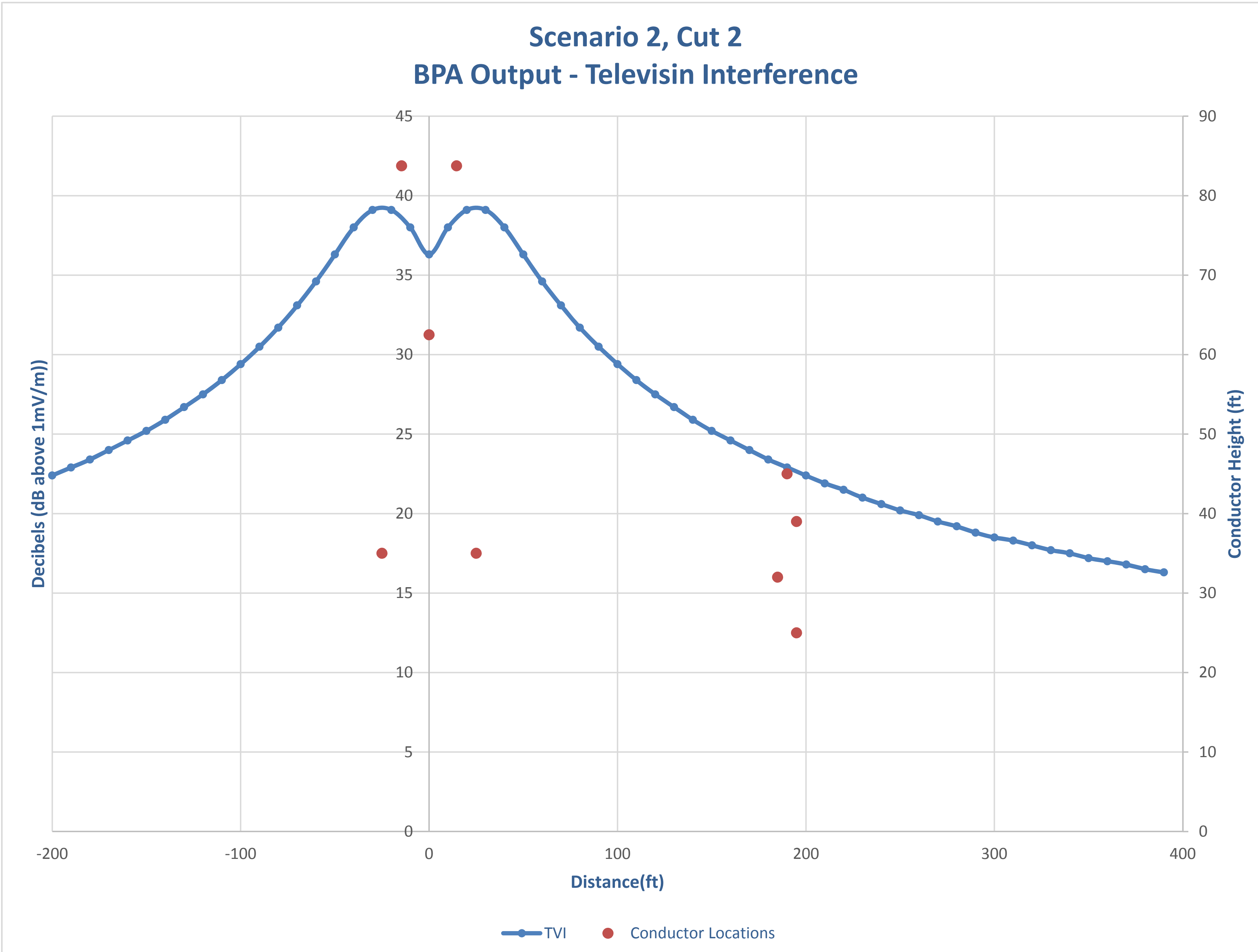
Scenario 2, Cut 2
BPA Output - Electric Field
Electric Field (kV/m)
Conductor Height (ft)
Distance (ft)
0
1
2
3
4
5
6
7
8
9
0
10
20
30
40
50
60
70
80
90
-200
-100
0
100
200
300
400
Electric Field (kV/m)
Conductor Locations



Scenario 2, Cut 2
BPA Output - Magnetic Field
Magnetic Field (mG)
Conductor Height (ft)
Distance (ft)
250
200
150
100
50
0
90
80
70
60
50
40
30
20
10
0
-200
-100
0
100
200
300
400
Magnetic Field (mG)
Conductor Locations



Scenario 2, Cut 2
BPA Output - Radio Interference
Decibels (dB above 1mV/m)
Conductor Height (ft)
Distance (ft)
0
10
20
30
40
50
60
70
80
90
-200
-100
0
100
200
300
400
RI-RAIN
Conductor Locations
RI-FAIR



Scenario 2, Cut 2
BPA Output - Televisin Interference
Decibels (dB above 1mV/m))
Conductor Height (ft)
Distance(ft)
0
5
10
15
20
25
30
35
40
45
0
10
20
30
40
50
60
70
80
90
-200
-100
0
100
200
300
400
TVI
Conductor Locations

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     ÛßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßÛ
     Û       C O R O N A   A N D   F I E L D      Û
     Û E F F E C T S   P R O G R A M   V E R. 3.1  Û
     Û   Source: Bonneville Power Administration   Û
     ÛÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÛ


                              INPUT DATA LIST


                 1/17/2018          00:27:03
SCENARIO 3 ,,,,,,,,,,
 CUT 3,,,,,,,,,,
1,0,24,34,0.0,   0.50,   1.00, 800.00

(ENGLISH UNITS OPTION)

(GRADIENTS ARE COMPUTED BY PROGRAM)

PHYSICAL SYSTEM CONSISTS OF 34 CONDUCTORS, OF WHICH 24 ARE ENERGIZED PHASES

OPTIONS: 'COMB','XX','XX','XX','XX','XX','XX','XX',,,
  5.000,  6.600,  9.800,  0.000,  1.000, 75.000,  3.280,  2.000,  3.280
'SF-SL2SW','A', -506.53,   82.00, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'SF-SL2B'','A', -515.00,   47.00, 2,   1.600,  18.000, 139.440, 240.000,   1.121,   0.000
'SF-SL2C'','A', -512.03,   27.00, 2,   1.600,  18.000, 139.440, 120.000,   1.121,   0.000
'SF-SL2A'','A', -512.03,   77.00, 2,   1.600,  18.000, 139.440,   0.000,   1.121,   0.000
'SF-SL1SW','A', -493.47,   82.00, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'SF-SL1B'','A', -485.01,   47.00, 2,   1.600,  18.000, 139.440, 240.000,   1.121,   0.000
'SF-SL1C'','A', -487.97,   77.00, 2,   1.600,  18.000, 139.440, 120.000,   1.121,   0.000
'SF-SL1A'','A', -487.97,   27.00, 2,   1.600,  18.000, 139.440,   0.000,   1.121,   0.000
'GL-SL1DN','A',  -12.92,   99.12, 1,   0.510,   0.000,   0.000,   0.000,   0.000,   0.000
'GL-SL1SW','A',   12.92,   99.12, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'GL-SL1B'','A',  -20.00,   62.50, 2,   1.600,  18.000, 317.550, 240.000,   1.328,   0.000
'GL-SL1C'','A',  -25.00,   35.00, 2,   1.600,  18.000, 317.550, 120.000,   1.328,   0.000
'GL-SL1A'','A',   25.00,   35.00, 2,   1.600,  18.000, 317.550,   0.000,   1.328,   0.000
'AS-MR2SW','A',  138.00,   91.17, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'AS-MR2SW','A',  162.00,   91.17, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'AS-MR2B'','A',  150.00,   51.67, 3,   1.600,  18.000, 317.550, 240.000,   1.249,   0.000
'AS-MR2C'','A',  134.67,   33.00, 3,   1.600,  18.000, 317.550, 120.000,   1.249,   0.000
'AS-MR2A'','A',  165.33,   33.00, 3,   1.600,  18.000, 317.550,   0.000,   1.249,   0.000
'AS-SL1SW','A',  248.00,   75.67, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'AS-SL2SW','A',  272.00,   75.67, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'AS-SL1B'','A',  260.00,   51.67, 3,   1.600,  18.000, 317.550, 240.000,   1.973,   0.000
'AS-SL1C'','A',  236.54,   33.00, 3,   1.600,  18.000, 317.550, 120.000,   1.973,   0.000
'AS-SL1A'','A',  283.46,   33.00, 3,   1.600,  18.000, 317.550,   0.000,   1.973,   0.000
'CS-SLSW1','A',  355.42,   83.75, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'CS-SLSW2','A',  384.58,   83.75, 1,   0.390,   0.000,   0.000,   0.000,   0.000,   0.000
'CS-SLB' ','A',  350.00,   62.50, 2,   1.600,  18.000, 317.550, 240.000,   1.993,   0.000
'CS-SLC' ','A',  345.00,   35.00, 2,   1.600,  18.000, 317.550, 120.000,   1.993,   0.000
'CS-SLA' ','A',  395.00,   35.00, 2,   1.600,  18.000, 317.550,   0.000,   1.993,   0.000
'BDTW-HBB','A',  468.67,   27.00, 1,   1.350,   0.000,  69.720, 240.000,   0.455,   0.000
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 'BDTW-HBC','A',  521.33,   27.00, 1,   1.350,   0.000,  69.720, 120.000,   0.455,   0.000
 'BDTW-HBA','A',  495.00,   27.00, 1,   1.350,   0.000,  69.720,   0.000,   0.455,   0.000
 'MF-JCB' ','A',  593.67,   27.00, 1,   1.350,   0.000, 139.440, 240.000,   1.034,   0.000
 'MF-JCC' ','A',  620.00,   27.00, 1,   1.350,   0.000, 139.440, 120.000,   1.034,   0.000
 'MF-JCA' ','A',  646.33,   27.00, 1,   1.350,   0.000, 139.440,   0.000,   1.034,   0.000
  61 -700.0   25.0
   0    0.0    0.0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
 SCENARIO 3 ,,,,,,,,,,
  CUT 3,,,,,,,,,,
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	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
SF-SL2SW	-506.53	82.00	10.47	0.39	1	0.00	0.00	0.00	0.00	0.005
SF-SL2B'	-515.00	47.00	8.48	1.60	2	18.00	139.44	240.00	1.12	0.895
SF-SL2C'	-512.03	27.00	9.39	1.60	2	18.00	139.44	120.00	1.12	1.737
SF-SL2A'	-512.03	77.00	9.16	1.60	2	18.00	139.44	0.00	1.12	1.469
SF-SL1SW	-493.47	82.00	10.49	0.39	1	0.00	0.00	0.00	0.00	0.005
SF-SL1B'	-485.01	47.00	8.48	1.60	2	18.00	139.44	240.00	1.12	0.892
SF-SL1C'	-487.97	77.00	9.15	1.60	2	18.00	139.44	120.00	1.12	1.464
SF-SL1A'	-487.97	27.00	9.40	1.60	2	18.00	139.44	0.00	1.12	1.740
GL-SL1DN	-12.92	99.12	7.89	0.51	1	0.00	0.00	0.00	0.00	0.002
GL-SL1SW	12.92	99.12	5.81	0.39	1	0.00	0.00	0.00	0.00	0.000
GL-SL1B'	-20.00	62.50	18.01	1.60	2	18.00	317.55	240.00	1.33	119.444
GL-SL1C'	-25.00	35.00	18.91	1.60	2	18.00	317.55	120.00	1.33	164.164
GL-SL1A'	25.00	35.00	17.70	1.60	2	18.00	317.55	0.00	1.33	106.685
AS-MR2SW	138.00	91.17	7.65	0.39	1	0.00	0.00	0.00	0.00	0.001
AS-MR2SW	162.00	91.17	7.92	0.39	1	0.00	0.00	0.00	0.00	0.001
AS-MR2B'	150.00	51.67	15.87	1.60	3	18.00	317.55	240.00	1.25	89.029
AS-MR2C'	134.67	33.00	15.79	1.60	3	18.00	317.55	120.00	1.25	86.065
AS-MR2A'	165.33	33.00	16.02	1.60	3	18.00	317.55	0.00	1.25	94.577
AS-SL1SW	248.00	75.67	12.37	0.39	1	0.00	0.00	0.00	0.00	0.015
AS-SL2SW	272.00	75.67	13.11	0.39	1	0.00	0.00	0.00	0.00	0.022
AS-SL1B'	260.00	51.67	15.16	1.60	3	18.00	317.55	240.00	1.97	66.124
AS-SL1C'	236.54	33.00	15.09	1.60	3	18.00	317.55	120.00	1.97	64.149
AS-SL1A'	283.46	33.00	15.25	1.60	3	18.00	317.55	0.00	1.97	68.719
CS-SLSW1	355.42	83.75	15.49	0.39	1	0.00	0.00	0.00	0.00	0.064
CS-SLSW2	384.58	83.75	6.89	0.39	1	0.00	0.00	0.00	0.00	0.000
CS-SLB'	350.00	62.50	18.29	1.60	2	18.00	317.55	240.00	1.99	0.000
CS-SLC'	345.00	35.00	19.36	1.60	2	18.00	317.55	120.00	1.99	0.000
CS-SLA'	395.00	35.00	17.44	1.60	2	18.00	317.55	0.00	1.99	0.000
BDTW-HBB	468.67	27.00	6.76	1.35	1	0.00	69.72	240.00	0.46	0.000
BDTW-HBC	521.33	27.00	6.73	1.35	1	0.00	69.72	120.00	0.46	0.000
BDTW-HBA	495.00	27.00	6.53	1.35	1	0.00	69.72	0.00	0.46	0.000
MF-JCB'	593.67	27.00	13.03	1.35	1	0.00	139.44	240.00	1.03	0.000
MF-JCC'	620.00	27.00	13.59	1.35	1	0.00	139.44	120.00	1.03	0.000
MF-JCA'	646.33	27.00	12.97	1.35	1	0.00	139.44	0.00	1.03	0.000

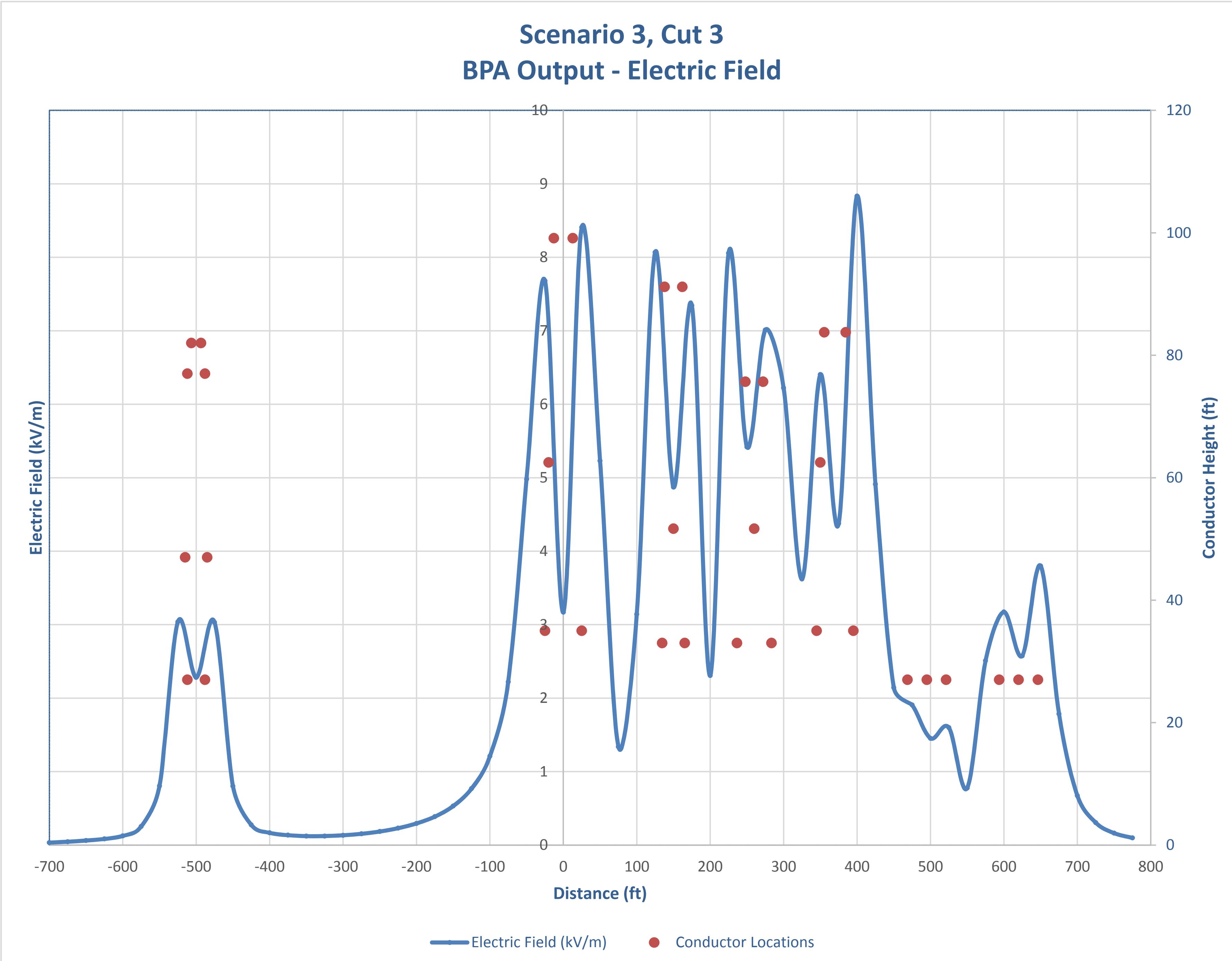
AN MICROPHONE HT.= 5.0 FT, RI ANT. HT.= 6.6 FT, TV ANT. HT.= 9.8 FT, ALTITUDE=   800.0 FT

RI FREQ= 1.000 MHZ, TV FREQ= 75.000 MHZ, WIND VEL.(OZ)= 0.500 MPH, GROUND CONDUCTIVITY = 2.0 MMHOS/M
E-FIELD TRANSDUCER HT.= 3.3FT, B-FIELD TRANSDUCER HT.= 3.3FT

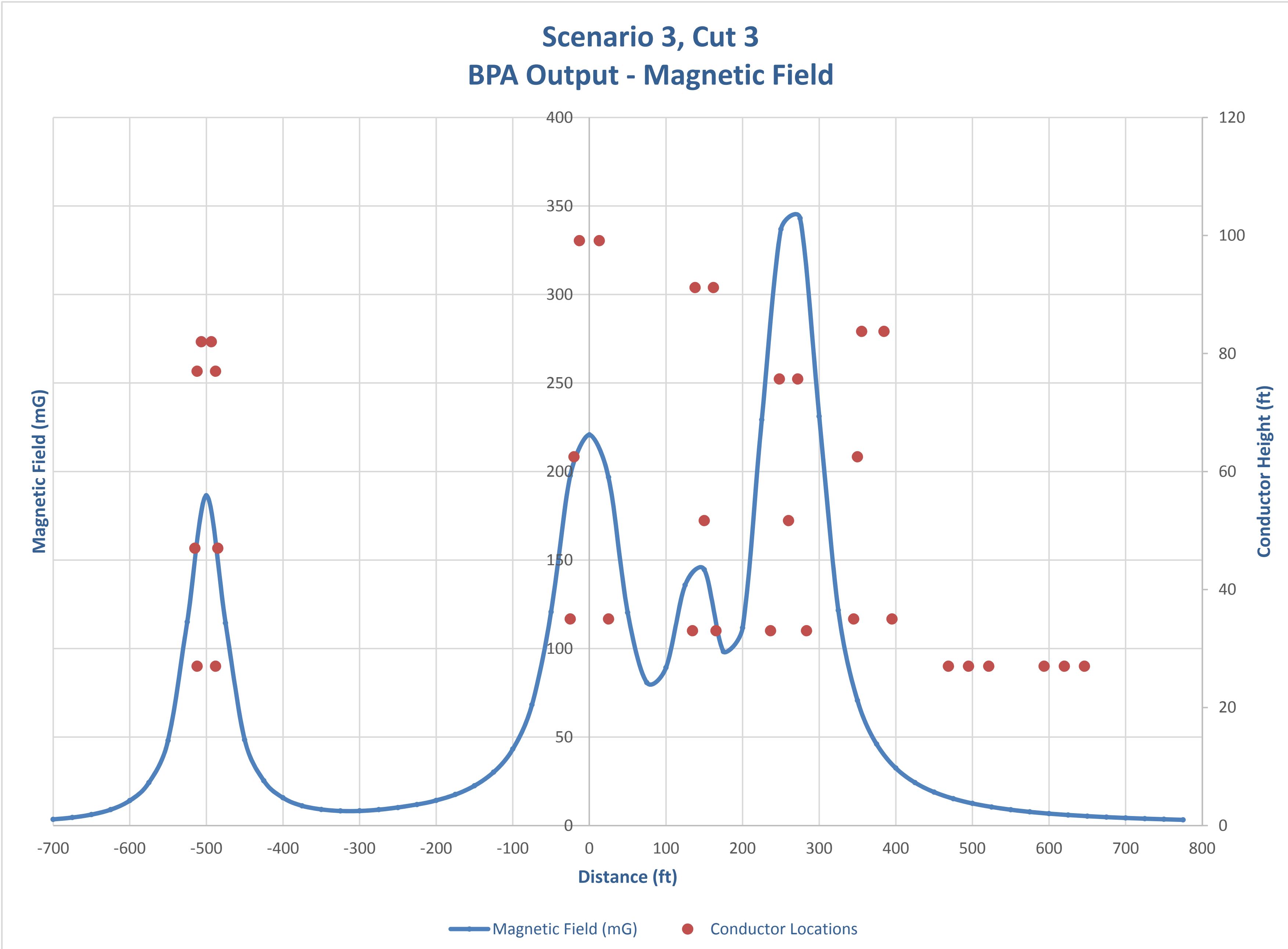
LATERAL DIST	AUDIBLE NOISE		RADIO INTERFERENCE		TVI	OZONE		
FROM	(RAIN)	(FAIR)	(RAIN)	(FAIR)	TOTAL	FOR RAIN RATE OF	ELECTRIC	MAGNETIC
REFERENCE	L50	L50	L50	L50	RAIN	1.00 IN/HR AT 0. FT LEVEL	FIELD	FIELD
(FEET)	DBA	DBA	DBUV/M	DBUV/M	DBUV/M	PPB	KV/M	GAUSS
-700.0	49.5	24.5	44.1	27.1	8.7	0.000000	0.034	0.00347
-675.0	49.7	24.7	44.5	27.5	9.3	0.000000	0.046	0.00451
-650.0	49.9	24.9	44.9	27.9	10.0	0.000000	0.062	0.00618
-625.0	50.1	25.1	45.2	28.2	10.7	0.000000	0.084	0.00899
-600.0	50.3	25.3	45.6	28.6	11.4	0.000000	0.125	0.01408
-575.0	50.5	25.5	46.0	29.0	12.2	0.000000	0.253	0.02426
-550.0	50.7	25.7	46.5	29.5	12.6	0.000000	0.805	0.04802
-525.0	51.0	26.0	48.2	31.2	13.0	0.000000	3.037	0.11499
-500.0	51.2	26.2	48.6	31.6	13.4	Infinity	2.282	0.18629
-475.0	51.4	26.4	48.3	31.3	13.9	Infinity	3.031	0.11443
-450.0	51.7	26.7	48.5	31.5	14.4	Infinity	0.803	0.04841
-425.0	52.0	27.0	49.1	32.1	15.4	Infinity	0.275	0.02532
-400.0	52.2	27.2	49.7	32.7	16.6	Infinity	0.167	0.01566
-375.0	52.6	27.6	50.3	33.3	17.8	Infinity	0.135	0.01112
-350.0	52.9	27.9	51.1	34.1	19.0	Infinity	0.122	0.00901
-325.0	53.2	28.2	51.9	34.9	20.1	Infinity	0.122	0.00824
-300.0	53.6	28.6	52.8	35.8	20.8	Infinity	0.133	0.00831
-275.0	54.0	29.0	53.7	36.7	21.6	Infinity	0.154	0.00897
-250.0	54.5	29.5	54.8	37.8	22.5	Infinity	0.185	0.01012
-225.0	55.0	30.0	56.1	39.1	23.5	Infinity	0.230	0.01180
-200.0	55.6	30.6	57.5	40.5	24.7	Infinity	0.294	0.01416
-175.0	56.2	31.2	59.2	42.2	26.0	Infinity	0.387	0.01753
-150.0	57.0	32.0	61.2	44.2	27.5	Infinity	0.532	0.02247
-125.0	57.9	32.9	63.6	46.6	29.4	Infinity	0.770	0.03017
-100.0	58.9	33.9	67.0	50.0	31.7	Infinity	1.211	0.04322
-75.0	60.3	35.3	72.4	55.4	34.7	Infinity	2.221	0.06822
-50.0	61.9	36.9	79.3	62.3	38.6	Infinity	4.981	0.12064
-25.0	63.0	38.0	84.2	67.2	41.6	Infinity	7.679	0.19765
0.0	62.6	37.6	79.3	62.3	38.6	Infinity	3.170	0.22074
25.0	62.0	37.0	80.7	63.7	38.2	Infinity	8.408	0.19675
50.0	60.8	35.8	75.9	58.9	35.2	Infinity	5.231	0.12034
75.0	59.8	34.8	68.9	51.9	31.2	Infinity	1.339	0.08073
100.0	59.2	34.2	67.0	50.0	28.2	Infinity	3.142	0.08917
125.0	59.3	34.3	74.5	57.5	32.2	Infinity	8.068	0.13589
150.0	59.3	34.3	73.8	56.8	32.1	Infinity	4.872	0.14457
175.0	58.8	33.8	75.2	58.2	33.0	Infinity	7.344	0.09827
200.0	58.0	33.0	67.8	50.8	28.6	Infinity	2.308	0.11171
225.0	57.6	32.6	71.7	54.7	29.6	Infinity	8.057	0.22921
250.0	57.3	32.3	71.2	54.2	29.3	Infinity	5.419	0.33682
275.0	57.0	32.0	72.9	55.9	30.6	Infinity	7.011	0.34309
300.0	56.3	31.3	70.9	53.9	29.3	Infinity	6.222	0.23114
325.0	55.3	30.3	63.2	46.2	24.9	Infinity	3.621	0.12158
350.0	54.6	29.6	57.1	40.1	21.5	Infinity	6.404	0.07068
375.0	54.0	29.0	52.7	35.7	18.9	Infinity	4.378	0.04601
400.0	53.5	28.5	50.1	33.1	16.9	Infinity	8.834	0.03247

425.0	53.1	28.1	48.1	31.1	15.3	Infinity	4.911	0.02426
450.0	52.7	27.7	47.6	30.6	13.9	Infinity	2.144	0.01888
475.0	52.3	27.3	47.1	30.1	13.1	Infinity	1.907	0.01517
500.0	52.0	27.0	46.7	29.7	12.7	Infinity	1.453	0.01248
525.0	51.7	26.7	46.2	29.2	12.3	Infinity	1.598	0.01047
550.0	51.4	26.4	45.8	28.8	11.7	Infinity	0.777	0.00892
575.0	51.2	26.2	45.4	28.4	11.0	Infinity	2.509	0.00770
600.0	50.9	25.9	45.0	28.0	10.3	Infinity	3.173	0.00672
625.0	50.7	25.7	44.6	27.6	9.6	Infinity	2.576	0.00593
650.0	50.5	25.5	44.3	27.3	9.0	Infinity	3.799	0.00527
675.0	50.3	25.3	43.9	26.9	8.3	Infinity	1.786	0.00471
700.0	50.1	25.1	43.6	26.6	7.7	Infinity	0.673	0.00424
725.0	49.9	24.9	43.3	26.3	7.1	Infinity	0.306	0.00384
750.0	49.7	24.7	43.0	26.0	6.5	Infinity	0.163	0.00350
775.0	49.5	24.5	42.7	25.7	6.0	Infinity	0.098	0.00320
800.0	49.3	24.3	42.4	25.4	5.5	Infinity	0.065	0.00294

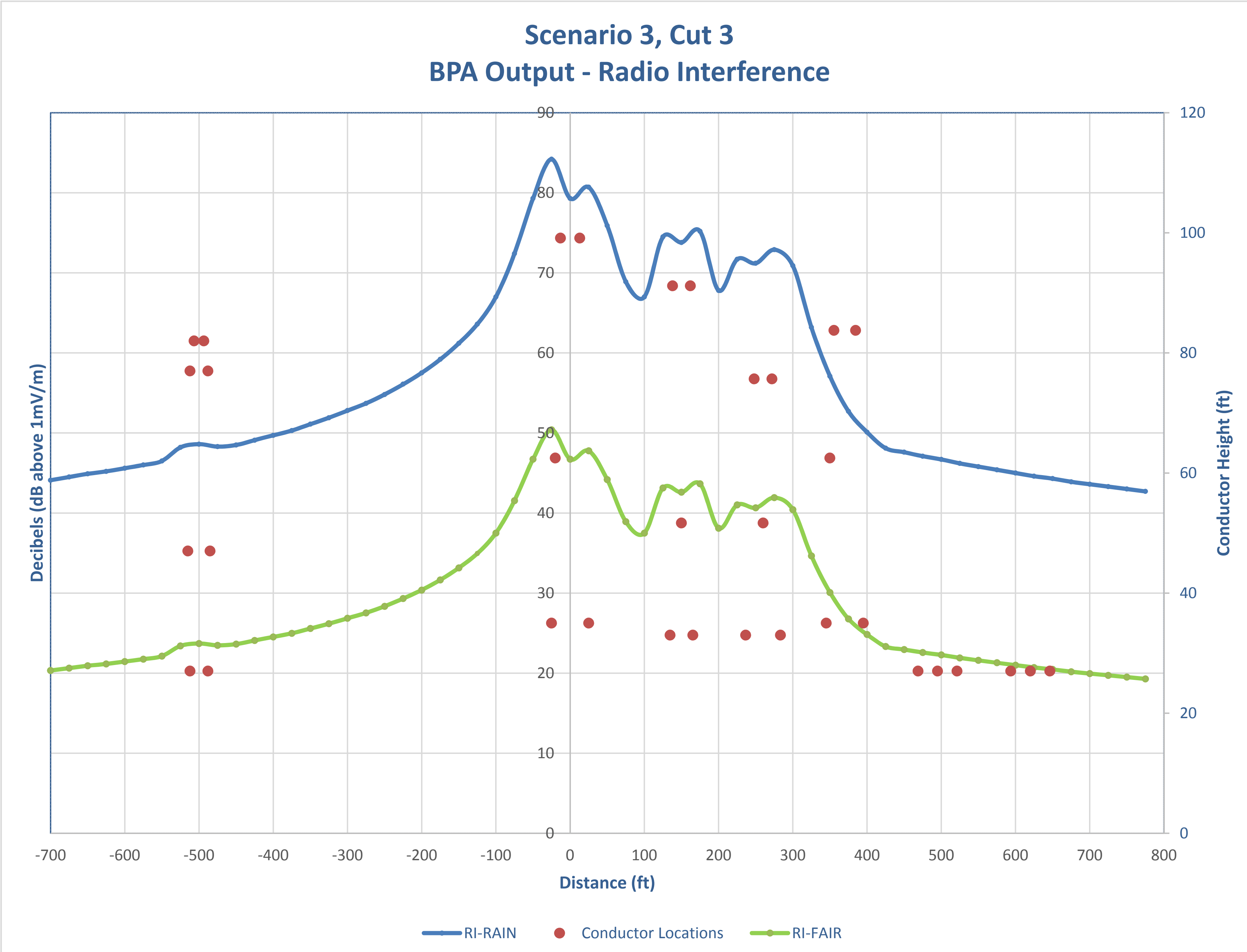
1

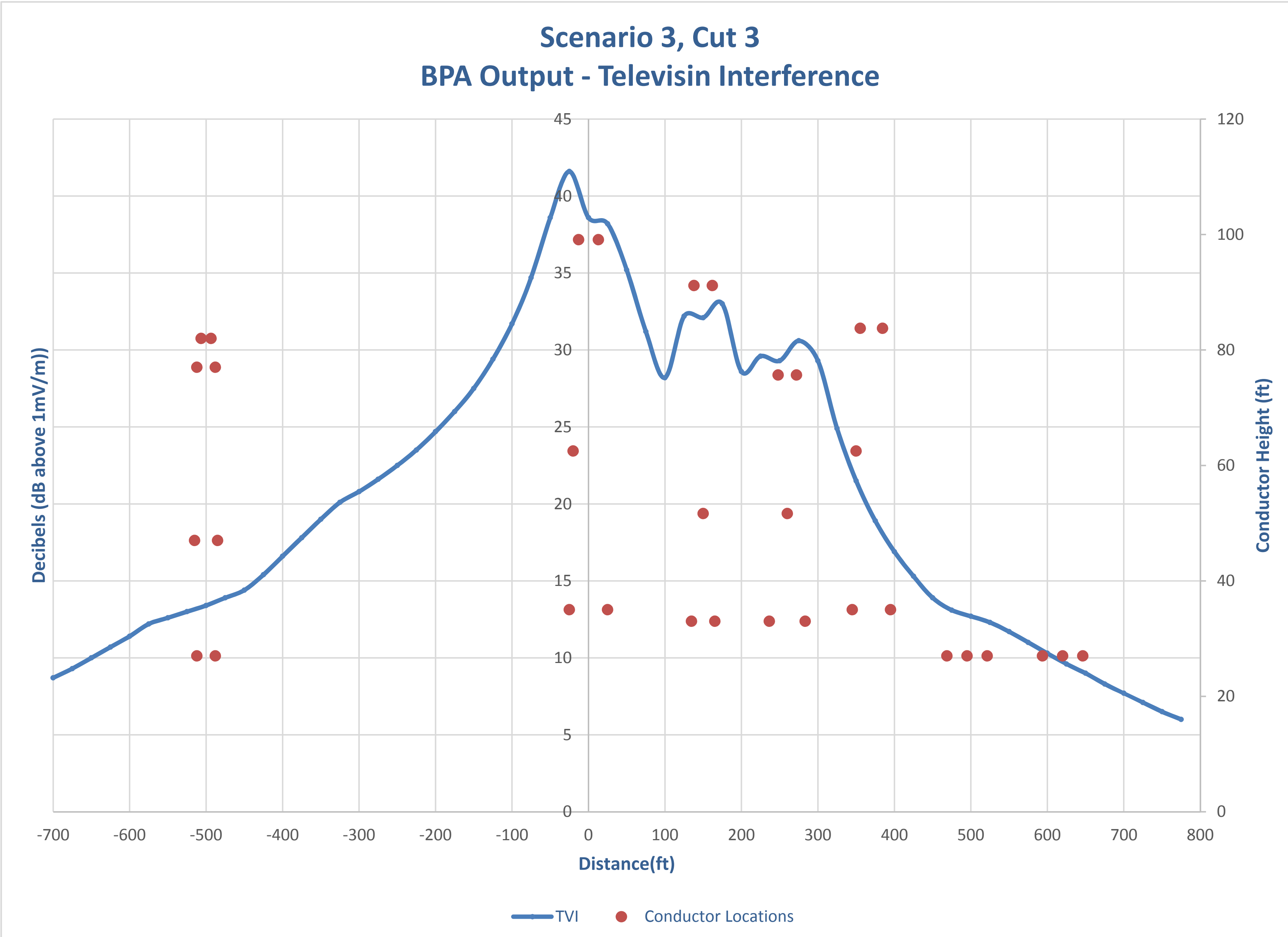


Scenario 3, Cut 3
BPA Output - Electric Field
Electric Field (kV/m)
Conductor Height (ft)
Distance (ft)
0
1
2
3
4
5
6
7
8
9
10
0
20
40
60
80
100
120
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
600
700
800
Electric Field (kV/m)
Conductor Locations



Scenario 3, Cut 3
BPA Output - Magnetic Field
Magnetic Field (mG)
Conductor Height (ft)
Distance (ft)
0
50
100
150
200
250
300
350
400
0
20
40
60
80
100
120
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
600
700
800
Magnetic Field (mG)
Conductor Locations


Scenario 3, Cut 3
BPA Output - Radio Interference
Decibels (dB above 1mV/m)
Conductor Height (ft)
Distance (ft)
0
10
20
30
40
50
60
70
80
90
0
20
40
60
80
100
120
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
600
700
800
RI-RAIN
Conductor Locations
RI-FAIR



Scenario 3, Cut 3
BPA Output - Televisin Interference
Decibels (dB above 1mV/m))
Conductor Height (ft)
Distance(ft)
45
40
35
30
25
20
15
10
5
0
120
100
80
60
40
20
0
-700
-600
-500
-400
-300
-200
-100
0
100
200
300
400
500
600
700
800
TVI
Conductor Locations

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ÛßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßßÛ
Û       C O R O N A   A N D   F I E L D        Û
Û E F F E C T S   P R O G R A M   V E R. 3.1  Û
Û   Source: Bonneville Power Administration    Û
ÛÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÜÛ


                              INPUT DATA LIST


                 1/17/2018          07:59:49
 SCENARIO 4,,,,,,,,,,,
  CUT 4,,,,,,,,,,,
 1,0, 3, 4,0.0,   0.50,   1.00, 800.00

 (ENGLISH UNITS OPTION)

 (GRADIENTS ARE COMPUTED BY PROGRAM)

 PHYSICAL SYSTEM CONSISTS OF  4 CONDUCTORS, OF WHICH  3 ARE ENERGIZED PHASES

 OPTIONS: 'COMB','XX','XX','XX','XX','XX','XX','XX',,,
   5.000,  6.600,  9.800,  0.000,  1.000, 75.000,  3.280,  9.340,  3.280
 'SLRDNO' ','A',    0.00,   45.00, 1,   0.510,   0.000,   0.000,   0.000,   0.000,   0.000
 'SLRB'   ','A',   -5.00,   32.00, 1,   1.100,   0.000,  20.920,-240.000,   0.881,   0.000
 'SLRC'   ','A',    5.00,   25.00, 1,   1.100,   0.000,  20.920,-120.000,   0.881,   0.000
 'SLRA'   ','A',    5.00,   39.00, 1,   1.100,   0.000,  20.920,   0.000,   0.881,   0.000
  81 -200.0    5.0
   0    0.0    0.0
1COMBINED OUTPUT OF AUDIBLE NOISE, RADIO NOISE, TVI, OZONE CONCENTRATION, GROUND GRADIENT AND MAGNETIC FIELD
 SCENARIO 4,,,,,,,,,,,
  CUT 4,,,,,,,,,,,
```

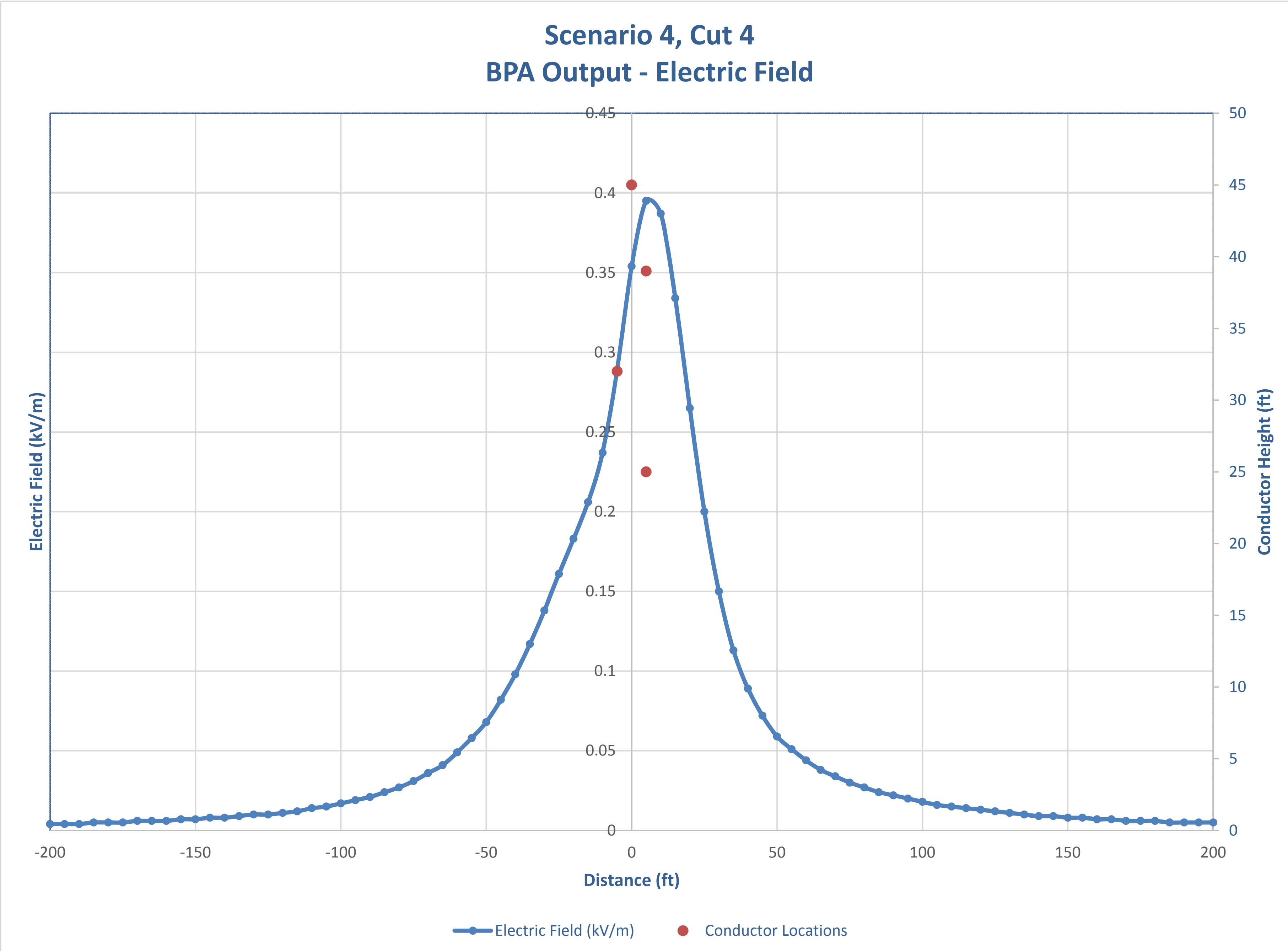
	DIST. FROM CENTER OF TOWER (FEET)	HEIGHT (FEET)	MAXIMUM GRADIENT (KV/CM)	SUBCON DIAM. (IN)	NO. OF SUBCON	SUBCON SPACING (IN)	VOLTAGE L-N (KV)	PHASE ANGLE (DEGREES)	CURRENT (kAmps)	CORONA LOSSES (KW/MI)
SLRDNO'	0.00	45.00	0.70	0.51	1	0.00	0.00	0.00	0.00	0.000
SLRB'	-5.00	32.00	2.69	1.10	1	0.00	20.92	-240.00	0.88	0.000
SLRC'	5.00	25.00	2.68	1.10	1	0.00	20.92	-120.00	0.88	0.000
SLRA'	5.00	39.00	2.70	1.10	1	0.00	20.92	0.00	0.88	0.000

```
 AN MICROPHONE HT.=  5.0 FT, RI ANT. HT.=  6.6 FT, TV ANT. HT.=  9.8 FT, ALTITUDE=   800.0 FT
 RI FREQ=  1.000 MHZ, TV FREQ=  75.000 MHZ, WIND VEL.(OZ)= 0.500 MPH, GROUND CONDUCTIVITY =   9.3 MMHOS/M
 E-FIELD TRANSDUCER HT.=  3.3FT, B-FIELD TRANSDUCER HT.=  3.3FT
```

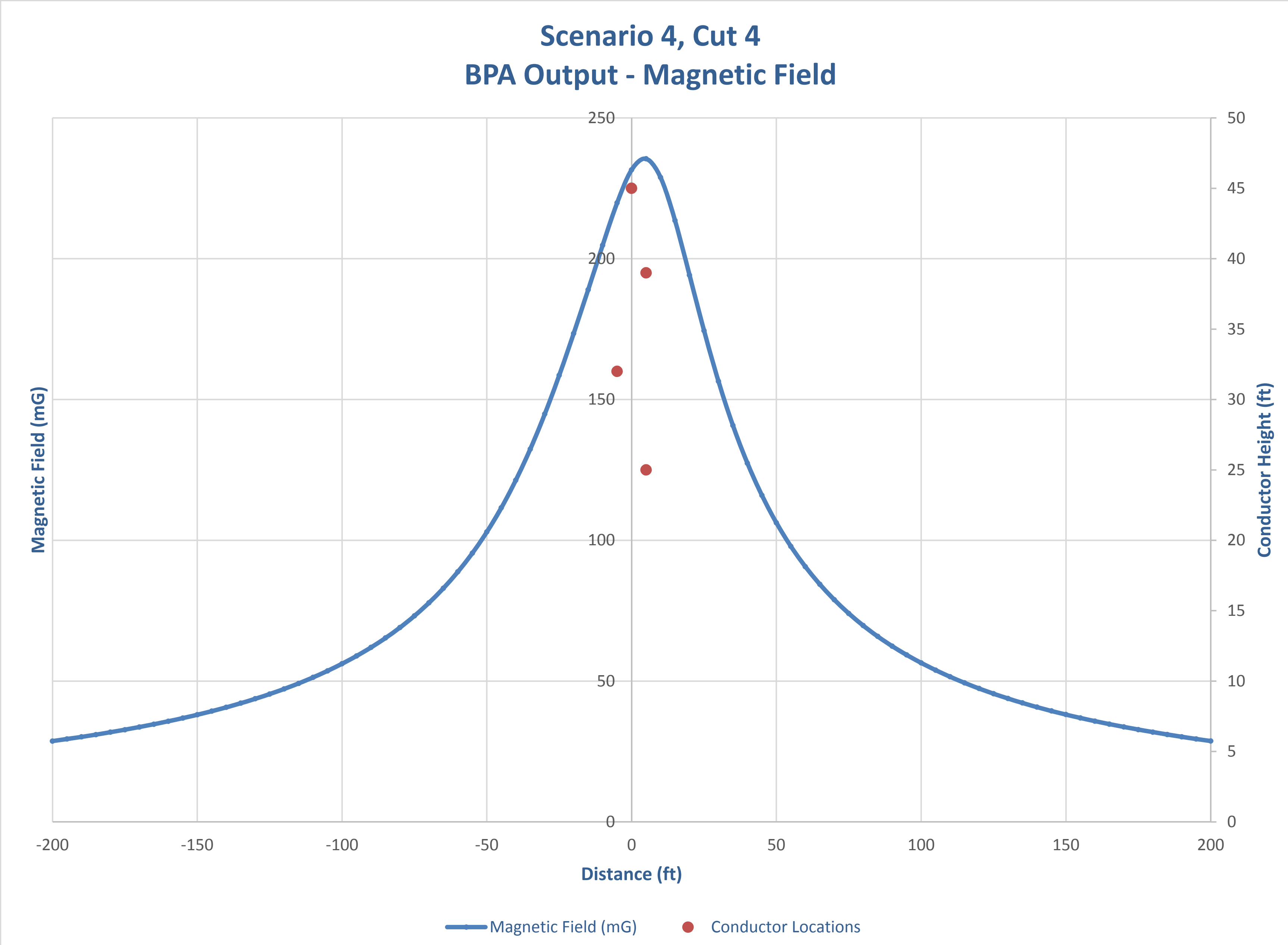
LATERAL DIST FROM REFERENCE (FEET)	AUDIBLE NOISE (RAIN) L50 DBA	AUDIBLE NOISE (FAIR) L50 DBA	RADIO INTERFERENCE (RAIN) L50 DBUV/M	RADIO INTERFERENCE (FAIR) L50 DBUV/M	TVI TOTAL RAIN DBUV/M	OZONE FOR RAIN RATE OF 1.00 IN/HR AT 0. FT LEVEL PPB	ELECTRIC FIELD KV/M	MAGNETIC FIELD GAUSS
-200.0	-55.9	-80.9	-54.4	-71.4	-84.4	0.000000	0.004	0.02870
-195.0	-55.8	-80.8	-54.1	-71.1	-84.1	0.000000	0.004	0.02943
-190.0	-55.7	-80.7	-53.7	-70.7	-83.9	0.000000	0.004	0.03019
-185.0	-55.5	-80.5	-53.4	-70.4	-83.7	0.000000	0.005	0.03099
-180.0	-55.4	-80.4	-53.1	-70.1	-83.4	0.000000	0.005	0.03184
-175.0	-55.3	-80.3	-52.7	-69.7	-83.2	0.000000	0.005	0.03273
-170.0	-55.1	-80.1	-52.3	-69.3	-82.9	0.000000	0.006	0.03367
-165.0	-55.0	-80.0	-51.9	-68.9	-82.7	0.000000	0.006	0.03467
-160.0	-54.8	-79.8	-51.5	-68.5	-82.4	0.000000	0.006	0.03573
-155.0	-54.7	-79.7	-51.1	-68.1	-82.1	0.000000	0.007	0.03686
-150.0	-54.5	-79.5	-50.7	-67.7	-81.8	0.000000	0.007	0.03805
-145.0	-54.3	-79.3	-50.2	-67.2	-81.5	0.000000	0.008	0.03933
-140.0	-54.2	-79.2	-49.8	-66.8	-81.2	0.000000	0.008	0.04069
-135.0	-54.0	-79.0	-49.3	-66.3	-80.9	0.000000	0.009	0.04215
-130.0	-53.8	-78.8	-48.7	-65.7	-80.6	0.000000	0.010	0.04372
-125.0	-53.6	-78.6	-48.2	-65.2	-80.2	0.000000	0.010	0.04540
-120.0	-53.4	-78.4	-47.6	-64.6	-79.9	0.000000	0.011	0.04722
-115.0	-53.2	-78.2	-47.0	-64.0	-79.5	0.000000	0.012	0.04918
-110.0	-53.0	-78.0	-46.4	-63.4	-79.1	0.000000	0.014	0.05131
-105.0	-52.8	-77.8	-45.7	-62.7	-78.7	0.000000	0.015	0.05363
-100.0	-52.6	-77.6	-45.0	-62.0	-78.3	0.000000	0.017	0.05615
-95.0	-52.3	-77.3	-44.2	-61.2	-77.8	0.000000	0.019	0.05892
-90.0	-52.1	-77.1	-43.4	-60.4	-77.4	0.000000	0.021	0.06196
-85.0	-51.8	-76.8	-42.6	-59.6	-76.9	0.000000	0.024	0.06531
-80.0	-51.5	-76.5	-41.7	-58.7	-76.4	0.000000	0.027	0.06903
-75.0	-51.2	-76.2	-40.7	-57.7	-75.8	0.000000	0.031	0.07316
-70.0	-50.9	-75.9	-39.7	-56.7	-75.2	0.000000	0.036	0.07778
-65.0	-50.6	-75.6	-38.6	-55.6	-74.6	0.000000	0.041	0.08297
-60.0	-50.3	-75.3	-37.4	-54.4	-74.0	0.000000	0.049	0.08882
-55.0	-49.9	-74.9	-36.1	-53.1	-73.3	0.000000	0.058	0.09544
-50.0	-49.5	-74.5	-34.8	-51.8	-72.5	0.000000	0.068	0.10297
-45.0	-49.1	-74.1	-33.4	-50.4	-71.7	0.000000	0.082	0.11154
-40.0	-48.7	-73.7	-31.8	-48.8	-70.9	0.000000	0.098	0.12130
-35.0	-48.2	-73.2	-30.2	-47.2	-69.9	0.000000	0.117	0.13238
-30.0	-47.7	-72.7	-28.6	-45.6	-69.0	0.000000	0.138	0.14483
-25.0	-47.2	-72.2	-26.9	-43.9	-68.0	0.000000	0.161	0.15859
-20.0	-46.7	-71.7	-25.4	-42.4	-67.1	0.000000	0.183	0.17344
-15.0	-46.2	-71.2	-24.0	-41.0	-66.2	0.000000	0.206	0.18900
-10.0	-45.8	-70.8	-23.1	-40.1	-65.3	0.000000	0.237	0.20478
-5.0	-45.5	-70.5	-21.8	-38.8	-63.9	0.000000	0.289	0.21985
0.0	-45.3	-70.3	-20.2	-37.2	-62.8	0.000003	0.354	0.23156
5.0	-45.3	-70.3	-19.6	-36.6	-62.3	Infinity	0.395	0.23547
10.0	-45.5	-70.5	-20.2	-37.2	-62.8	Infinity	0.387	0.22885
15.0	-45.9	-70.9	-21.8	-38.8	-63.9	Infinity	0.334	0.21356
20.0	-46.5	-71.5	-24.0	-41.0	-65.3	Infinity	0.265	0.19416
25.0	-47.0	-72.0	-26.3	-43.3	-66.7	Infinity	0.200	0.17446
30.0	-47.6	-72.6	-28.5	-45.5	-68.0	Infinity	0.150	0.15647
35.0	-48.1	-73.1	-30.7	-47.7	-69.2	Infinity	0.113	0.14078

40.0	-48.6	-73.6	-32.6	-49.6	-70.3	Infinity	0.089	0.12737
45.0	-49.0	-74.0	-34.5	-51.5	-71.3	Infinity	0.072	0.11596
50.0	-49.5	-74.5	-36.1	-53.1	-72.2	Infinity	0.059	0.10623
55.0	-49.9	-74.9	-37.6	-54.6	-73.0	Infinity	0.051	0.09787
60.0	-50.2	-75.2	-39.0	-56.0	-73.8	Infinity	0.044	0.09066
65.0	-50.6	-75.6	-40.3	-57.3	-74.5	Infinity	0.038	0.08438
70.0	-50.9	-75.9	-41.5	-58.5	-75.2	Infinity	0.034	0.07888
75.0	-51.2	-76.2	-42.6	-59.6	-75.8	Infinity	0.030	0.07403
80.0	-51.5	-76.5	-43.4	-60.4	-76.3	Infinity	0.027	0.06972
85.0	-51.8	-76.8	-44.2	-61.2	-76.9	Infinity	0.024	0.06587
90.0	-52.1	-77.1	-45.0	-62.0	-77.4	Infinity	0.022	0.06241
95.0	-52.3	-77.3	-45.7	-62.7	-77.9	Infinity	0.020	0.05929
100.0	-52.6	-77.6	-46.4	-63.4	-78.3	Infinity	0.018	0.05646
105.0	-52.8	-77.8	-47.0	-64.0	-78.8	Infinity	0.016	0.05388
110.0	-53.0	-78.0	-47.6	-64.6	-79.2	Infinity	0.015	0.05152
115.0	-53.2	-78.2	-48.2	-65.2	-79.6	Infinity	0.014	0.04936
120.0	-53.4	-78.4	-48.7	-65.7	-80.0	Infinity	0.013	0.04737
125.0	-53.6	-78.6	-49.3	-66.3	-80.3	Infinity	0.012	0.04553
130.0	-53.8	-78.8	-49.8	-66.8	-80.7	Infinity	0.011	0.04383
135.0	-54.0	-79.0	-50.2	-67.2	-81.0	Infinity	0.010	0.04225
140.0	-54.2	-79.2	-50.7	-67.7	-81.3	Infinity	0.009	0.04078
145.0	-54.3	-79.3	-51.1	-68.1	-81.6	Infinity	0.009	0.03940
150.0	-54.5	-79.5	-51.5	-68.5	-81.9	Infinity	0.008	0.03812
155.0	-54.7	-79.7	-51.9	-68.9	-82.2	Infinity	0.008	0.03691
160.0	-54.8	-79.8	-52.3	-69.3	-82.5	Infinity	0.007	0.03578
165.0	-55.0	-80.0	-52.7	-69.7	-82.8	Infinity	0.007	0.03472
170.0	-55.1	-80.1	-53.1	-70.1	-83.1	Infinity	0.006	0.03371
175.0	-55.3	-80.3	-53.4	-70.4	-83.3	Infinity	0.006	0.03277
180.0	-55.4	-80.4	-53.7	-70.7	-83.6	Infinity	0.006	0.03187
185.0	-55.5	-80.5	-54.1	-71.1	-83.8	Infinity	0.005	0.03102
190.0	-55.7	-80.7	-54.4	-71.4	-84.0	Infinity	0.005	0.03021
195.0	-55.8	-80.8	-54.7	-71.7	-84.3	Infinity	0.005	0.02945
200.0	-55.9	-80.9	-55.0	-72.0	-84.5	Infinity	0.005	0.02872

1



Scenario 4, Cut 4
BPA Output - Electric Field
Electric Field (kV/m)
Conductor Height (ft)
Distance (ft)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0
5
10
15
20
25
30
35
40
45
50
-200
-150
-100
-50
0
50
100
150
200
Electric Field (kV/m)
Conductor Locations

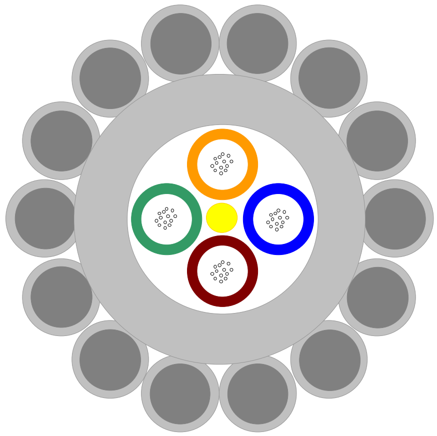

Scenario 4, Cut 4
BPA Output - Magnetic Field
Magnetic Field (mG)
Conductor Height (ft)
Distance (ft)
250
200
150
100
50
0
50
45
40
35
30
25
20
15
10
5
0
-200
-150
-100
-50
0
50
100
150
200
Magnetic Field (mG)
Conductor Locations

Attachment 4: AFL DNO-8234 Specifications

PO Box 3127
Spartanburg, SC 29304
Tel: 1 800 235 3423
Fax: 1 864 433 5560

Specification DNO-8234

AlumaCore Optical Ground Wire



AC-58/513

Component Details					
Component	**#**	**OD**		**Area**	
CENTER					
Aluminum Pipe	1	8.42 mm	0.3315 in	33.62 mm²	0.0521 in²
LAYER 1 - LEFT HAND LAY					
Aluminum Clad Steel (20.3% IACS)	14	2.30 mm	0.0906 in	58.17 mm²	0.0902 in²

Standards	
Designed and Manufactured in accordance with the following:	
Cable	*IEEE 1138, IEC 60794-4*
Fiber	*IEC 60793, ITU-T G.65x Series*
Color Code	*ANSI/EIA 359-A, 598-A, IEC 60304*
Aluminum Pipes	*ASTM B483*
Aluminum Clad Steel Wires	*ASTM B415*

Specification DNO-8234

Mechanical / Electrical Details				
Calculated Breaking Load	7,645	kg	16,855	lbs
Maximum Cable Design Tension	4,676	kg	10,309	lbs
Approximate Cable Diameter	13.02	mm	0.513	in
Total Cross-Sectional Area	91.79	mm²	0.1423	in²
Approximate Cable Weight	497	kg/km	1,762	lbs/mile
Modulus of Elasticity	12,375	kg/mm²	17,601	kpsi
Coefficient of Linear Expansion	1.47E-05	1/℃	8.14E-06	1/℉
Sag10™ Chart Number	1-1450		1-1450	
Calculated DC Resistance (20℃)	0.5543	Ohms/km	0.8920	Ohms/mile
Short Circuit Rating	62	(kA)²•sec	62	(kA)²•sec
Short Circuit Ambient Temperature	40	℃	104	℉
Short Circuit Duration 1 sec	7.8	kA	7.8	kA
Short Circuit Max Cable Temperature	210	℃	410	℉

Optical Details

Attenuation Characteristics for Single-mode Fiber

Max Individual

0.40 dB/km 1310 nm
0.30 dB/km 1550 nm

48 Fiber Loose Tube Design (4 - 12 fiber units)

Unit	Fiber Type	Fiber Count
Blue	Single-mode	12
Orange	Single-mode	12
Green	Single-mode	12
Brown	Single-mode	12
	Total Fiber Count	48

Standard Fiber Color Code

Fiber	1	2	3	4	5	6	7	8	9	10	11	12
Color	Blue	Orange	Green	Brown	Slate	White	Red	Black	Yellow	Violet	Rose	Aqua

Designs with more than 12 fibers per tube will use the standard color code and binders for identification of the fibers.

Installation and Handling Recommendations

Installation and cable preparation procedures are outlined in the AFL documents listed below. Contact AFL to request copies.

Recommended Installation Procedures for Composite Optical Ground Wire

Installation Instructions for Installing Optical Ground Wire in an AFL Telecommunications Splice Enclosure

Fiber Optic Cable Receiving, Handling and Storage. Document ACS-WI-809

Specification DNO-8234

Quick Reference Installation Notes

Approximate Cable Diameter	13.02	mm	0.513	in
Maximum Stringing Tension (at tensioner)*	1,529	kg	3,371	lbs
Minimum Bull Wheel Diameter	92	cm	36	in
Stringing Sheave Diameter**	52	cm	21	in
Minimum Bending Radius				
Cable				
Static (No load)	20	cm	8	in
Dynamic (under tension)	26	cm	11	in
Fiber				
Static (No load)	3.8	cm	1.5	in
Buffer Tube				
Static (No load)	8.0	cm	3.0	in

* - The stringing tension is always measured at the tensioner side. In general the maximum stringing tension should be approximately half of the maximum sagging tension and should never exceed 20% RBS of the OPT-GW.

** - The value indicated is for the first and last structures of the pull and is based on 40 times the diameter of the OPT-GW. Smaller diameters can be used at tangent structures. Reference AFL's installation instructions for more details.

Reference AFL's "Recommended Installation Procedures for Composite Optical Ground Wire" for detailed installation instructions.

Shipping Reels

Reel Type	*FL* (cm)	*TR* (cm)	*DR* (cm)	*OW* (cm)	*Tare (kgs)*	*FL* (in)	*TR* (in)	*DR* (in)	*OW* (in)	*Tare (lbs)*	*Capacity (meters)*	*Capacity (feet)*
Wood	147	81	71	97	200	58	32	28	38	441	5,170	16,960
Wood	168	91	91	107	260	66	36	36	42	573	6,960	22,830
Wood	183	91	91	107	300	72	36	36	42	662	7,000	22,960
Wood	213	86	89	104	385	84	34	35	41	849	7,000	22,960
Steel	152	81	81	97	345	60	32	32	38	761	5,130	16,830
Steel	183	91	102	107	540	72	36	40	42	1,191	7,000	22,960
Steel	213	114	107	130	773	84	45	42	51	1,704	7,000	22,960

FL - Flange Diameter; TR - Inside Traverse Width; DR - Drum Diameter; OW - Outside Overall Width

Arbor Hole Diameter: Wood: 3-1/4in (7.9cm)
Steel: 3in (7.6cm)

Maximum lengths shown are the longest lengths that AFL offers. Longer lengths may be possible.

Ordered lengths should include a distribution of lengths, i.e., all reels cannot be ordered at the maximum. A typical reel length distribution is as follows:

- 6000m – 7000m ~ 15% of reels
- 4500m – 6000m ~ 55% of reels
- 2500m – 4500m ~ 25% of reels
- <2500m ~ 5% of reels

Wood reels with flex-wrap covering are standard. Non-returnable steel reels and/or wood lagging are available upon request. Additional reel sizes may be available upon request.

Steel reels are recommended for long term storage. Reference AFL's "Fiber Optic Cable Receiving, Handling and Storage" document for additional information.

Specification DNO-8234

Electrical Characteristics

Composite DC Resistance	[20℃]	0.5543	Ohms/km	0.8920	Ohms/mile
Geometric Mean Radius		0.51	cm	0.0166	feet
Inductive Reactance	[60 Hz frequency]	0.3089	Ohms/km	0.4971	Ohms/mile
[one foot (0.3048 meter) spacing]					
	[50 Hz frequency]	0.2574	Ohms/km	0.4142	Ohms/mile
Capacitive Reactance	[60 Hz frequency]	0.1836	MOhms·km	0.1141	MOhms·mile
[one foot (0.3048 meter) spacing]					
	[50 Hz frequency]	0.2203	MOhms·km	0.1369	MOhms·mile

Composite Coefficient of Thermal Resistance 0.00368 (1/℃)

Temperature		DC Resistance		AC Resistance	
(℃)	(℉)	(Ohms/km)	(Ohms/mile)	(Ohms/km)	(Ohms/mile)
20	68	0.5543	0.8920	0.5653	0.9098
25	77	0.5645	0.9084	0.5758	0.9266
30	86	0.5747	0.9249	0.5862	0.9433
35	95	0.5849	0.9413	0.5966	0.9601
40	104	0.5951	0.9577	0.6070	0.9769
45	113	0.6053	0.9741	0.6174	0.9936
50	122	0.6155	0.9906	0.6278	1.0104
55	131	0.6257	1.0070	0.6382	1.0271
60	140	0.6359	1.0234	0.6487	1.0439
65	149	0.6461	1.0399	0.6591	1.0607
70	158	0.6564	1.0563	0.6695	1.0774
75	167	0.6666	1.0727	0.6799	1.0942
80	176	0.6768	1.0892	0.6903	1.1109
85	185	0.6870	1.1056	0.7007	1.1277
90	194	0.6972	1.1220	0.7111	1.1445
95	203	0.7074	1.1385	0.7216	1.1612
100	212	0.7176	1.1549	0.7320	1.1780
105	221	0.7278	1.1713	0.7424	1.1947
110	230	0.7380	1.1878	0.7528	1.2115
115	239	0.7482	1.2042	0.7632	1.2283
120	248	0.7585	1.2206	0.7736	1.2450
125	257	0.7687	1.2370	0.7840	1.2618
130	266	0.7789	1.2535	0.7945	1.2786
135	275	0.7891	1.2699	0.8049	1.2953
140	284	0.7993	1.2863	0.8153	1.3121
145	293	0.8095	1.3028	0.8257	1.3288
150	302	0.8197	1.3192	0.8361	1.3456

Specification DNO-8234

PLS-CADD Inputs

☐ Use simplified elastic cable model (no creep, no coefficient)

Name	
Description	AFL OPGW DNO-8234 AC-58/513

Cross section area	(in^2)	0.1423	Unit weight	(lbs/ft)	0.334
Outside diameter	(in)	0.513	Ultimate tension	(lbs)	16,855
Temperature at which strand data below obtained	(deg F)	76			

Number of independent wires: 1

(above should be 1 unless cables are separated by spacers)

Outer Strands

Final Modulus of elasticity (psi/100): 174000

Thermal expansion coeff. (/100 deg F): 0.000820

Polynomial coefficients (all strains in %)

	A0	A1	A2	A3	A4
Stress-strain	172.7	167351	-24582.8	-91415	78623
Creep	404.5	102518.6	119106.6	-225839	90157

Core Strands (if different from outer strands)

Final Modulus of elasticity (psi/100):

Thermal expansion coeff. (/100 deg F):

Polynomial coefficients (all strains in %)

	A0	A1	A2	A3	A4
Stress-strain					
Creep					

Thermal Rating Properties

Resistance at two different temperatures

Resistance	(Ohms/mile)	0.9084	at	(deg F)	77
Resistance	(Ohms/mile)	1.0727	at	(deg F)	167

Emissivity coefficient		0.5
Solar absorption coefficient		0.5
* Outer strands heat capacity	(Watt-s/ft-deg F)	
* Core heat capacity	(Watt-s/ft-deg F)	

Generate Coefficients from points on stress-strain cur   OK   Cancel

* These two fields do not need to be entered for OPGW - intentionally left blank.

EXHIBIT BB – Request for Amendment No. 1

OTHER INFORMATION
OAR 345-021-0010(1)(bb)

OAR 345-021-0010(1)(bb) *Any other information that the Department requests in the project order or in a notification regarding expedited review.*

Response: This exhibit is not applicable to this request for amendment because it is being prepared for an amendment request; therefore, there is no project order or notification regarding expedited review.

EXHIBIT CC – Request for Amendment No. 1

OTHER LAW

OAR 345-021-0010(1)(cc)

TABLE OF CONTENTS

TABLES

CC.1 INTRODUCTION

OAR 345-021-0010(1)(cc) *Identification, by legal citation, of all state statutes and administrative rules and local government ordinances containing standards or criteria that the proposed facility must meet for the Council to issue a site certificate, other than statutes, rules and ordinances identified in Exhibit E, and identification of the agencies administering those statutes, administrative rules and ordinances. The applicant shall identify all statutes, administrative rules and ordinances that the applicant knows to be applicable to the proposed facility, whether or not identified in the project order. To the extent not addressed by other materials in the application, the applicant shall include a discussion of how the proposed facility meets the requirements of the applicable statutes, administrative rules and ordinances.*

Response: This exhibit provides the information required by Oregon Administrative Rules 345-021-0010(1)(cc), in support of the Request for Amendment No. 1 of the Site Certificate for the Carty Generating Station.

CC.2 APPLICABLE STATUTES, RULES AND ORDINANCES

Response: The following state statutes and administrative rules, not listed in Exhibit E, contain standards or criteria that must be met in order for the Energy Facility Siting Council to issue Amendment No. 1 to the Site Certificate for the Carty Generating Station. All applicable local ordinances related to permits required for the facility are listed in Exhibit E. Table CC-1 identifies with an asterisk those statutes or rules that have been revised since Portland General Electric Company submitted the Application for Site Certificate in 2011. No additional rules have been identified for purposes of this request for amendment.

Table CC-1 Statutes and Rules

State Statutes/Administrative Rules	Administering Agency	Compliance Issue	Associated Exhibit
Noise			
ORS 467.020 and 467.030	Department of Environmental Quality	DEQ Noise Standard compliance	Exhibit X, Noise
OAR 340-035-0035			
Fish and Wildlife			
ORS 496	Department of Fish and Wildlife	Oregon Habitat Conservation Compliance	Exhibit P, Fish and Wildlife
OAR Chapter 635, Division 415[Amended 2016][1]		ODFW Habitat Mitigation Policy Compliance	

Table CC-1 Statutes and Rules

State Statutes/Administrative Rules	Administering Agency	Compliance Issue	Associated Exhibit
Threatened & Endangered Plant Species			
ORS 564 [Amended 2011][1]	Department of Agriculture	State and federal threatened and endangered species protection and compliance programs	Exhibit Q, Threatened and Endangered Species
OAR Chapter 603, Division 73 [0070 – Updated 10/13/2011]			
Historic Preservation			
ORS 97.745	State Historic Preservation Office, State Parks and Recreation Department	Historic, Cultural or Archaeological Resources Site Assessment	Exhibit S, Historic, Cultural Resources
ORS 358.905 through 358.961 [Amended 2017][1]			
ORS 390.235 through 390.240 [Amended 2015][1]			
OAR Chapter 736, Division 51 [0090 corrected 10/20/2017][1]			
Land Use			
OAR 660-033-0120, Agricultural Lands [Amended 2011-2016][1]	Department of Land Conservation and Development	Statewide Planning Goal 3	Exhibit K, Land Use Standard
OAR 660-033-0130, Agricultural Lands [Amended 2011-2016][1]			
ORS 215.274, Associated Transmission Lines Necessary for Public Service [Enacted 2013][1]			
ORS 215.275, Utility Facilities Necessary for Public Service [Amended 2013][1]			
ORS 215.296(1) Standards for approval of certain uses in Exclusive Farm Use zones.			

Note:
[1] Denotes that statute or rule was updated since the Application for Site Certificate was submitted in 2011.
Key:
DEQ = Oregon Department of Environmental Quality
OAR = Oregon Administrative Rules
ODFW = Oregon Department of Fish and Wildlife
ORS = Oregon Revised Statutes

EXHIBIT DD – Request for Amendment No. 1

OTHER SPECIFIC STANDARDS
OAR 345-021-0010(1)(dd)

OAR 345-021-0010(1)(dd) *If the proposed facility is a facility for which the Council has adopted specific standards, information about the facility providing evidence to support findings by the Council.*

Response: This exhibit is not applicable to the proposed Carty Generating Station.