GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS FOR THE INSTALLATION OF 230kV POD TO BELLS FORK 115kV TRANSMISSION LINE

ISSUED FOR BIDS

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS FOR THE INSTALLATION OF 230kV POD TO BELLS FORK 115kV TRANSMISSION LINE

ISSUED FOR BIDS

Booth & Associates, LLC
Consulting Engineers
5811 Glenwood Avenue, Suite 109
Raleigh, North Carolina 27612
Firm License No. F-0221

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS FOR THE INSTALLATION OF 230kV POD TO BELLS FORK 115kV TRANSMISSION LINE

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NOTICE TO PROSPECTIVE BIDDERS

Sealed Proposals for the installation of the 230kV POD to Bells Fork 115kV Transmission Line, complete and conforming to the bid documents, as set forth in the Bid Schedule, will be received by Greenville Utilities Commission, North Carolina (hereinafter referred to as the Owner) at the offices of the Procurement Coordinator, Greenville Utilities Commission, 401 S. Greene Street, Greenville, NC 27834 on or before **2:00 PM, local time, Wednesday, November 30, 2016**, at which time the Proposals will be opened and read. Any Proposal received subsequent to that time will be promptly returned to the Bidder unopened. Questions concerning this bid must be received by close of business **Friday, November 18, 2016** via electronic mail to Mr. Cleve Haddock, Procurement Coordinator, Greenville Utilities Commission, haddocgc@guc.com.

The Specifications, together with all necessary forms and other documents for the Bidder, may be obtained from the Owner's Engineer, Booth & Associates, LLC, 5811 Glenwood Avenue, Suite 109, Raleigh, North Carolina 27612, Attention: Bill Jordan, PE.

Proposals and all supporting instruments must be submitted on and in the format of the forms furnished in the Form of Proposal of these bid documents and must be delivered in a sealed envelope addressed to the Owner. Proposals must be filled in with indelible ink. No alteration or interlineations will be permitted unless made before submission and initialed and dated.

Prior to the submission of the Proposal, the Bidder shall make and shall be deemed to have made a careful examination of the bid documents on file with the Owner and with the Engineer and of all other matters that may affect the cost and the time of the work.

The name and address of the Bidder, its license number (if a license is required by the State), and the following description must appear on the envelope in with the Proposal is submitted:

"BID FOR THE INSTALLATION OF
230kV POD TO BELLS FORK 115kV TRANSMISSION LINE
2:00 PM, LOCAL TIME, WEDNESDAY, NOVEMBER 30, 2016"

Each Proposal shall be accompanied by a cashier's check, or certified check drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation, or the Savings Association Insurance Fund, or an original signed/sealed Bid Bond in an amount equal to not less than five percent (5%) of the total amount of the Proposal; said deposit to be retained by the Owner as liquidated damages in event of failure of the Successful Bidder to execute the Contract within ten (10) days after the award.

The Owner reserves the rights to (1) waive minor irregularities or minor errors in any Proposal if it appears to the Owner that such irregularities or errors were made through inadvertence. Any such irregularities or errors so waived must be corrected on the Proposal prior to its acceptance by the Owner; (2) reject any or all Proposals and to hold any or all Proposals for a period of sixty (60) days from the date of opening thereof; (3) accept the bid, in its opinion, that represents the lowest responsible, responsive bid from the standpoint of quality, performance, and price; and (4) award purchase order(s) to Bidder(s) for any schedule(s) individually or collectively from the Bid Schedules.

GREENVILLE UTILITIES COMMISSION OF THE
CITY OF GREENVILLE, NORTH CAROLINA

By: Anthony C. Cannon
General Manager/ CEO

Date: October 27, 2016

DEFINITIONS

Whenever the following terms or pronoun in place of them are used in these "Instructions to Bidders", "Form of Proposal", "Technical Specifications", "Contract", bond, etc., the intent and meaning shall be interpreted as follows:

Owner	Greenville Utilities Commission Greenville, North Carolina
General Manager/ CEO	Anthony C. Cannon; or his authorized assistant
Consulting Engineer	Booth & Associates, LLC
Observer	An authorized representative of the Owner assigned to make any or all necessary observations of work performed and equipment and/or apparatus furnished by the Bidder
Bidder	Any individual, firm, or corporation submitting a Proposal for the work contemplated, acting directly or through a duly authorized representative; or party of the second part of the Contract, acting directly or through a duly authorized representative
Subcontractor	An individual, firm, or corporation who contracts with the Bidder to perform part of the latter's Contract
Surety	The body, corporate or individual, approved by the Owner, which is bound with and for the Bidder who is primarily liable and which engages to be responsible for his acceptable performance of the work for which he has contracted
Form of Proposal, Proposal	The approved, prepared form on which the Bidder is to submit or has submitted his Proposal for the work contemplated
Bid Security/Bid Bond	To all bids there shall be attached cash, cashier's check, or certified check from the Bidder upon a bank or trust company insured by the Federal Deposit Insurance Corporation or the Savings Associates Insurance Fund, or in lieu thereof, an original signed/sealed Bid Bond
Plans, Drawings	All Drawings or reproductions of Drawings pertaining to the construction under the Contract
Technical Specifications	The directions, provisions, and requirements contained herein pertaining to the method and manner of performing the work or to the quantities and qualities of materials to be furnished under the Contract
Contract	The agreement covering the furnishing of equipment and/or apparatus and the performance of the work. The Contract shall include the "Instructions to Bidders", "General Conditions", "Form of Proposal", "Plans", "Technical Specifications", and Acknowledgments

Performance Bond	The approved form of security to be approved by the Owner furnished by the Bidder and his Surety as a guarantee of good faith on the part of the Bidder to accept the work in accordance with the terms of the Specifications and Contract
Payment Bond	The approved form of security to be approved by the Owner furnished by the Bidder and his Surety as a guarantee for payment of all Subcontractors on the part of the Bidder in acceptance of the work in accordance with the terms of the Specifications and Contract
Work	The performance of the project covered by the Specifications or the furnishing of labor, machinery, equipment, tools, or any other article or item being purchased by the Owner
Emergency	A temporary unforeseen occurrence or combination of circumstances which endangers life and property and calls for immediate action or remedy
Work at Site of Project	Work to be performed, including work normally done on the location of the project
Bid Documents	Include all sections of the Request for Bids, Form of Proposal, Technical Specifications and Appendices, Addendum/Clarifications/Bulletins, and Drawings

The subheadings in these Specifications are intended for convenience or reference only and shall not be considered as having any bearing on the interpretations thereof.

1.0 Proposals

1.1 Only those Proposals made in accordance with these instructions will be considered.

1.2 Bids not received on Booth & Associates, LLC *Form of Proposal* contained herein will be considered unresponsive. The forms shall be filled out complete; any omissions may cause the entire Proposal to be rejected.

1.3 Proposals must be made on the *Form of Proposal* provided herein and must not be altered, erased, or interlined in any manner. The Bidder shall fill in the *Form of Proposal* as detailed in the Terms and Conditions. The Bidder may retain one (1) copy, but the original, fully executed, must be inserted in or attached to the Bid Documents. Also, one (1) additional copy of all executed forms and supporting information shall be supplied.

1.4 Proposals must be enclosed in a sealed envelope, addressed to the Owner. The outside of the envelope must be marked as required in the "Notice to Prospective Bidders" and the Bidder's name, bid opening date and time and the Bidder's license number shall be shown thereon.

1.5 Additional copies of these Specifications may be obtained upon request from the Engineer by approved Bidders upon payment of a fifty dollar ($50.00) non-refundable fee per copy.

1.6 Proposals shall include a *Form of Exceptions* utilizing forms provided which shall itemize each and every exception from the Specifications. The *Form of Exceptions* shall state the section, subsection, and paragraph designations from the part of the Specifications to which exception is taken and explain in detail the nature of the exception. A copy of this *Form of Exceptions* is included in the Form of Proposals. Exceptions will not necessarily eliminate a Bidder from consideration, even if bids without exceptions are received from others. The treatment of exceptions will be based entirely on the overall best interests of the Owner.

1.7 Modifications to bids must be by removal of the Bidder's original bid and the submittal of a completely revised bid package in full compliance with the Drawings, Specifications, and Bid Documents. This is required prior to the time of opening bids. No oral or telephonic Proposals will be accepted.

1.8 Should the Bidder find discrepancies in or omissions from the Drawings or Documents or should he be in doubt as to their meaning, he shall at once notify the Engineer who will send written instructions to all Bidders. Neither the Owner nor the Engineer will be responsible for any oral instructions. If Plans and Specifications are found to disagree after Contract is awarded, the Engineer shall be the judge as to what was intended. The Successful Bidder is hereby made responsible for the furnishing of the necessary labor, tools and equipment reasonably inferred or evidently necessary for the proper execution and completion of the work; for any additional work involved in the correction of apparent errors or inconsistencies, and in executing the true intent and meaning of the Drawings and Specifications as interpreted by the Engineer and all such labor and equipment shall be provided at the Contractor's expense, and under no condition will any such labor and equipment be allowed as an extra.

If, within 24 hours after bids are opened, any Bidder files a duly signed written notice with the Owner and promptly thereafter demonstrates to the reasonable satisfaction of the Owner that there was a substantial mistake in the preparation of its bid, that Bidder will not be permitted to modify its bid, but may withdraw its bid in its entirety, and the Bid Security will be returned. Thereafter, the bidder will be disqualified from further bidding on the installation of the project herein specified.

2.0 Payment

Payment by the Owner to the Successful Bidder shall be made periodically based on the actual percentage of completion, and it is demonstrated that any equipment or materials furnished meets the Specifications.

Invoices for labor shall be submitted in triplicate to the Owner's Engineer for review and approval. There shall be a ten-percent (10%) retainage until the equipment and installation, as per Specifications, have been approved and accepted by the Owner and the Owner's Engineer.

The address for submittal of all invoices is Booth & Associates, LLC at 5811 Glenwood Avenue, Suite 109, Raleigh, North Carolina 27612, Attention: Michael L. Clements, PE.

3.0 Bid Security

3.1 Each Proposal shall be accompanied by a cashier's check, or certified check drawn on a bank or trust company insured by the Federal Deposit Insurance Corporation, or the Savings Association Insurance Fund, or an original signed/sealed Bid Bond in an amount equal to not less than five percent (5%) of the total amount of the Proposal; said deposit to be retained by the Owner as liquidated damages in event of failure of the Successful Bidder to execute the Contract within ten (10) days after the award.

3.2 Bid Bond shall be conditioned that the Surety will upon demand forthwith make payment to the Obligee upon said Bond if the Bidder fails to execute the Contract in accordance with the Bid Bond, and upon failure to immediately make payment, the Surety shall pay to the Obligee an amount equal to double the amount of said Bond. Standard Form of Bid Bond is included in these Specifications.

3.3 Only one (1) bid Surety is required, the amount of which shall be based on the total amount of all bid schedules.

4.0 Bulletins and Addenda

Any bulletins issued during the time of bidding or addenda to Specifications are to be considered covered in the Proposal, and in executing a Contract will become a part thereof. Receipt of addenda shall be acknowledged by the Bidder in the *Form of Proposal*.

5.0 Award of Contract

5.1 The award of the Contract will be made to the lowest acceptable Bidder as soon as practicable. The bid shall be awarded to the Bidder who, in the judgment of the Owner, offers the best value to the Owner. Factors to be considered by the Owner are specified in Paragraph 5.3. The Owner reserves the right to reject any and all bids.

5.2 The Owner reserves the right to waive minor irregularities or minor errors in any Proposal if it appears to the Owner that such irregularities or errors were made through inadvertence. Any such irregularities or errors so waived must be corrected on the Proposal prior to its acceptance by the Owner.

5.3 In estimating the lowest cost to the Owner as one of the factors in deciding the award of the Contract, the Owner will consider, in addition to the prices quoted in the Proposal, the following:

1. Completion date,
2. Adherence to the Plans and Specifications,
3. Contractor capabilities, crew experience, and past performance,
4. Conditional quotations (Only firm fixed prices in U.S. dollars),
5. Any additional factors deemed appropriate by the Owner.

5.4 In the event the Bidder proposes any change or deviation from the Engineer's Plans and Specifications, such proposed changes or deviations must be submitted at the time bids are opened on the *Form of Exceptions* included. The Owner reserves the right to reject any proposed changes or deviations. All exceptions must be stated on the *Form of Exceptions*. Failure to provide a *Form of Exceptions* with the Proposal shall imply strict adherence to all details of the Plans and Specifications.

5.5 The Contract, when awarded, shall be deemed to include the Specifications for the equipment, and the Bidder shall not claim any modification thereof resulting from any representative or promise made at any time by any officer, agent, or employee of the Owner or by any other person.

6.0 Performance and Payment Bonds

6.1 The Successful Bidder shall be required to furnish separate Performance and Payment Bonds executed on the forms bound herein in amounts at least equal to one hundred percent (100%) of the Contract price as security for the faithful performance of this Contract and as security for the payment of all persons performing labor and furnishing materials and equipment in connection with this Contract.

6.2 Performance and Payment Bonds shall be with a Surety company authorized and licensed to do business in the State of North Carolina and shall be for the full Contract sum.

7.0 Examination of Conditions

Prior to the submission of the Proposal, the Bidder shall make and shall be deemed to have made a careful examination of the Plans and Specifications on file with the Owner and with the Engineer, and all other matters that may affect the cost and the time of completion of the work.

8.0 Subcontractors

The Bidder shall include in the Proposal a listing of all subcontractors (if any) and their respective support services to be utilized during the course of the project. All subcontractors will be subject to approval by the Owner and Engineer.

9.0 Completion

a. The award of this Contract shall be issued as soon as possible, subsequent to the bid opening, by issuance of written contract to the Contractor by the Engineer or notification from the Owner. **Work on the projects shall begin after award of Contract and no later than April 3, 2017.**

b. The completion date for the projects' on-site activities shall be November 30, 2017.

c. Time for completion shall be extended for delays due to bad weather days or other special cases with the written consent of the Owner and/or Engineer.

d. The Contractor shall include in the Proposal a project construction schedule using the completion date above, indicating each major construction activity with duration and the total number of calendar days of construction time he proposes to perform his work based on the above completion date.

10.0 Liquidated Damages

Time is of the essence, and it is critical that the work be performed on schedule and time is allowed for the completion of the work in the Contract Agreement included herewith. Damages for delay shall be at the rate **of five-hundred dollars ($500.00) per calendar day** for failure of the Contractor to complete the work within the Construction Schedule. No credit shall be given for early completion of the work.

11.0 Bids to be Retained

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of sixty (60) days pending the execution of a Contract by the Successful Bidder. Should the Successful Bidder default and not execute a Contract, the Contract will be offered to the next lowest responsible Bidder.

12.0 Delivery Location

The prices quoted shall include delivery of any Contractor-furnished materials and equipment to the project site, and complete installation of said materials and equipment and installation of the Owner-furnished materials. The location of the station is shown on the Vicinity Map in the Appendices.

13.0 Form of Proposal

Those bids not received on the Booth & Associates, LLC Form of Proposal contained herein will be considered unresponsive. The forms shall be filled out completely. Any omissions may cause the entire Proposal to be rejected.

14.0 Contractor's Insurance

14.1 General Liability

Commercial General Liability Insurance, (with coverage consistent with ISO Form CG 00 01 12 07 or its equivalent) with a limit of not less than One Million Dollars ($1,000,000) per occurrence and Two Million Dollars ($2,000,000) per project or per location general aggregate, and a deductible or self-insured retention not to exceed Twenty-five Thousand Dollars ($25,000) per occurrence, covering liability for bodily injury and property damage, arising from premises, operations, independent contractors, personal injury/advertising injury, contractual liability, and products/completed operations for not less than two (2) years from the Substantial Completion Date.

14.2 Automobile Liability

Commercial Automobile Liability Insurance, including coverage for liability arising out of the use of owned (if any), non-owned, leased or hired automobiles, for both bodily injury and property damage in accordance with Applicable Legal Requirements, with a limit of not less than One Million Dollars ($1,000,000) combined single limit per occurrence.

14.3 Workers Compensation

Worker's Compensation Insurance, with statutory limits, covering all of Subcontractor's employees, on terms and conditions as required by applicable Law and imposed by worker's compensation, occupational disease or similar laws, including the Longshore and Harbor Workers' Act, the Federal Employers' Liability and the Jones Act, if applicable.

14.4 Employers Liability

Employers' Liability Insurance with limits of not less than One Million Dollars ($1,000,000) each accident for bodily injury by accident, One Million Dollars ($1,000,000) each employee for bodily injury by disease, and One Million Dollars ($1,000,000) policy limit.

14.5 Umbrella Liability

Subcontractor must provide an Umbrella form (not Excess Liability form) that provides additional liability for underlying General Liability, Auto Liability, and Employer Liability.

- Level 1 Contracts (Contract Value $200,000 to $499,999) - $1,000,000
- Level 2 Contracts (Contract Value $500,000 to $999,999) - $3,000,000
- Level 3 Contracts (Contract Value $1,000,000 & up)- $5,000,000

15.0 Contractor's License

In accordance with the State of North Carolina General Statues, Contractors performing work of this caliber in the State must be licensed to do so. A current copy of the Contractor's State of North Carolina Board for General Contractor's License must be submitted with this Proposal in the Form of Proposal. Additionally, a valid license must be maintained during the course of the work.

Contractor represents and warrants that it is fully experienced in projects of the nature, scope and magnitude of the Work, properly qualified, registered, licensed, equipped, organized and financed to perform the Work.

1.0 Drawings and Specifications

The Drawings and Specifications are complementary, one to the other. That which is shown on the Drawings or called for in the Specifications shall be as binding as if it were both called for and shown. The intention of the Drawings and Specifications is to include all labor, materials, transportation, equipment and any and all other items necessary to do a complete job which may include manufactured items and field service assistance. In case of discrepancy or disagreement in the Contract, the order of precedence shall be: Contract, Specifications, Drawings.

2.0 Clarifications and Detailed Drawings

In such cases where the nature of the work requires clarification by the Engineer, such clarification shall be furnished by the Engineer with reasonable promptness by means of written instructions or Detail Drawings or both. Clarifications and Drawings shall be consistent with the intent of Contract Documents, and shall become a part thereof.

3.0 Change in Drawings and/or Specifications

The Owner, or the Engineer on behalf of the Owner, may make changes to Drawings and/or Specifications after award of the Contract or while construction is in progress. The compensation for such changes shall be agreed upon in writing between the Contractor and the Owner prior to commencement of work involving the change. No payment shall be made to the Contractor for correcting work not in compliance with Specifications. Once the change of work has been agreed upon between all parties, the Engineer will initiate a change order.

Records of conditions above and below ground, water records or other observations which may have been made by or for Owner shall be made available to Contractor for its information, upon request. Site subsurface conditions which differ materially from the results reasonably indicated in any reports furnished by Owner or undertaken by Contractor shall be deemed to be changed work.

Except as otherwise set forth in the Contract, all loss or damage to Contractor arising out of the Work or from the action of the elements, or from any unforeseen circumstance in the prosecution of the Work including inefficiencies or claims of inefficiencies, shall be sustained and borne by Contractor at its own cost and expense.

4.0 Copies of Bid Documents

The Engineer will furnish free of charge to each pre-qualified Bidder one (1) copy of bid documents. Additional sets of these Specifications for approved Bidders, and sets for Bidders seeking approval may be obtained upon request for a non-refundable payment of Fifty Dollars ($50) per set.

5.0 Working Drawings and Specifications at the Job Site

Contractor shall maintain, in readable condition at his office, one (1) complete set of as-built working Drawings and Specifications for his work. Such Drawings and Specifications shall be available for use by the Engineer or Owner. During the course of construction, the Contractor will work diligently to keep the Owner abreast of electric system conditions, so as not to interfere with normal or emergency operations.

6.0 Ownership of Drawings and Specifications

All Drawings and Specifications are instruments of service and remain the property of the Engineer whose name appears thereon. The use of these instruments on work other than this Contract without permission is prohibited. All copies of Drawings and Specifications other than Contract copies shall be returned to the Engineer upon request after completion of the work.

7.0 Materials, Equipment, And Employees

7.1 The Contractor shall, unless otherwise specified, supply and pay for all labor, equipment, transportation, tools, apparatus, lights, heat, sanitary facilities, water, and incidentals necessary for the entire proper and substantial completion of his work. The Contractor shall

install, maintain, and remove all equipment of the construction and be responsible for the safe, proper, and lawful construction, maintenance, and use of same. The Contractor shall construct, in the best and most workmanlike manner, a complete job and everything incidental thereto, as shown on the Plans, stated in the Specifications, or reasonably implied there from, all in accordance with the Contract Documents. Some of the major material items required for the work will be furnished by the Owner as outlined in the Technical Specifications. **All other necessary materials are to be furnished by the Contractor as outlined in** the Technical Specifications.

7.2 The Contractor shall not re- use any "removed" materials in the completion of this project unless indicated as a transfer unit on the construction drawings. Materials damaged or lost during construction of the work due to carelessness of the Contractor's personnel, shall be replaced in kind by the Contractor at no cost to the Owner.

7.3 If at any time during the construction and completion of the work covered by these Specifications, the conduct of any workman of the various crafts is adjudged ungentlemanly and a nuisance to the Owner or the Engineer, or if any workman is considered incompetent or detrimental to the work, the Contractor shall order such parties to be immediately removed from the grounds.

7.4 Any superintendent or foreman of the Contractor who ignores or refuses to follow written instructions of the Owner or the Engineer or his representative at the site shall be immediately removed and replaced.

7.5 The Contractor shall insure that at all times he has sufficient crew compliments, both in terms of numbers and experience of personnel to perform work tasks safely, both for workers and the general public. Any instance noted to the contrary of this requirement may result in the complete shutdown of work on the project.

8.0 Royalties, Licenses, and Patents

It is the intention of the Contract Documents that the work covered herein will not constitute in any way on an infringement on any patent whatsoever. The Contractor shall protect and save harmless the Owner against suit on account of alleged or actual infringement. The Contractor shall pay all royalties and/or license fees required on account of patented articles or processes, whether or not the patent rights are evidenced hereinafter.

9.0 Indemnification

9.1 Bidder agrees to indemnity and save GUC of the City of Greenville, Pitt County, North Carolina, and the City of Greenville, North Carolina, its co-owners, joint-venturers, agents, employees, and insurance carriers harmless from any and all Third Party claims, actions, costs, expenses, including reasonable attorney fees, judgments, or other damages resulting from injury to any person (including injury resulting in death), or damage (including loss or destruction) to third party tangible property arising out of the negligent performance of the terms of this Contract by Bidder; including, but not limited to, Bidder's employees, agents, subcontractors, and others designated by Bidder to perform work or services in, about, or attendant to, the work and services under the terms of this Contract. Bidder shall not be held responsible for any losses, expenses, claims, subrogation, actions, costs, judgments, or other damages, directly and proximately caused by the negligence of Greenville Utilities Commission of the City of Greenville, Pitt County, North Carolina. Insurance covering this indemnity agreement by Bidder in favor of Greenville Utilities Commission of the City of Greenville, Pitt County, North Carolina, and the City of Greenville, North Carolina, shall be provided by the Bidder.

10.0 Surveys

Unless otherwise specified, the Owner, will furnish all surveys and locations for locating the principal component parts of the work. Stakes missing at the time of construction will be replaced within a reasonable amount of time after notification by the Contractor.

11.0 Uncorrected Faulty Work

The Contractor shall be notified of faulty or damaged work and shall have the option to respond in a reasonable period of time. Should the correction of faulty or damaged work be considered inadvisable or inexpedient by the Owner or the Engineer, the Owner shall be reimbursed by the Contractor for the same by a deduction in the Contract prices arrived at by a fair estimate of the probable cost of correction, approved by the Engineer.

12.0 Delays and Extension of Time

12.1 The time to be allowed for construction of these facilities is stated in the Instructions to Bidders. The Contractor, upon notice of award of Contract, shall prepare a construction schedule based on the allowed time, and submit such schedule to the Engineer for approval. A Pre-Construction Conference will be scheduled for all parties concerned.

12.2 If the Contractor is delayed at any time in the progress of the work by any act of negligence by the Owner or the Engineer, or by any separate Contractor employed by the Owner or by changes ordered in the work, then the time of completion shall be extended for such reasonable time as the Engineer may decide.

12.3 No extension of time for completion will be made for ordinary delays and accidents. Extensions may be granted for delays ordered by the Owner or the Engineer if the request has been made in writing within forty-eight (48) hours after the order to cease work has been given.

13.0 Liquidated Damages

Time is of the essence, and it is critical that the work be performed on schedule and time is allowed for the completion of the work in the Contract Agreement included herewith. Damages for delay shall be at the rate of **five-hundred dollars ($500.00) per calendar day** for failure of the Contractor to complete the work within the Construction Schedule. No credit shall be given for early completion of the work.

14.0 Correction of Work Before Final Payment

14.1 Any work, materials, or other parts of the work which have been condemned or declared not in accordance with the Contract by the Owner or the Engineer shall be removed from the work site by the Contractor and shall be immediately replaced by new work in accordance with the Contract at no additional cost to the Owner. Work or property of others or the Owner damaged or destroyed by virtue of such faulty work shall be made good at the expense of the Contractor whose work is faulty.

14.2 Correction of condemned work described above shall commence within twenty-four (24) hours after receipt of notice from the Owner or the Engineer and shall be pursued to completion.

14.3 Final payment will not be made until certificates of the Engineer have been duly issued.

15.0 Correction of Work AFTER Final Payment

Neither the final certificate, final payment, acceptance of the premises by the Owner, nor any provision of the Contract, nor any other act or instrument of the Owner or Engineer shall relieve the Contractor from responsibility for negligence, or faulty materials or workmanship, or failure to comply with the Drawings and Specifications. He shall correct or make good any defects due thereto and repair any damage resulting there from which may appear during the period of the guarantee following final acceptance of the work by the Owner. The Owner will report any defects as they may appear to the Engineer who will give the instructions for a time limit for completion of corrections to the Contractor.

16.0 The Owner's Right to Perform Work

The Owner may perform or have performed by others work which is described in the Specifications to be performed by the Contractor, due to early delivery of equipment prior to the execution of this Contract. Upon the execution of the contract, the work performed will be deducted from the Contractor's price by the unit price set forth in the *Form of Proposal*.

If during the progress of the work or during the period of guarantee, the Contractor fails to execute the work properly or to perform any provision of the Contract, the Owner, after five (5) days' written notice to the Contractor from the Engineer or the Owner, may perform or have performed that portion of the work and may deduct the cost thereof from any amounts due or to become due the Contractor, such action and cost of same having been first approved by the Engineer. Should the cost of such action of the Owner exceed the amount due or to become due the Contractor, then the Contractor or his surety, or both, shall be liable for and shall pay to the Owner the amount of said excess.

17.0 Contractor's Affidavit

The final payment of retained amount due the Contractor on account of the Contract shall not become due until the Contractor has furnished to the Owner, with a copy to the Engineer, an affidavit signed, sworn and notarized to the effect that all payments for materials, services, or any other reason in connection with his Contract have been satisfied and that no claims or liens exist against the Contractor in connection with this Contract. In the event that the Contractor cannot obtain similar affidavits from Subcontractors to protect the Contractor and the Owner from possible liens or claims against the Subcontractor, the Contractor shall state in his affidavit that no claims or liens exist against any Subcontractor to the best of his (the Contractor's) knowledge and if any appear afterwards, the Contractor shall save the Owner harmless on account thereof.

18.0 Assignments

The Contractor shall not assign any portion of this Contract nor subcontract it in its entirety. Except as may be required under terms of the Payment and/or Performance Bond, no funds or sums of money due or to become due the Contractor under this Contract may be assigned.

19.0 Guarantee

The Contractor shall guarantee his work against defect due to faulty workmanship or negligence for a period of two (2) years following final acceptance of the work. He shall make good such defective workmanship and any damage resulting therefrom without cost to the Owner.

20.0 Engineer's Status

The Engineer has authority to stop the work whenever such stoppage may be necessary to ensure the proper execution of the Contract. He shall also have authority to reject all work and materials which do not conform to the Contract, to direct the application of forces to any portion of the work as in his judgment is required, to order the forces increased or diminished, and to decide questions which arise in the execution of the work.

The Engineer is the interpreter of the conditions of the Contract and the judge of its performance, and he shall use his powers under the Contract to enforce its faithful performance.

21.0 Engineer's Decisions

The Engineer shall, within a reasonable time after their presentation to him, make decisions on all claims of the Contractor and on all other matters relating to the execution and progress of the work or the interpretation of the Contract Documents. All such decisions by the Engineer shall be final.

22.0 Right-Of-Way

The Owner will obtain all easements and/or rights-of-way required for the project.

23.0 Accidents

The Contractor shall provide at the site such equipment and medical facilities as are necessary to supply first-aid service to anyone who may be injured in connection with the work. The Contractor will provide a written report to the Owner of all accidents within twenty-four (24) hours of the event.

24.0 Equal Employment Opportunity

During the performance of this Contract, the Contractor agrees as follows:

24.1 The Contractor will not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap. The Contractor will take affirmative action to ensure that applicants are employed and that employees are treated during employment without regard to race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap. Such action shall include but not be limited to the following employment, upgrading, demotion or transfer, recruitment or recruitment advertising, layoff or termination, rates of pay or other forms of compensation and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places available to employees and applicants for employment notices setting forth the provisions of the nondiscrimination clause.

24.2 The Contractor will, in all solicitations or advertisements for employees placed by or on behalf of the Contractor, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, national origin, political affiliation or belief, age, or physical handicap.

24.3 The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or other understanding, a notice advertising the labor union or workers' representative of the Contractor's commitments under the Equal Employment Opportunity Section of this Contract and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

24.4 In the event of the Contractor's noncompliance with the nondiscrimination clauses of this Contract or with any of such rules, regulations, or orders, this Contract may be canceled, terminated, or suspended in whole or in part and the Contractor may be declared ineligible for further Owner contracts.

24.5 The owner has adopted an Affirmative Action & Minority & Women Business Enterprise Plan (M/WBE) Program. Contractors submitting a proposal are attesting that they also have taken affirmative action to ensure equality of opportunity in all aspects of employment, and to utilize M/WBE supplies of material and/or labor.

25.0 Mediation/Binding Arbitration

In the event of any dispute between the Parties, the Parties agree to submit any dispute to non-binding mediation before a mutually agreeable Mediator prior to initiating litigation. If the Parties are unable to agree upon a Mediator within thirty (30) days after demand therefore, either Party may petition a Court of competent jurisdiction for the designation of a qualified Mediator for these purposes. Each Party shall bear its own costs and expenses of participating in the mediation (including, without limitation, reasonable attorneys' fees), and each Party shall bear one-half (1/2) of the costs and expenses of the Mediator. Unless otherwise agreed, the Parties will hold the mediation in Greenville, North Carolina. The matters discussed or revealed in the mediation session shall not be disclosed in any subsequent litigation.

In the event the matter is not resolved in mediation, either Party may request arbitration. The parties shall jointly select an Arbitrator, and shall be bound by the decision of the Arbitrator with respect to any dispute between the parties with respect to this Agreement. If the parties are unable to mutually agree upon an Arbitrator, the Parties shall each select an Arbitrator, and the two Arbitrators so selected shall select a third Arbitrator, and the decision of the majority of the Arbitrators shall be conclusive and binding upon the Parties. The Parties at all times agree to equally split the costs of any Arbitrator(s) selected in an effort to resolve the dispute between the Parties. Any party desiring

to resolve a dispute under the terms of this Agreement shall notify the other Party in writing, and the Parties shall seek to agree upon a mutually agreed-upon Arbitrator within a period of ten (10) days from the date of such written demand. If the Parties are unable to agree within such ten (10) day period, the Parties shall each select an Arbitrator, and the two (2) Arbitrators so selected shall select a third Arbitrator within fifteen (15) days from the date of the written demand for arbitration, and a decision shall be rendered by the Arbitrator(s) so selected within five (5) days after such Arbitrator(s) is selected.

26.0 Government Restrictions

In the event any Governmental restrictions may be imposed which would necessitate alteration of the material, quality, workmanship, or performance of the items offered on this bid prior to their delivery, it shall be the responsibility of the successful Bidder to notify the GUC Procurement Coordinator, at once, indicating in its letter the specific regulation which required such alterations. GUC reserves the right to accept any such alterations, including any price adjustments occasioned thereby, or, in the sole discretion of GUC, to cancel the contract

27.0 Patents and Copyrights

The Bidder shall hold and save GUC, its officers, agents, and employees, harmless from liability of any kind, including costs and expenses, including reasonable attorney fees, on account of any copyrighted articles or any patented or unpatented invention, device or appliance manufactured or used in the performance of this contract.

28.0 Patent and Copyright Indemnity

The Bidder will defend or settle, at its own expense, any action brought against GUC to the extent that it is based on a claim that the product(s) provided pursuant to this agreement infringe any U.S. copyright or patent; and will pay those costs, damages, and attorney fees finally awarded against GUC in any such action attributable to any such claim, but such defense, settlements, and payments are conditioned on the following: (1) that Bidder shall be notified promptly in writing by GUC of any such claim; (2) that Bidder shall have sole control of the defense of any action on such claim and of all negotiations for its settlement or compromise; (3) that GUC shall cooperate with Bidder in a reasonable way to facilitate the settlement of defense of such claim; (4) that such claim does not arise from GUC modifications not authorized by the Bidder or from the use of combination of products provided by the Bidder with products provided by GUC or by others; and (5) should such product(s) become, or in the Bidder's opinion likely to become, the subject of such claim of infringement, then GUC shall permit Bidder, at Bidder's option and expense, either to procure for GUC the right to continue using the product(s), or replace or modify the same so that it becomes non-infringing and performs in a substantially similar manner to the original product.

29.0 Exceptions

All proposals are subject to the terms and conditions outlined herein. All responses will be controlled by such terms and conditions and the submission of other terms and conditions, price catalogs, and other documents as part of a Bidder's response will be waived and have no effect on this Request for Proposal or any other contract that may be awarded resulting from this solicitation. The submission of any other terms and conditions by a Bidder may be grounds for rejection of the Bidder's proposal. The Bidder specifically agrees to the terms and conditions set forth in this set of Terms and Conditions by affixing its name on the signatory page contained herein.

30.0 Confidential Information

GUC will keep trade secrets which the Bidder does not wish to be disclosed, except as provided by statute and rule of law. Each page shall be identified in boldface at the top and bottom as "CONFIDENTIAL" by the Bidder. Cost information shall not be deemed confidential. The determination of whether a matter is confidential will be determined by North Carolina law.

31.0 Assignment

No assignment of the Bidder's obligations or the Bidder's right to receive payment hereunder shall be permitted without the express written consent of GUC, provided however, upon written request approved by the GUC Procurement Coordinator, solely as a convenience to the Bidder, GUC may:

- Forward the Bidder's payment check directly to any person or entity designated by the Bidder, and
- Include any person or entity designated by Bidder as a joint payee on the Bidder's payment check.
- In no event shall such approval and action obligate GUC to anyone other than the Bidder, and the Bidder shall remain responsible for fulfillment of all contract obligations.

32.0 Availability of Funds

Any and all payments of compensation of this specific transaction and any continuation or any renewal or extension are dependent upon and subject to the allocation of GUC funds for the purpose set forth in this Agreement.

33.0 Governing Laws

All contracts, transactions, agreements, etc., are made under and shall be governed by and construed in accordance with the laws of the State of North Carolina.

34.0 Administrative Code

Bids, proposals, and awards are subject to applicable provisions of the North Carolina Administrative Code.

35.0 Execution

In the discretion of GUC, failure of a duly authorized official of Bidder to sign the Signatory Page may render the bid invalid.

36.0 Clarifications/Interpretations

Any and all questions regarding these Terms and Conditions must be addressed to the GUC Procurement Coordinator. Do not contact the user directly. **These Terms and Conditions are a complete statement of the parties' agreement and may only be modified in writing signed by Bidder and the GUC Procurement Coordinator.**

37.0 Situs

The place of all contracts, transactions, agreements, their situs and forum, shall be North Carolina, where all matters, whether in contract or tort, relating to the validity, construction, interpretation, and enforcement shall be determined.

38.0 Termination of Agreement

GUC or Bidder may terminate this Agreement for just cause at any time. Bidder will be paid for all time and expenses incurred as of the termination date. Termination for just cause by either party shall be by certified letter and shall be effective thirty (30) days after signed and acknowledged receipt of said letter. Just cause shall be based on reasonable grounds, and there must be a fair and honest cause or reason for such action. The causes for termination, include, but are not limited to: (1) Bidder's persistent failure to perform in accordance with the Terms and Conditions, (2) Bidder's disregard of laws and regulations related to this transaction, and/or (3) Bidder's substantial violation of the provisions of the Terms and Conditions

39.0 Force Majeure

Neither party shall be considered in default in the performance of its obligations hereunder to the extent that the performance of any such obligation is prevented or delayed by any cause, existing or future, which is beyond the reasonable control of such party. In any such event of force majeure, the parties shall advise each other of such event, and the parties shall negotiate an equitable adjustment to their respective obligations under this Agreement.

40.0 Integrated Contract

These Terms and Conditions, Instructions to Bidders, Specifications, and the selected Bidder's bid represents the entire contract between the Parties. No verbal or other written agreement(s) shall be held to vary the provisions of this Agreement.

41.0 Contract Provisions

Each of the provisions of these Terms and Conditions shall apply to the full extent permitted by law, and the invalidity in whole or in part of any provision shall not affect the remainder of such provision or any other provisions.

42.0 E-Verify

E-Verify - I understand that E-Verify is the federal E-Verify program operated by the United States Department of Homeland Security and other federal agencies, or any successor or equivalent program used to verify the work authorization of newly hired employees pursuant to federal law in accordance with NCGS §64-25 et seq. I am aware of and in compliance with the requirements of E-Verify and Article 2 of Chapter 64 of the North Carolina General Statutes. To the best of my knowledge, any subcontractors employed by me as a part of this contract are in compliance with the requirements of E-Verify and Article 2 of Chapter 64 of the North Carolina General Statutes.

43.0 Iran Divestment Act Certification

By acceptance of this purchase order, Vendor/Contractor certifies that, as of the date of the purchase order or contract, it is not on the Final Divestment List as created by the State Treasurer pursuant to N.C.G.S. § 143-6A-4. In compliance with the requirements of the Iran Divestment Act and N.C.G.S. § 143C-6A-5(b), Vendor/Contractor shall not utilize in the performance of the contract any subcontractor that is identified on the Final Divestment List.

44.0 Notices

Notices to the Parties should be sent to the names and addresses specified below:

Mr. Cleve Haddock, CLGPO
Procurement Coordinator
Greenville Utilities Commission
P.O. Box 1847
Greenville, NC 27835-1847

1.0 Defective Workmanship

The acceptance of any workmanship by the Owner shall not preclude the subsequent rejection thereof if such workmanship shall be found to be defective after installation, and any such workmanship found defective before final acceptance of the work or within two (2) years after completion shall be remedied or replaced, as the case may be, by and at the expense of the Contractor. In the event of failure by the Contractor to do so, the Owner may remedy such defective workmanship and in such event the Contractor shall pay to the Owner the cost and expense thereof. The Contractor shall not be entitled to any payment hereunder so long as any defective workmanship, of which the Contractor shall have had notice, shall not have been remedied or replaced, as the case may be.

2.0 Materials

2.1 At or prior to the commencement of construction, the Owner shall make available to the Contractor all materials which the Owner has on hand, and from time to time as such additional deliveries of materials, if any, are received by the Owner, the Owner shall make such materials available to the Contractor; Provided, however, that the Contractor or his authorized representative shall give to the Owner a receipt in such form as the Owner shall approve for all materials furnished to the Contractor by the Owner. Upon completion of the project, the Contractor shall return all materials furnished by the Owner which are in excess of those required for the construction. Excess will be determined by comparison of Contractor's material receipts with final inventory as approved by the Owner. The Contractor shall also return to the Owner all material, usable and scrap, removed during construction. The Contractor will reimburse the Owner, at the current invoice cost to the Owner, for loss and/or breakage resulting from Contractor's negligence, of materials furnished to the Contractor by the Owner.

The winning Bidder will use the material package supplied by the Owner. The structures and equipment list is located in the Appendices.

2.2 The project foundation details (as applicable) will be provided to the Contractor prior to start of construction.

3.0 Defective Materials (Supplied by Contractor)

3.1 All materials supplied by the Contractor shall be subject to the inspection, tests and approval of the Owner. The Contractor shall furnish all information required concerning the nature or source of any materials and provide adequate facilities for testing and inspecting the materials at the plant of the Contractor.

3.2 The materials furnished hereunder shall become the property of the Owner when delivered at the point to which shipment is to be made. The Owner may, however, reject any materials and/or warranties of the Contractor and manufacturers. Recognition and subsequent rejection of any defective materials may occur either before or after incorporation of such materials into the work, provided such rejection is made within one (1) year of date of delivery of the materials. Upon any such rejection, the Contractor shall replace the rejected materials with materials complying with the Specification for Materials and warranties at the substation site. The Owner shall return the rejected materials F.O.B. truck at the same destination. In the event of the failure of the Contractor to so replace rejected materials, the Owner shall make such replacement and the cost and expense thereof shall be paid by and recoverable from the Contractor.

4.0 Storage of Materials

The pole line structures for this construction will be delivered and stored in the vicinity of Bells Fork Substation site, shown on the Vicinity Map in the Appendices. All other materials furnished by Owner shall be issued from the Owner's warehouse located at 801 Mumford Road, Greenville, North

Carolina. All driveways and public roadways must be kept clear. No parking, storage or staging of materials shall be placed in a driveway or roadway, causing said roadway impassable any time.

5.0 Protection to Persons and Property

The Contractor shall at all times take all reasonable precautions for the safety of employees on the work and of the public, and shall comply with all applicable provisions of Federal, State, and Municipal safety laws and building and construction codes, as well as the safety rules and regulations of the Owner. All machinery and equipment and other physical hazards shall be guarded in accordance with the "Manual of Accident Prevention in Construction" of the Associated General Contractors of America unless such instructions are incompatible with Federal, State, or Municipal laws or regulations.

The following provisions shall not limit the generality of the above requirements:

5.1 The Contractor shall so conduct the construction as to cause the least possible obstruction of public highways or streets.

5.2 The Contractor shall provide and maintain all such guard lights and other protection for the public as may be required by applicable statutes, ordinances, and regulations or by local conditions.

5.3 The Contractor shall do all things necessary or expedient to protect properly any and all parallel, converging, and intersecting lines, joint line poles, highways, railways and any and all property of others from damage, and in the event that any such parallel, converging and intersecting lines, joint line poles, highways, railways or other property are damaged in the course of the construction of the line, the Contractor shall at his own expense immediately restore any or all of such damaged property to as good a state as before such damage occurred.

5.4 The Contractor shall enter and exit the right-of-way at those locations specified by Owner or the Engineer.

It shall be the responsibility of the Contractor to maintain safe and unobstructed control of traffic along all state roads, highways, and all other streets within the project area. The Contractor shall obtain sufficient and suitable traffic cones, barriers, warning signs, and other devices necessary to maintain a safe work environment for crews and the general public. Traffic control must be provided for in accordance with the Manual of Uniform Traffic Control Devices (MUTCD), the North Carolina Department of Transportation (NC D.O.T.) Supplement to the MUTCD, all local ordinances, and as approved by local and state authorities.

5.5 All ditches and access ways disturbed shall be returned to their pre-existing condition at the end of construction.

5.6 Any and all excess earth, rock, debris, underbrush, and other useless material shall be removed by the Contractor from the site of the work as rapidly as practicable as the work progresses.

5.7 Before beginning work in or around any areas where underground facilities are known to exist, the Contractor shall locate all such facilities including water, sewer, gas, telephone and electrical lines.

5.8 Upon violation by the Contractor of any provisions of this section, after written notice of such violation given to the Contractor by the Owner, the Contractor shall immediately correct such violation. Upon failure of the Contractor to do so, the Owner may correct such violation at the Contractor's expense.

5.9 The Contractor shall submit to the Owner monthly reports in duplicate of all accidents, giving such data as may be prescribed by the Owner.

6.0 Supervision and Inspection

6.1 The Contractor shall cause the construction work to receive constant supervision by a competent superintendent (hereinafter called the "Superintendent") who shall be present at all times during working hours where construction is being carried on. The Contractor shall also employ, in connection with the construction of the substation capable, experienced, and reliable foremen and such skilled workmen as may be required for the various classes of work to be performed. Directions and instructions given to the Superintendent by the Owner shall be binding upon the Contractor.

6.2 The Owner reserves the right to require the removal from the project of any employee of the Contractor if, in the judgment of the Owner, such removal shall be necessary in order to protect the interest of the Owner. The Owner shall have the right to require the Contractor to increase the number of his employees and to increase or change the amount or kind of tools and equipment if at any time the progress of the work shall be unsatisfactory to the Owner; the failure of the Owner to give any such directions shall not relieve the Contractor of his obligations to complete the work within the time and in the manner specified in this Proposal.

6.3 The manner of performance of the work, and all equipment used therein, shall be subject to the inspection, tests and approval of the Owner. The Contractor shall have an authorized agent accompany the Owner when final inspection is made and, if requested by the Owner, when any other inspection is made.

6.4 In the event that the Owner shall determine that the construction contains or may contain numerous defects, it shall be the duty of the Contractor, if requested by the Owner to have an inspection made by the Engineer for the purpose of determining the exact nature, extent, and location of such defects.

7.0 Temporary Construction

All temporary construction required to accomplish the work covered in these Specifications shall be the sole responsibility of the Contractor. The Contractor shall furnish all labor and materials necessary for temporary construction including the installation and removal of structures, poles, insulators, hardware, guys, anchors, etc. All materials used for temporary construction shall be removed from the site as soon as practicable and the site restored to as good a state as before such construction. All temporary materials supplied by the Contractor will remain the property of the Contractor. All temporary construction shall be performed and shall adhere to the same safety and code requirements as the proposed work and shall be covered by all requirements of these Plans, Specifications, and Contract Documents.

No extra pay item will be issued for temporary construction, or for subsequent removal of same.

8.0 Normal Work Week

8.1 The Contractor shall provide the Owner quoted prices on a per-hour basis, for various personnel and equipment, assuming a normal work week as being forty (40) hours.

8.2 The Contractor shall state in the Proposal his normal work week for the project.

8.3 Work on weekends or generally accepted holidays will only be allowed if specific outage arrangements are required or the Contractor falls behind in meeting the project's scheduled completion date.

8.4 The Contractor will not be paid for inclement weather days or for travel time to and from the job site, unless expressly requested by the Contractor as a written stipulation to his original Proposal.

9.0 Job-Site Obligations

9.1 Except as otherwise provided in the Contract, necessary sanitary conveniences for use by the Contractor's employees and Subcontractors at the Jobsite shall be furnished and maintained

by the Contractor in such manner and at such locations as shall be approved by the Company Representative and their use shall be strictly enforced.

9.2 The Contractor shall, at all times, keep its work areas in a neat, clean, and safe condition. The Contractor shall be responsible for continuous clean up and removal of its trash, debris, waste materials and scrap and disposal of same off the Jobsite. Upon completion of any portion of the Work, the Contractor shall immediately remove all of its equipment, construction plant, temporary structures and surplus materials not to be used at or near the same location during later stages of the Work. Upon completion of the Work and before final payment is made, the Contractor shall, at its expense, satisfactorily dispose of all plant, buildings, rubbish, unused materials, and other equipment and materials belonging to it or used in the performance of the Work, including return to the Owner's warehouse or designated lay down area(s), at the Owner's option of any salvageable materials for which the Owner has reimbursed the Contractor or that has been supplied by the Owner for incorporation into the Work but not used; and the Contractor shall leave the premises in a neat, clean and safe condition acceptable to the Company Representative. In the event of the Contractor's failure to comply with the foregoing, the same may be accomplished by the Owner at the Contractor's expense.

9.3 The Owner reserves the right to authorize its agents or designees to enter the Jobsite as it may elect for the purpose of inspecting the Work, or constructing or installing such collateral work as it may desire, or testing, boring or surveying, or any other purpose.

9.4 The Contractor understands and agrees that duly authorized representatives of government agencies having appropriate jurisdiction may enter the Jobsite at any time and from time to time.

9.5 If any Work or part thereof shall be covered contrary to the requirements of the Contract or the request of the Owner or Engineer, it must, if required by the Company Representative, be uncovered for observation and inspection and covered again at the Contractor's sole expense.

9.6 If any other Work that the Company Representative has not specifically requested to observe and inspect prior to being covered has been covered, the Owner or Engineer may request to see such Work or part thereof and it shall be uncovered by the Contractor. If such Work or part thereof is found to be in accordance with the Contract, the cost of uncovering and covering again shall, by appropriate Change Form, be charged to the Owner. If such Work or part thereof fails to meet the requirements of the Contract, the Contractor shall pay all costs of uncovering, correcting, and covering again and any additional costs resulting there from.

9.7 The Contractor shall conduct daily and weekly on-site safety meetings at the beginning of each work period. These meetings should not preclude the Contractor from conducting tailgate safety meetings before each new work period, after break, different work assignments, etc. as determined by OSHA and other applicable safety laws and regulations. In addition, the Contractor shall be required to attend onsite safety meetings with the Owner.

9.8 All personnel / visitors / individuals shall have a safety briefing by the Contractor prior to entering the energized substation area.

9.9 The Contractor shall facilitate a formal safety program for all individuals entering the site.

9.10 The Contractor shall provide the Owner a copy of the Contractor's Safety Manual, outlining policies, procedures, documentation and training. The Owner will provide the Contractor with a copy of the Owner's Safety Manual. The Contractor shall perform the work using the more stringent of the two policies.

CONTRACT AGREEMENT

THIS CONTRACT, made this _____ day _____, 2016, by _____, hereinafter called Bidder, and GREENVILLE UTILITIES COMMISSION (GUC) OF THE CITY OF GREENVILLE, PITT COUNTY, NORTH CAROLINA, a corporation, hereinafter called the Owner.

WITNESSETH

THAT WHEREAS, a Contract for

GREENVILLE UTILITIES COMMISSION
WORK FOR 230kV POD TO BELLS FORK
115kV TRANSMISSION LINE

has recently been awarded to Bidder by the Owner at and for a total price of _____ AND 00/100 ($ _____) named in the Bidder's Proposal attached hereto;

AND WHEREAS, it was provided in said award that a formal Contract would be executed by and between Bidder and Owner, evidencing the terms of said award, and that Bidder would commence the work to be performed under this agreement on a date to be specified in a written order of Owner, and would fully complete all work thereunder no later than 60 days from the date of contract.

NOW, THEREFORE, Bidder doth hereby covenant and agree with Owner that it will well and faithfully perform and execute such work and furnish such work and furnish such materials and equipment in accordance with each and every one of the conditions, covenants, stipulations, terms, and provisions contained in said Specifications in accordance with the Plans, at the total price named therefore in the Bidder's Proposal attached hereto, and will well and faithfully comply with and perform each and every obligation imposed upon it by said Plans and Specifications and the terms of said award.

Bidder shall promptly make payments to all laborers and others employed thereon.

Bidder shall be responsible for all damages to the property of the Owner that may be consequent upon the normal procedure of its work or that may be caused by or result from the negligence of Bidder, its employees, or agents during the progress of or connected with the prosecution of the work, whether within the limits of the work or elsewhere. Bidder must restore all property so injured to a condition as good as it was when Bidder entered upon the work.

By execution of this Contract, both parties acknowledge the following conditions as a part of their respective obligations:

a) Governing Law - This Contract shall be construed and enforced in accordance with the laws of the State of North Carolina. All parties agree to the jurisdiction of the Courts of North Carolina with respect to any action or dispute arising between the parties.

b) Further Assurances - The parties hereto agree to execute and deliver any and all papers and documents which may be necessary to carry out the terms of this Contract.

c) Entire Contract - This Contract (including materials incorporated herein by reference) constitutes the entire agreement between the parties hereto and there are no agreements, representations, or warranties which are not set forth herein. All prior negotiations, agreements, and understandings are superseded hereby. This Contract may not be amended or revised except by a writing signed by all parties hereto. This Contract shall be construed and interpreted without any presumption either for or against the party who caused its preparation.

d) Binding Effect - This Contract shall be binding upon an inure to the benefit of the heirs, legal representatives, successors and assigns of the respective parties hereto, provided that this Contract and all rights hereunder may not be assigned by any party hereto without the written consent of the other party.

e) Time of Performance - Time is of the essence with regard to the performance of this Contract.

f) Survivability - The terms of this Contract shall survive execution and delivery of any deeds or bills of sale called for hereunder.

g) Headings - The headings in the paragraphs of this Contract are inserted for convenience only and do not constitute a part hereof.

Bidder shall furthermore be responsible for and required to make good at its expense any and all damages of whatever nature to persons or property arising during the period of the Contract caused by carelessness, neglect, or want of due precaution on the part of Bidder, its agents, employees, or workmen. Bidder shall also indemnify and save harmless the Owner, and the officers and agents thereof, from all third party claims, suits, and proceedings of every name and description which may be brought against the Owner, or the officers and agents thereof, for or on account of any injuries or damages to persons or property received or sustained by any person or persons, firm, or corporation, by or in consequence of any materials used in said work, to the extent caused by the negligence of Bidder, its agents, employees, servants, or workmen.

It is agreed and understood that the Notice to Prospective Bidders, Definitions, Instructions to Bidders, and Technical Specifications, the accepted Bidder's Proposal, and the enumerated addenda are incorporated in this Contract by reference and are an integral part thereof as set forth herein.

And the Owner doth hereby covenant and agree with Bidder that it will pay to Bidder, when due and payable under the terms of said Specifications and said award, the above-mentioned sum; and that it will well and faithfully comply with and perform each and every obligation imposed upon it by said Specifications and the terms of said award.

Bidder shall, upon completion of all work awarded under this Contract, furnish to the Owner invoices or copies of invoices for all materials purchased for said work; and such invoices shall state the amount of North Carolina sales tax paid for said materials. Bidder shall also furnish the Owner an affidavit certifying the total costs of materials purchased for all work performed under the Contract and the total amount of state sales tax paid for said materials.

Whenever used herein, the singular shall include the plural, the plural the singular, and the use of any genders shall be applicable to all genders as the context may require.

PROVIDE CURRENT LIABILITY INSURANCE CERTIFICATE(S)
Instructions to Bidders, 14.0 Contractor's Insurance

COVERAGES:

1. Workmen's Compensation Insurance shall include all of the Bidder's employees employed at the site of the project under his Contract. In case any class of employees engaged in hazardous work under this Contract at the site of the project is not protected under the Workmen's Compensation Statute, the Bidder shall provide adequate coverage for the protection of his employees not otherwise protected.

2. Public Liability and Property Damage Insurance shall be in such amounts as to adequately protect the Owner and the Bidder from claims for damages for personal injury, including accidental death, as well as from claims for property damages which may arise from operations under this Contract, whether such operations be by himself or by anyone directly or indirectly employed by him. The amount of such insurance shall be for the following:

   Public Liability Insurance for bodily injury or death $1,000,000 for one person, and $2,000,000 for each accident.

   Property Damage Insurance $2,000,000 for each accident and $2,000,000 aggregate for accidents during the policy period.

3. Motor Vehicle Liability Insurance shall be for the following amounts:

   Bodily injury or death $1,000,000 for one person and $2,000,000 for each accident.

   Property damage is $2,000,000 for each accident.

Copies of Certificates of Insurance for all aforementioned policies shall be furnished by the Bidder and shall be attached to the respective pages of the Contract Agreement at the time of signing.

It shall be understood that the above-required insurance shall not be canceled or changed until thirty (30) days after written notice of such termination or alteration has been sent by registered mail to the certificate holder.

CERTIFICATE HOLDER:

Greenville Utilities Commission
401 South Green Street
Greenville, NC 27835-1847
Contact: Mr. Cleve Haddock
Phone: 252-551-1533

EXPIRATION:

Each certificate must not terminate before the contract completion date.

IN TESTIMONY WHEREOF, Bidder and Owner have duly signed and sealed this Contract.

BIDDER:

(Imprint Corporate Seal Below this line)

_____(SEAL)

By _____(SEAL)

Title _____

ATTEST:

By: _____

Title: _____

GREENVILLE UTILITIES COMMISSION (GUC) OF THE CITY OF GREENVILLE, PITT COUNTY, NORTH CAROLINA

By_____
Anthony C. Cannon

Title: General Manager / CEO

ATTEST:

By: _____
Amy Carson Quinn

Title: Executive Secretary

APPROVED AS TO FORM AND LEGALITY:

By: _____
Phillip R. Dixon

Title: General Counsel

CONTRACT INSTRUCTIONS

INSTRUCTIONS FOR PROPER SIGNING

If Bidder is an individual, sign on first line only and designate trade name below first line, thus:

John Jones (SEAL)
Trading as Jones Paving Company

If Bidder is a partnership, sign partnership name on first line; have at least one general (not limited) partner sign on second line, and put his designation as partner on third line, thus:

JONES PAVING COMPANY (SEAL)

By John Jones (SEAL)

Title General Partner

If Bidder is a corporation, sign corporate name on first line (exactly) as such appears on the corporate seal, have the President or a Vice President sign on second line, put his title on third line, have the Secretary or Assistant Secretary sign on the left "Attest" line (adding the word "Assistant" before the word "Secretary" if the Assistant Secretary is signing), and imprint corporate seal above the word "Attest", thus:

JONES PAVING COMPANY, INC. (SEAL)

By John Jones (SEAL)

Title President

ATTEST:

Thomas Jones
Assistant Secretary

CERTIFICATE OF ATTORNEY

GREENVILLE UTILITIES COMMISSION (GUC)
OF THE CITY OF GREENVILLE,
PITT COUNTY, NORTH CAROLINA

This is to certify I have examined the attached Contract Documents, and after such examination I am of the opinion that such Documents conform to the laws of the State of North Carolina, the execution of the Contract is in due and proper form, the representatives of the respective contracting parties have full power and authority to execute such Contract on behalf of the respective contracting parties, and the foregoing agreements constitute valid and binding obligations on such parties.

By: _____
Phillip R. Dixon

Title: General Counsel

Date: _____

This instrument has been pre-audited in the manner required by the Local Government Budget and Fiscal Control Act.

By: Jeff W. McCauley

Title: Chief Financial Officer

Date: _____

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

INSTALLATION CONTRACT FOR
230KV POD TO BELLS FORK
115kV TRANSMISSION LINE

1.2.FORM OF PROPOSAL

1.3. (Provide two (2) copies)

Respectfully submitted this ____ day of _____, 2016.

OWNER:	**BIDDER:**
Greenville Utilities Commission 401 South Greene Street Greenville, North Carolina 27834 P.O. Box 1847 Greenville, North Carolina 27835 Mr. Cleve Haddock, CLGPO Procurement Coordinator Office: 252-551-1533 Cell: 252-551-3302	NAME TITLE STREET ADDRESS CITY/STATE/ZIP PHONE: FAX: E-MAIL: SIGNATURE
MANUFACTURER OF PROPOSED EQUIPMENT MANUFACTURER STREET ADDRESS CITY / STATE / ZIP	

TERMS AND CONDITIONS

1. The undersigned, hereafter called the Contractor, hereby declares that the only person or persons interested in this Proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this Proposal or in the Contract to be entered into; that this Proposal is made without connection with any other person, company or parties making a bid or Proposal; and that it is in all respects fair and in good faith without collusion or fraud.
2. The Contractor further declares that he has examined the site of the work and informed himself fully in regard to all conditions pertaining to the locations where the work is to be done; that he has examined the Technical Specifications for the work and Contract Documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.
3. The Contractor proposes and agrees, if this Proposal is accepted, to contract with the Owner in the form of Contract specified, to furnish all necessary labor, equipment, and materials, except materials and equipment specified to be furnished by the Owner, required for the installation of the station, complete in accordance with the Plans, Specifications and Contract Documents, to the full and entire satisfaction of the Owner with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and Contract Documents, as filed on Change Order forms. No changes in work shall begin without prior written approval by the Owner or its representative Engineer.
4. The Bid Schedule is subject to the following terms and conditions which, by reference, are made a part of this Proposal.
5. The prices of materials set forth herein do not include any sums which are or may be payable by the Contractor on account of North Carolina Sales Tax upon the sale, purchase, or use of the materials hereunder, the amount thereof shall be added to the purchase price and paid by the Owner after the Contractor has ascertained the actual sales tax to be included in the Contract price.
6. The prices quoted in the Proposal shall be firm unless otherwise clearly noted in the Proposal.
7. The price quoted includes delivery FOB substation site of any equipment and materials and complete installation at substation site. The prices of the equipment and installation set forth herein shall include the cost of delivery at the Contractor's risk to the site.
8. The Contractor shall provide the Owner quoted prices on a per-hour basis, for various personnel and equipment, assuming a normal work week as being forty (40) hours.
9. The Contractor shall state his normal work week for the project:

   _____ Five (5), eight (8) hour days (Monday through Friday)

   _____ Four (4), ten (10) hour days (Monday through Thursday)

   _____ Other, _____

10. Work on weekends or generally accepted holidays will only be allowed if specific outage arrangements are required, or if the Contractor falls behind in meeting the project's scheduled completion date. If the Contractor deems this necessary, he must receive the Owner's written approval five (5) business days prior to beginning the revised work scheme.
11. The time of completion for the project is of the essence.
12. The Contractor shall submit a proposed project construction schedule with the Proposal for review and approval by the Owner and Engineer. The targeted date for completion is November 30, 2017. If this date is not possible, please present an alternate date.
13. The time for delivery and installation shall be extended for the period of any reasonable delay due exclusively to causes beyond the control and without fault of the Contractor, including acts of God, fires, floods, strikes, and delay in transportation.

14. The Contractor will not be paid for inclement weather days or for travel time to and from the job site, unless expressly requested by the Contractor as a written stipulation to his original Proposal.

15. The Contractor-furnished materials shall conform to the "Technical Specifications" attached hereto and made a part hereof.

16. Title to the materials furnished by the Contractor shall pass to the Owner upon completion of the installation at the point above specified.

17. This Proposal is made pursuant to the provisions of the Notice and Instructions to Bidders, the Specifications, and the Contractor agrees to the terms and conditions thereof.

18. The Contractor warrants the accuracy of all statements contained in the Bidders Qualifications, if any shall be submitted, and agrees that the Owner shall rely upon such accuracy as a condition of the Contract in the event that this Proposal is accepted.

19. The Contractor warrants that the Contractor-furnished Materials will conform to the performance data and guarantees attached which, by this reference, are made a part of this Proposal. Any exceptions or deviations from the Plans and Specifications must be clearly stated in the Proposal to warrant consideration.

20. The Contractor assumes liability for the proper care, handling, storage, and security of all materials furnished to the Contractor by the Owner for the project.

21. The undersigned further agrees that in case of failure on his part to execute said Contract within ten (10) consecutive calendar days after written notice has been given of the Award of the Contract, bid security accompanying this bid, and the monies payable thereon, shall be paid into the funds of the Owner's account set aside for this project, as liquidated damages for such failure, otherwise, the check, cash, or Bid Bond accompanying the Proposal shall be returned to the undersigned.

22. The Contractor shall maintain during the course of the project and shall provide the Owner/Engineer one (1) complete set of "as-constructed" drawings upon the completion of the project.

23. The Contractor warrants that it possesses Electric Utility Contractor's License for the State of North Carolina. A copy of the license shall be included in this *Form of Proposal*.

24. The Contractor shall submit, in the *Form of Proposal*, the proposed project management staff, i.e., project manager, site superintendent, general foreman, etc. The qualifications / work experience level of the Bidder's proposed work force shall be included as well. The Contractor shall provide evidence of a minimum of 60% of the proposed work force having five (5) years or more tenure with the Bidder's firm. If other personnel are actually assign to the project, similar information will be required prior to construction assignment.

25. The Contractor shall provide a list of recent projects of similar voltage class and complexity, along with the Owner and contact information of the representative who was reported to directly.

26. If the proposed staff along with their qualifications is not provided, the bid may be subject to non-compliance, thus, making it unacceptable.

27. The Contractor shall provide a list of subcontractors (if any) in the proposal and their respective support services which will be used by the Contractor when undertaking this project. All subcontractors will be subject to review and approval by the Owner.

28. A mandatory <u>pre-construction meeting</u> will be scheduled at a later time based on the construction schedule.

INSERT

ADDENDA / CLARIFICATIONS / BULLETINS

Instructions to Bidders, 4.0 Bulletins and Addenda

TRANSMISSION CONSTRUCTION ASSEMBLY UNITS

Definitions:

POLE UNITS

A pole unit consists of one pole in place. It does not include pole-top construction assembly unit or other parts attached to the pole. The first two digits indicate the length of the pole; the third digit shows the classification per ANSI (Example: 60-3 means a pole 60 feet long, Class 3.)

For Wood Poles: Species of Timber: ***Galvanized Steel Poles***

Kind of Preservative: (Check one)

1. Creosote ___; 2. Pentachlorophenol _____; 3. Copper Naphthenate _____;

4. Waterborne preservative - CCA _____ ACZA _____ ACA_____

Method of Treatment: (Check one)

1. Pressure _____; 2. Thermal Process _____

Pole Plan Under Which the Poles are to be Furnished: (Check one)

1. Insured Warranted _____; 2. Independently Inspected___X___; 3. Quality Assured _____;

4. Either Insured Warranted, Independently Inspected, or Quality Assured _____ .

(Engineer to complete above)

POLE TOP CONSTRUCTION ASSEMBLY UNITS

A pole top construction assembly unit generally consists of the insulator(s), crossarm(s), braces, and hardware, except tie wire, required to support the power conductors and overhead ground wire, as indicated on the applicable ~~RUS~~ drawing. It does not include the pole, the downlead, and butt coil, which are separate units.

CONDUCTOR CONSTRUCTION ASSEMBLY UNITS

A conductor construction assembly unit consists of 1,000 feet of a single conductor or overhead ground wire, and includes tie wire, sleeves for splicing, and armor rods with clips or armor wire where necessary. The length of conductor or overhead ground wire shall be determined by taking the sum of all straight horizontal span distances between pole stakes or from center to center of the poles carrying the conductors. The conductor sizes and types listed are the manufacturer's designation.

___X___ *Tension Stringing (Engineer check when required)*

As provided for in the specifications, prior to beginning of work, the Bidder will furnish the Engineer the following data on tension equipment:

Diameter Bull Wheel	_____ *in.*
Diameter Groove	_____ *in.*
Conductor Bending Radius	_____ *in.*
Thickness of Neoprene at Bottom of Groove	_____ *in.*
Stringing Sheave Diameter; Tangent	_____ *in., Large Angle* _____ *in.*

GUY CONSTRUCTION ASSEMBLY UNITS (TG UNITS)

A guy construction assembly unit consists of the hardware and wire. Guy guards are designated separately.

ANCHOR CONSTRUCTION ASSEMBLY UNITS

An anchor construction assembly unit consists of the anchor with rod or rods, complete, ready for attaching the guy wire.

MISCELLANEOUS CONSTRUCTION ASSEMBLY UNITS

A miscellaneous construction assembly unit consists of an additional unit needed in the Project for line construction but not otherwise listed in the Proposal.

RIGHT-OF-WAY CLEARING UNITS – *Not Applicable*

TM-12 *The unit is 1,000 feet in length and _____ in width (to be measured _____ feet on one side of pole line or centerline of structures) of actual clearing of right-of-way. This includes clearing of underbrush, tree removal, and such tree trimming as is required so that the right-of-way, except for tree stumps which shall not exceed _____ feet in height, shall be clear from the ground up on one side of the line of poles carrying conductors. The length of actual clearing shall be measured in a straight line parallel to the horizontal line between poles or centerline of structures and across the maximum dimension of foliage cleared projected to the ground line. All trees and underbrush across the width of the right-of-way shall be considered to be grouped together as a single length in measuring the total length of clearing. Spaces along the right-of-way in which no trees are to be removed or trimmed or underbrush cleared shall be omitted from the total measurement. All length thus arrived at, added together and divided by 1,000 shall give the number of 1,000-foot TM-12 units of clearing. The Bidder shall not remove or trim shade, fruit, or ornamental trees unless so directed by the Engineer in writing.*

TM-12 (1). *This unit is identical with TM-12, except the full width of the right-of-way to be cleared shall be _____ feet wide (to be measured _____ feet on each side of the pole line or centerline of structures).*

TMC-12, TMC-12 (1). *These units are identical to the respective TM units except that chemical treatment of stumps is required in addition to the clearing of underbrush, tree removal and tree trimming.*

TM-13. *The unit, for purpose of quoting, is 1,000 feet in length of clearing off the right-of-way. The Engineer will select those trees off the right-of-way that the Engineer deems to be a hazard to the line and will designate them to the Bidder in writing as danger trees. When so designated, the Bidder shall remove or top such trees at the Bidder's option except that the Bidder shall trim and not remove shade, fruit, or ornamental trees unless otherwise directed by the Engineer in writing.*

The measurement of the length of clearing off the right-of-way shall be considered as a straight line parallel to the horizontal line between poles or centerline of structures, such measurement of length to be based on maximum dimension of foliage (not trunk) projected to the ground line. Dead trees having no foliage shall be measured across the maximum dimension and multiplied by two. Each tree so removed shall be added together to determine the total length of clearing. All length thus arrived at, added together and divided by 1,000, shall give the number of TM-13 units.

TM-14. *The unit is 1,000 feet in length and _____ feet in width (to be measured _____ feet on one side of right-of-way centerline) of actual clearing of right-of-way. Trees and underbrush should be cleared from the ground up within 10 feet of any structure location. The Engineer will mark the trees and brush to be cleared to provide "undulating" boundaries. Low growing trees and brush are to be left in the right-of-way to the extent it will not be hazardous to the line or will not interfere with the access road.*

The length of actual clearing shall be measured in a straight line parallel to the horizontal line between poles or centerline of structures and across the maximum dimension of foliage cleared projected to the groundline All trees and underbrush cleared across the right-of-way shall be considered to be grouped together as a single length in measuring the total length of clearing. Spaces along the right-of-way in which no trees are to be removed or trimmed or underbrush cleared shall be omitted from the total measurement.

TM-14 (1). *This unit is identical with TM-14 except the full width of the right-of-way to be cleared shall be _____) feet in width (to be measured _____ feet wide).*

TM-15. *The unit is 1,000 feet in length and _____ feet in width (to be measured _____ feet on one side of the right-of-way centerline) of actual clearing of the right-of-way. Trees and underbrush should be cleared from ground up within 10 feet of any structure location. The Engineer will mark the trees and brush to be cleared to provide a "feathered" appearance in the right-of-way. Low growing trees and brush are to be left in the right-of-way to the extent it will not be hazardous to the line or will not interfere with the access road.*

The length of actual clearing shall be measured in a straight line parallel to the horizontal line between poles or centerline of structures and across the maximum dimension of foliage cleared projected to ground line. All trees and underbrush cleared across the right-of-way shall be considered to be grouped together as a single length in measuring the total length of clearing. Spaces along the right-of-way which no trees are to be removed or trimmed or underbrush cleared shall be omitted from the total measurement.

TM-15 (1). *This unit is identical to TM-15 except the full width of the right-of-way to be cleared shall be _____ feet wide.*

Additional Requirements. *(When specifying TM units denote type of disposal (A or B).)*

A. *Trees, brush, branches and refuse shall, without delay, be disposed of by one of the following methods as the Engineer will direct (Engineer to strike out methods not to be used):*
   1. *Burned*
   2. *Piled on one side of right-of-way*

3. *Roller chopped and left on right-of-way in such a manner as not to obstruct roads, ditches, drains, etc.*
4. *Other (describe)* _____

B. *Trees that are felled shall be cut to commercial wood lengths, stacked neatly, and left on the right-of-way for the landowner. Commercial wood length means the length designated by the Engineer but in no case shall it be required to be less than _____ feet. Brush, branches, and refuse shall, without delay, be disposed of by such of the following methods as the Engineer will direct (Engineer to strike out methods not to be used):*

1. *Burned*
2. *Piled on one side of right-of-way*
3. *Roller chopped and left on right-of-way in such a manner as not to obstruct roads, ditches, drains, etc.*
4. *Other (describe)* _____

STEEL POLE TRANSMISSION CONSTRUCTION ASSEMBLY UNITS - NEW

Structure Number	Unit Number	Embedment Depth	NO. OF UNITS	Unit Price			EXTENDED PRICE
				Labor	Materials	Labor & Materials	Labor & Materials
Part 1a - Pole Units - Galvanized Steel Direct Embedded							
GUC-TAP-1A	50/S-03.5	11'-0"	1	$ -	$ -	$ -	$ -
GUC-TAP-1B	50/S-03.5	11'-0"	1	$ -	$ -	$ -	$ -
GUC-TAP-1C	50/S-03.5	11'-0"	1	$ -	$ -	$ -	$ -
Part 1b - Pole Units - Galvanized Steel - Vibratory Pole Base (VPB) - 3'-0" diameter caisson unless otherwise noted							
2A	90/ENG	30'-0"	1	$ -	$ -	$ -	$ -
3A	85/ENG	30'-0"	1	$ -	$ -	$ -	$ -
2	110/S-08.0	30'-0"	1	$ -	$ -	$ -	$ -
3	110/S-09.0	30'-0"	1	$ -	$ -	$ -	$ -
4	105/S-08.0	25'-0"	1	$ -	$ -	$ -	$ -
5	105/S-06.5	25'-0"	1	$ -	$ -	$ -	$ -
6	105/S-05.7	25'-0"	1	$ -	$ -	$ -	$ -
7	105/S-05.7	25'-0"	1	$ -	$ -	$ -	$ -
8	105/S-08.0	25'-0"	1	$ -	$ -	$ -	$ -
9	105/S-10.0	25'-0"	1	$ -	$ -	$ -	$ -
10	105/S-08.0	25'-0"	1	$ -	$ -	$ -	$ -
11	110/S-10.0	30'-0"	1	$ -	$ -	$ -	$ -
12	115/S-10.0	30'-0"	1	$ -	$ -	$ -	$ -
13	115/S-12.0	35'-0"	1	$ -	$ -	$ -	$ -
15	110/S-08.0	30'-0"	1	$ -	$ -	$ -	$ -
16	115/S-10.0	35'-0"	1	$ -	$ -	$ -	$ -
17	110/S-09.0	30'-0"	1	$ -	$ -	$ -	$ -
18	105/S-09.0	25'-0"	1	$ -	$ -	$ -	$ -
19	105/S-08.0	25'-0"	1	$ -	$ -	$ -	$ -
20	95/S-08.0	20'-0"	1	$ -	$ -	$ -	$ -
21	100/S-10.0	25'-0"	1	$ -	$ -	$ -	$ -
22	100/S-08.0	20'-0"	1	$ -	$ -	$ -	$ -
23	100/S-08.0	20'-0"	1	$ -	$ -	$ -	$ -
24	95/S-08.0	20'-0"	1	$ -	$ -	$ -	$ -
25	100/S-08.0	20'-0"	1	$ -	$ -	$ -	$ -
26	100/S-09.0	20'-0"	1	$ -	$ -	$ -	$ -
27	100/S-09.0	20'-0"	1	$ -	$ -	$ -	$ -
28	100/S-09.0	20'-0"	1	$ -	$ -	$ -	$ -
29	100/S-08.0	20'-0"	1	$ -	$ -	$ -	$ -
30	100/S-09.0	20'-0"	1	$ -	$ -	$ -	$ -

Structure Number	Unit Number	Embedment Depth	NO. OF UNITS	Unit Price			EXTENDED PRICE
				Labor	Materials	Labor & Materials	Labor & Materials
Part 1b - Pole Units - Galvanized Steel - Vibratory Pole Base (VPB) - 3'-0" diameter caisson unless otherwise noted - *Continued*							
31	110/S-08.0	20'-0"	1	$ -	$ -	$ -	$ -
32	120/S-12.0	25'-0"	1	$ -	$ -	$ -	$ -
34	115/S-11.0	25'-0"	1	$ -	$ -	$ -	$ -
35	115/S-11.0	25'-0"	1	$ -	$ -	$ -	$ -
36	115/S-12.0	25'-0"	1	$ -	$ -	$ -	$ -
37	115/S-11.0	25'-0"	1	$ -	$ -	$ -	$ -
38	115/S-11.0	25'-0"	1	$ -	$ -	$ -	$ -
39	120/S-13.0	30'-0"	1	$ -	$ -	$ -	$ -
39A	115/S-08.0	25'-0"	1	$ -	$ -	$ -	$ -
40	115/S-09.0	25'-0"	1	$ -	$ -	$ -	$ -
41	115/S-07.4	25'-0"	1	$ -	$ -	$ -	$ -
42	115/S-11.0	25'-0"	1	$ -	$ -	$ -	$ -
43	115/S-12.0	25'-0"	1	$ -	$ -	$ -	$ -
44	120/S-14.0	30'-0"	1	$ -	$ -	$ -	$ -
45	115/S-07.4	25'-0"	1	$ -	$ -	$ -	$ -
46	115/S-07.4	25'-0"	1	$ -	$ -	$ -	$ -
47	115/S-07.4	25'-0"	1	$ -	$ -	$ -	$ -
48	115/S-09.0	25'-0"	1	$ -	$ -	$ -	$ -
49	115/S-10.0	25'-0"	1	$ -	$ -	$ -	$ -
50	110/S-08.0	25'-0"	1	$ -	$ -	$ -	$ -
51	110/S-13.0	25'-0"	1	$ -	$ -	$ -	$ -
52	110/S-09.0	25'-0"	1	$ -	$ -	$ -	$ -
53	115/S-09.0	30'-0"	1	$ -	$ -	$ -	$ -
54	125/S-14.0	35'-0"	1	$ -	$ -	$ -	$ -
55	115/S-09.0	30'-0"	1	$ -	$ -	$ -	$ -
56	120/ENG	35'-0"(4'dia)	1	$ -	$ -	$ -	$ -
57	130/ENG	35'-0"(4' dia)	1	$ -	$ -	$ -	$ -
58	115/ENG	30'-0"	1	$ -	$ -	$ -	$ -
59	115/S-14.0	30'-0"	1	$ -	$ -	$ -	$ -
60	115/S-10.0	30'-0"	1	$ -	$ -	$ -	$ -
61	115/S-11.0	30'-0"	1	$ -	$ -	$ -	$ -
62	115/S-14.0	30'-0"	1	$ -	$ -	$ -	$ -
63	115/S-10.0	30'-0"	1	$ -	$ -	$ -	$ -
64	115/S-09.0	30'-0"	1	$ -	$ -	$ -	$ -
65	120/ENG	35'-0"	1	$ -	$ -	$ -	$ -

Structure Number	Unit Number	Embedment Depth	NO. OF UNITS	Unit Price			EXTENDED PRICE
				Labor	Materials	Labor & Materials	Labor & Materials
Part 1b - Pole Units - Galvanized Steel - Vibratory Pole Base (VPB) - 3'-0" diameter caisson unless otherwise noted - *Continued*							
66	120/ENG	35'-0"	1	$ -	$ -	$ -	$ -
67	120/ENG	35'-0"	1	$ -	$ -	$ -	$ -
68	120/S-15.0	35'-0"	1	$ -	$ -	$ -	$ -
69	120/S-11.0	35'-0"	1	$ -	$ -	$ -	$ -
70	120/S-14.0	35'-0"	1	$ -	$ -	$ -	$ -
71	120/S-14.0	35'-0"	1	$ -	$ -	$ -	$ -
72	110/S-12.0	25'-0"	1	$ -	$ -	$ -	$ -
72A	105/S-10.0	20'-0"	1	$ -	$ -	$ -	$ -
73	120/S-13.0	35'-0"	1	$ -	$ -	$ -	$ -
74	110/S-12.0	25'-0"	1	$ -	$ -	$ -	$ -
75	110/S-15.0	25'-0"	1	$ -	$ -	$ -	$ -
75A	110/S-14.0	25'-0"	1	$ -	$ -	$ -	$ -
76	110/S-13.0	25'-0"	1	$ -	$ -	$ -	$ -
77	110/S-14.0	25'-0"	1	$ -	$ -	$ -	$ -
78	110/S-13.0	25'-0"	1	$ -	$ -	$ -	$ -
79	110/S-12.0	25'-0"	1	$ -	$ -	$ -	$ -
80	105/S-10.0	20'-0"	1	$ -	$ -	$ -	$ -
81	110/S-09.0	25'-0"	1	$ -	$ -	$ -	$ -
82	115/S-10.0	30'-0"	1	$ -	$ -	$ -	$ -
83	Omitted from project						
84	110/S-10.0	25'-0"	1	$ -	$ -	$ -	$ -
85	120/S-16.0	35'-0"	1	$ -	$ -	$ -	$ -
86	110/S-10.0	25'-0"	1	$ -	$ -	$ -	$ -
88	115/S-09.0	25'-0"	1	$ -	$ -	$ -	$ -
90	110/ENG	25'-0"	1	$ -	$ -	$ -	$ -
91	105/S-09.0	20'-0"	1	$ -	$ -	$ -	$ -
Part 1c - Pole Units - Galvanized Steel - Surface Mounted Flange Vibratory Pole Base (VPB-F)							
1	85+47/ENG	45'-0"(5' dia)	1	$ -	$ -	$ -	$ -
4A	90+37/ENG	35'-0"(3' dia)	1	$ -	$ -	$ -	$ -
14	80+37/ENG	35'-0"(4' dia)	1	$ -	$ -	$ -	$ -
33	95+37/ENG	35'-0"(4' dia)	1	$ -	$ -	$ -	$ -
87	85+37/ENG	35'-0"(4' dia)	1	$ -	$ -	$ -	$ -
89	85+37/ENG	35'-0"(5' dia)	1	$ -	$ -	$ -	$ -
92	75+32/ENG	30'-0"(4' dia)	1	$ -	$ -	$ -	$ -
						TOTAL Part 1 - Pole Units	$ -

STEEL POLE TRANSMISSION CONSTRUCTION ASSEMBLY UNITS - NEW

UNIT NO.	NO. OF UNITS	Unit Price			EXTENDED PRICE
		Labor	Materials	Labor & Materials	Labor & Materials
Part 2 - Pole Top Construction Assembly Units					
TP-115B2-A(S)	69	$ -	$ -	$ -	$ -
TP-115B2-T(S)	18	$ -	$ -	$ -	$ -
TS-4A(S)	2	$ -	$ -	$ -	$ -
TS-5A(S)	1	$ -	$ -	$ -	$ -
TS-5AA(S)	5	$ -	$ -	$ -	$ -
TS-DC-DA-DE-115(S)	1	$ -	$ -	$ -	$ -
TH-TAP	1	$ -	$ -	$ -	$ -
(1/2) TS-5AA(s)	1	$ -	$ -	$ -	$ -
TOTAL Part 2 - Pole Top Construction Assembly Units					$ -

STEEL POLE TRANSMISSION CONSTRUCTION ASSEMBLY UNITS - NEW

UNIT NO.	NO. OF UNITS (mft.)	Unit Price			EXTENDED PRICE
		Labor	Materials	Labor & Materials	Labor & Materials
Part 3 - Conductor Construction Assembly Units					
1272 AAC "Narcissus"	82.000	$ -	$ -	$ -	$ -
795 AAC "Arbutus"	1.000	$ -	$ -	$ -	$ -
7 No. 9 Alumoweld	28.250	$ -	$ -	$ -	$ -
TOTAL Part 3 - Conductor Construction Assembly Units					$ -

STEEL POLE TRANSMISSION CONSTRUCTION ASSEMBLY UNITS - NEW

UNIT NO.	NO. OF UNITS	Unit Price			EXTENDED PRICE
		Labor	Materials	Labor & Materials	Labor & Materials
Part 4 - Guy Construction Assembly Units (TG Units)					
TG-21A	7	$ -	$ -	$ -	$ -
TG-GM	7	$ -	$ -	$ -	$ -
TOTAL Part 4 - Guy Construction Assembly Units (TG Units)					$ -

STEEL POLE TRANSMISSION CONSTRUCTION ASSEMBLY UNITS - NEW

UNIT NO.	NO. OF UNITS	Unit Price			EXTENDED PRICE
		Labor	Materials	Labor & Materials	Labor & Materials
Part 5 - Anchor Construction Assembly Units					
TA-2H	7	$ -	$ -	$ -	$ -
TA-3.5E *	7	$ -	$ -	$ -	$ -
TA-7E *	7	$ -	$ -	$ -	$ -
TA-4HE *	7	$ -	$ -	$ -	$ -
TOTAL Part 5 - Anchor Construction Assembly Units					$ -

*Estimated

STEEL POLE TRANSMISSION CONSTRUCTION ASSEMBLY UNITS - NEW

UNIT NO.	NO. OF UNITS	Unit Price			EXTENDED PRICE
		Labor	Materials	Labor & Materials	Labor & Materials
Part 6 - Miscellaneous Construction Assembly Units					
TM-1CM	6	$ -	$ -	$ -	$ -
TM-1EM	6	$ -	$ -	$ -	$ -
TM-2A	5	$ -	$ -	$ -	$ -
TM-2B	9	$ -	$ -	$ -	$ -
TM-2C	0	$ -	$ -	$ -	$ -
TM-3DM**	3	$ -	$ -	$ -	$ -
TM-4GM	17	$ -	$ -	$ -	$ -
TM-6A(S)	87	$ -	$ -	$ -	$ -
TM-7X (1272)	27	$ -	$ -	$ -	$ -
TM-7M (1272)	12	$ -	$ -	$ -	$ -
TM-9R *	100	$ -	$ -	$ -	$ -
TM-9SP	100	$ -	$ -	$ -	$ -
TM-9X(S)	89	$ -	$ -	$ -	$ -
TM-ODE	5	$ -	$ -	$ -	$ -
TM-D1	0	$ -	$ -	$ -	$ -
TMF-EMB	1	$ -	$ -	$ -	$ -
TMF-VPB	82	$ -	$ -	$ -	$ -
TMF-VPB-F-A	7	$ -	$ -	$ -	$ -
M-2 (Stone Backfill) yd^3	1	$ -	$ -	$ -	$ -
M-1 (Rockhole) cu. Yds*	1	$ -	$ -	$ -	$ -
TOTAL Part 6 - Miscellaneous Construction Assembly Units					$ -

*If encountered.

**For unit pricing only, not to be included in project cost.

STEEL POLE TRANSMISSION CONSTRUCTION ASSEMBLY UNITS - NEW

UNIT	NO. OF	Unit Price			EXTENDED PRICE
NO.	UNITS	Labor	Materials	Labor & Materials	Labor & Materials
Part 7 - Right-of-Way Clearing Units					
N/A					
				TOTAL Part 7 - Right-of-Way Clearing Units	**$ -**

PROPOSAL SUMMARY

TRANSMISSION CONSTRUCTION ASSEMBLY UNITS	
Wood Pole Transmission Line	
Removal	N/A
Steel Pole Transmission Line	
New	$ -
TOTAL TRANSMISSION CONSTRUCTION ASSEMBLY UNITS	$ -
SUBSTATION CONSTRUCTION ASSEMBLY UNITS	
_____ Substation	N/A
_____ Switching Substation	N/A
_____	N/A
TOTAL SUBSTATION CONSTRUCTION ASSEMBLY UNITS	N/A
DISTRIBUTION CONSTRUCTION ASSEMBLY UNITS	
NEW CONSTRUCTION	
Overhead	
Part 1, A to Y	N/A
Total Overhead	N/A
Underground	
Part UD	N/A
Part UG	N/A
Part UK	N/A
Part UM	N/A
Part UR	N/A
Total Underground	N/A
Total New Distribution Line Construction	N/A
Line Changes	
Part LCC	N/A
Part LCR	N/A
Part LCN	N/A
Total Line Changes	N/A
TOTAL DISTRIBUTION CONSTRUCTION ASSEMBLY UNITS	N/A
Transmission Construction Assembly Units	$ -
Substation Construction Assembly Units	N/A
Distribution Construction Assembly Units	N/A
TOTAL	$ -

INSERT

PROPOSED CONSTRUCTION SCHEDULE

Instructions to Bidders, 9.0 Completion
Form of Proposal, Terms and Conditions – Item 12

INSERT

CERTIFICATE(S) OF INSURANCE

Instructions to Bidders, 14.0 Contractor's Insurance

INSERT

CONTRACTOR'S LICENSE

Instructions to Bidders, 15.0 Contractor's License
Form of Proposal, Terms and Conditions – Item 23

FORM OF EXCEPTIONS

Instructions to Bidders, 5.0 Award of Contract

BIDDER: _____

OWNER: GREENVILLE UTILITES COMMISSION, NORTH CAROLINA

PROJECT DESCRIPTION: INSTALLATION OF THE 230kV POD TO BELLS FORK 115kV TRANSMISSION LINE

INSTRUCTIONS: The following is a list of exceptions to the Bidding Documents and/or Technical Specifications pertaining to the furnishing of the subject materials. Bidders shall identify each exception by Specification page and paragraph number on this form. The omission of exception implies complete compliance with Plans and Specifications.

BID DOCUMENT/ SPECIFICATION PAGE NO. AND PARAGRAPH	**EXCEPTION/VARIATION**

EQUAL EMPLOYMENT OPPORTUNITY AFFIDAVIT

General Conditions, 24.0 Equal Employment Opportunity

The Contractor shall include the provisions of the Equal Employment Opportunity, as found in General Conditions section, in every Subcontract unless exempted by rules, regulations, or orders of the Owner so that such provisions will be binding upon each Subcontractor.

Bidder: _____

By: _____

Date: _____

Special Instructions to Bidders

City of Greenville/Greenville Utilities Commission
Minority and/or Women Business Enterprise (M/WBE) Program

GUC
Construction Guidelines and Affidavits
$100,000 and above

These instructions shall be included with each bid solicitation.

City of Greenville/Greenville Utilities Commission
Minority and/or Women Business Enterprise Program

$100,000 and Construction Guidelines for M/WBE Participants

Policy Statement
It is the policy of the City of Greenville and Greenville Utilities Commission to provide minorities and women equal opportunity for participating in all aspects of the City's and Utilities' contracting and procurement programs, including but not limited to, construction projects, supplies and materials purchases, and professional and personal service contracts.

Goals and Good Faith Efforts
Bidders responding to this solicitation shall comply with the M/WBE program by making Good Faith Efforts to achieve the following aspiration goals for participation.

	GUC	
	MBE	**WBE**
Construction This goal includes Construction Manager at Risk.	7%	4%

Bidders shall submit M/WBE information with their bids on the forms provided. This information will be subject to verification by GUC prior to contract award. **As of July 1, 2009, contractors, subcontractors, suppliers, service providers, or M/WBE members of joint ventures intended to satisfy GUC M/WBE goals shall be certified by the NC Office of Historically Underutilized Businesses (NC HUB) only.** Firms qualifying as "WBE" for GUC's goals must be designated as a "women-owned business" by the HUB Office. Firms qualifying as "MBE" for the GUC's goals must be certified in one of the other categories (i.e.: Black, Hispanic, Asian American, American Indian, Disabled, or Socially and Economically Disadvantaged). Those firms who are certified as both a "WBE" and "MBE" may only satisfy the "MBE" requirement. A complete database of NC HUB certified firms may be found at http://www.doa.nc.gov/hub/. An internal database of firms who have expressed interest to do business with the City and GUC is available at www.greenvillencmwbe.org. However, the HUB status of these firms must be verified by the HUB database. GUC shall accept NCDOT certified firms on federally funded projects only. Please note: A contractor may utilize any firm desired. However, for participation purposes, all M/WBE vendors who wish to do business *as a minority or a female* must be certified by NC HUB.

The Bidder shall make good faith efforts to encourage participation of M/WBEs prior to submission of bids in order to be considered as a responsive bidder. Bidders are cautioned that even though their submittal indicates they will meet the M/WBE goal, they should document their good faith efforts and be prepared to submit this information, if requested.

The M/WBE's listed by the Contractor on the **Identification of Minority/Women Business Participation** which are determined by the GUC to be certified shall perform the work and supply the materials for which they are listed unless the Contractors receive prior authorization from the GUC to perform the work with other forces or to obtain materials from other sources. If a contractor is proposing to perform all elements of the work with his own forces, he must be prepared to document evidence satisfactory to the owner of similar government contracts where he has self-performed.

The Contractor shall enter into and supply copies of fully executed subcontracts with each M/WBE or supply signed Letter(s) of Intent to the Project Manager after award of contract and prior to Notice to Proceed. Any amendments to subcontracts shall be submitted to the Project Manager prior to execution.

Instructions

The Bidder shall provide with the bid the following documentation:

☐ Identification of Minority/Women Business Participation
(if participation is zero, please mark zero—Blank forms will be considered nonresponsive)

☐ Affidavit A (if subcontracting)

OR

☐ Identification of Minority/Women Business Participation
(if participation is zero, please mark zero—Blank forms will be considered nonresponsive)

☐ Affidavit B (if self-performing; must attest that bidder does not customarily subcontract work on this type of project—includes supplies and materials)

Within 72 hours or 3 business days after notification of being the apparent low bidder who is subcontracting anything must provide the following information:

☐ Affidavit C (if aspirational goals are met or are exceeded)

OR

☐ Affidavit D (if aspirational goals are not met)

After award of contract and prior to issuance of notice to proceed:

☐ Letter(s) of Intent or Executed Contracts

****With each pay request, the prime contractors will submit the Proof of Payment Certification, listing payments made to M/WBE subcontractors.**

*****If a change is needed in M/WBE Participation, submit a Request to Change M/WBE Participation Form. Good Faith Efforts to substitute with another M/WBE contractor must be demonstrated.**

Minimum Compliance Requirements:

All written statements, affidavits, or intentions made by the Bidder shall become a part of the agreement between the Contractor and the GUC for performance of contracts. Failure to comply with any of these statements, affidavits or intentions or with the minority business guidelines shall constitute a breach of the contract. A finding by the GUC that any information submitted (either prior to award of the contract or during the performance of the contract) is inaccurate, false, or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the GUC whether to terminate the contract for breach or not. In determining whether a contractor has made Good Faith Efforts, the GUC will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts.

Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid Attach to Bid

Identification of Minority/Women Business Participation

I,_____.
(Name of Bidder)

do hereby certify that on this project, we will use the following minority/women business enterprises as construction subcontractors, vendors, suppliers or providers of professional services.

Firm Name, Address and Phone #	Work type	*M/WBE Category

*M/WBE categories: Black, African American (**B**), Hispanic, Latino (**L**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**S**) Disabled (**D**)

If you will not be utilizing M/WBE contractors, please certify by entering zero "0"

The total value of MBE business contracting will be ($)_____.

The total value of WBE business contracting will be ($)_____.

MBForms 2002-
Revised July 2010

Greenville Utilities Commission AFFIDAVIT A – Listing of Good Faith Efforts

County of _____

(Name of Bidder)

Affidavit of _____

I have made a good faith effort to comply under the following areas checked:

Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive. (1 NC Administrative Code 30 I.0101)

- ☐ **1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- ☐ **2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- ☐ **3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- ☐ **4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- ☐ **5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- ☐ **6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- ☐ **7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- ☐ **8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- ☐ **9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- ☐ **10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority/Women Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority/women business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of_____, County of_____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

MBForms 2002-
Revised July 2010

Greenville Utilities Commission --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of _____

Affidavit of _____
(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the _____

_____ contract.
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: _____ Name of Authorized Officer: _____

Signature: _____

Title: _____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20___

Notary Public _____

My commission expires _____

MBForms 2002-
Revised July 2010

Do not submit with bid Do not submit with bid Do not submit with bid Do not submit with bid

Greenville Utilities Commission - AFFIDAVIT C - Portion of the Work to be Performed by M/WBE Firms

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by M/WBE businesses as defined in GS143-128.2(g) and the COG/GUC M/WBE Plan sec. III is equal to or greater than 11% of the bidders total contract price, then the bidder must complete this affidavit. This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises and a minimum of _____% of the total dollar amount of the contract with women business enterprises. Minority/women businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. Attach additional sheets if required

Name and Phone Number	*M/WBE Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic or Latino (**L**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**S**) Disabled (**D**)

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with M/WBE Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____ Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of _____, County of _____

Subscribed and sworn to before me this _____ day of _____ 20____

Notary Public_____

My commission expires_____

MBForms 2002-
Revised July 2010

Greenville Utilities Commission AFFIDAVIT D – Good Faith Efforts

County of _____

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the goal of 11% participation by minority/women business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of _____ I do hereby certify that on the
(Name of Bidder)

_____
(Project Name)

Project ID#_____ Amount of Bid $_____

I will expend a minimum of _____% of the total dollar amount of the contract with minority business enterprises and a minimum of _____% of the total dollar amount of the contract with women business enterprises. Minority/women businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*M/WBE Category	Work description	Dollar Value

*Minority categories: Black, African American (**B**), Hispanic or Latino (**L**), Asian American (**A**) American Indian (**I**),Female (**F**) Socially and Economically Disadvantaged (**S**) Disabled (**D**)

Examples of documentation required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster.

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with M/WBE Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:_____Name of Authorized Officer:_____

Signature:_____

Title:_____

SEAL

State of_____, County of _____

Subscribed and sworn to before me this _____day of _____20____

Notary Public_____

My commission expires _____

LETTER OF INTENT
M/WBE Subcontractor Performance

Please submit this form or executed subcontracts with M/WBE firms after award of contract and prior to issuance of notice to proceed.

PROJECT: _____
(Project Name)

TO: _____
(Name of Prime Bidder/Architect)

The undersigned intends to perform work in connection with the above project as a:

____Minority Business Enterprise _____Women Business Enterprise

The M/WBE status of the undersigned is certified the NC Office of Historically Underutilized Businesses (required). ___ Yes ___ No

The undersigned is prepared to perform the following described work or provide materials or services in connection with the above project at the following dollar amount:

Work/Materials/Service Provided	Dollar Amount of Contract	Projected Start Date	Projected End Date

_____
(Date)

_____ _____
(Address) (Name & Phone No. of M/WBE Firm)

_____ _____
(Name & Title of Authorized Representative of M/WBE) (Signature of Authorized Representative of M/WBE)

REQUEST TO CHANGE M/WBE PARTICIPATION

(Submit changes only if notified as apparent lowest bidder, continuing through project completion)

Project: _____

Bidder or Prime Contractor: _____

Name & Title of Authorized Representative: _____

Address: _____ **Phone #:** _____

_____ **Email Address:** _____

Total Contract Amount (including approved change orders or amendments): $_____

Name of subcontractor: _____

Good or service provided: _____

Proposed Action:

___Replace subcontractor
___Perform work with own forces

For the above actions, you must provide one of the following reasons (Please check applicable reason):

___ The listed MBE/WBE, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract.

___The listed MBE/WBE is bankrupt or insolvent.

___The listed MBE/WBE fails or refuses to perform his/her subcontract or furnish the listed materials.

___The work performed by the listed subcontractor is unsatisfactory according to industry standards and is not in accordance with the plans and specifications; or the subcontractor is substantially delaying or disrupting the progress of the work.

If replacing subcontractor:

Name of replacement subcontractor: _____

The M/WBE status of the contractor is certified by the NC Office of Historically Underutilized Businesses (required). ___Yes ___No

Dollar amount of original contract $_____

Dollar amount of amended contract $ _____

Other Proposed Action:

___Increase total dollar amount of work
___Decrease total dollar amount of work
___Add additional subcontractor
___Other

Please describe reason for requested action: _____

_____

If adding additional subcontractor:*

The M/WBE status of the contractor is certified by the NC Office of Historically Underutilized Businesses (required).___Yes ___No

**Please attach Letter of Intent or executed contract document*

Dollar amount of original contract $_____

Dollar amount of amended contract $ _____

Interoffice Use Only:

Approval __Y __N

Date_____

Signature_____

Pay Application No. _____

Purchase Order No. _____

Proof of Payment Certification

M/WBE Contractors, Suppliers, Service Providers

Project Name: _____

Prime Contractor: _____

Current Contract Amount (including change orders): $_____

Requested Payment Amount for this Period: $_____

Is this the final payment? ___Yes ___No

Firm Name	M/WBE Category*	Total Amount Paid from this Pay Request	Total Contract Amount (including changes)	Total Amount Remaining

*Minority categories: Black, African American (**B**), Hispanic or Latino (**L**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**S**) Disabled (**D**)

Date:_____

Certified By: _____
Name

_____
Title

_____
Signature

PROPOSED PROJECT MANAGEMENT STAFF

Form of Proposal, Terms and Conditions – Item 24

Title/Function	**Name**	**Years with Firm**	**Total Years Experience**
Project Manager			
Site Superintendent			
General Foreman - Foundations			

CONTRACTOR HAS ☐ DOES NOT HAVE☐ SIXTY PERCENT (60%) OF PROPOSED WORK FORCE WITH FIVE (5) YEARS CONTINUOUS SERVICE WITH BIDDER'S FIRM.

REFERENCES

Form of Proposal, Terms and Conditions – Item 25

CONTACT INFORMATION FOR RECENT SIMILAR PROJECTS

Owner Name	Project Description	Contact Name and Phone Number

LIST OF SUBCONTRACTORS

Form of Proposal, Terms and Conditions – Item 27

SUBCONTRACTOR	PROPOSED WORK TO BE PERFORMED

Letter of Compliance to E-Verify for Greenville Utilities Commission

1. I have submitted a bid for contract or desire to enter into a contract with the Greenville Utilities Commission;
2. As part of my duties and responsibilities pursuant to said bid and/or contract, I affirm that I am aware of and in compliance with the requirements of E-Verify, Article 2 of Chapter 64 of the North Carolina General Statutes, to include (mark which applies):
   a. ____ After hiring an employee to work in the United States I verify the work authorization of said employee through E-Verify and retain the record of the verification of work authorization while the employee is employed and for one year thereafter; or
   b. ____ I employee less than twenty-five (25) employees in the State of North Carolina.
3. As part of my duties and responsibilities pursuant to said bid and/or contract, I affirm that to the best of my knowledge and subcontractors employed as a part of this bid and/or contract, are in compliance with the requirements of E-Verify, Article 2 of Chapter 64 of the North Carolina General Statutes, to include (mark which applies):
   a. ____ After hiring an employee to work in the United States the subcontractor verifies the work authorization of said employee through E-Verify and retains the record of the verification of work authorization while the employee is employed and for one year thereafter; or
   b. ____ Employ less than twenty-five (25) employees in the State of North Carolina.

Specify subcontractor: _____

_____ (Company Name)

By: _____ (Typed Name)

_____ (Authorized Signatory)

_____ (Title)

_____ (Date)

LETTER OF COMPLIANCE TO THE IRAN DIVESTMENT ACT CERTIFICATION

Name of Vendor or Bidder: _____

_____

IRAN DIVESTMENT ACT CERTIFICATION
REQUIRED BY N.C.G.S. 143C-6A-5(a)

As of the date listed below, the vendor or bidder listed above is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. 143-6A-4.

The undersigned hereby certifies that he or she is authorized by the vendor or bidder listed above to make the foregoing statement.

_____

Signature Date

_____

Printed Name Title

BID BOND

KNOW ALL MEN BY THESE PRESENT, THAT WE _____

_____

as Principal, and _____

as Surety, who is duly licensed to act as Surety in North Carolina, are held and firmly bound unto the Greenville Utilities Commission, Greenville, NC, as Obligee, in the penal sum of _____

_____ DOLLARS ($_____) (5% Bid Bond), lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these present.

SIGNED, Sealed and dated this _____ day of _____, 2016.

WHEREAS, the said Principal is herewith submitting a Proposal for

INSTALLATION OF THE
230KV POD TO BELLS FORK 115kV TRANSMISSION LINE

and the Principal desires to file this Bid Bond in lieu of making the cash deposit as required by the bidding documents contained herein;

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such that if the principal shall be awarded the Purchase Order for which the bid is submitted and shall accept the Purchase Order within ten (10) days after the award of same to the principal, then this obligation shall be null and void; but if the principal fails to so accept such Purchase Order as required by the bidding documents contained herein, the Surety shall, upon demand, forthwith pay to the Obligee the amount set forth in the first paragraph hereof, and upon failure to forthwith make such payment, the Surety shall pay the Obligee an amount equal to double the amount of this Bid Bond as set forth in the first paragraph hereof. Power of Attorney from the Surety to its Attorney-in-Fact is attached hereto.

_____
Principal

By _____(SEAL)

_____
Corporate Surety

By _____(SEAL)

PERFORMANCE BOND/PAYMENT BOND

Date of Execution: _____

Name of Principal: _____

(Contractor) _____

Name of Surety: _____

Name of Contracting Body: _____

Amount of Bond: _____

Project: _____

KNOW ALL THESE MEN BY THESE PRESENTS, That We, the Principal and Surety above named, are held and firmly bound unto the above named Contracting Body, hereinafter called the Contracting Body, in the penal sum of the amount stated above the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH that whereas the Principal entered into a certain Contract with the Contracting Body, identified as shown above and hereto attached.

NOW, THEREFORE, if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Contract during the original term of said Contract and any extensions there of that may be granted by the Contracting Body, with or without notice to the Surety, and during the life of any guaranty required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the Surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.

IN WITNESS WHEREOF, the above bounded parties have executed this instrument under the several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in five (5) counterparts.

Witness:

_____
(Proprietorship or Partnership)

ATTEST:

By: _____

Title: _____
(Corporate Secretary or
Assistant Secretary, Only)

CONTRACTOR:

_____
(Trade or Corporate Name)

By: _____

Title: _____

(CORPORATE SEAL)

Witness:

_____

Countersigned:

_____

_____
N.C. Licensed Resident Agent

_____

_____
(Name and Address – Surety Agent)

_____

_____
Surety Company Name and N.C.
Regional or Branch Office Address

SURETY COMPANY:

_____

By: _____

Title: _____
(Attorney-in-Fact)

(SURETY SEAL)

SPACE FOR ATTACHING POWER OF ATTORNEY
(Performance Bond)

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

WORK CONTRACT FOR
230KV POD TO BELLS FORK
115kV TRANSMISSION LINE

TECHNICAL SPECIFICATIONS – TUBULAR STEEL STRUCTURES

1.0 SCOPE

This specification covers the design, materials, welding, inspection, protective coatings, drawings, and delivery of steel transmission structures including pipe piles, drop-in plates, thru-vangs, leveling bolts, crossarms, ladders and anchor bolt cages used for constructing overhead transmission lines. The pole manufacturer shall include field bolts, locknuts, vangs, attachment provisions for arms and/or insulators, anchor bolts, base plates, and other necessary items to make a complete structure per the following specifications:

1.1 Drawings

All poles shall conform to the Drawings included herewith, all of which form a part of these Specifications.

2.0 DEFINITIONS

a. Cambering – the fabricating of a slight convex curve in a pole or crossarm

b. D/t – the ratio of the diameter of a tubular pole to the steel plate thickness

c. Engineer – a registered or licensed person, who may be a staff employee or an outside consultant, and who provides engineering services. Engineer also includes duly authorized assistants and representatives of the licensed person.

d. Ground line – a designated location on the pole where the surface of the ground will be after installation of a direct embedded pole

e. Overload factors (OLF) – a multiplier which is applied to each of the vertical, transverse and longitudinal structure loads to obtain an ultimate load

f. P-delta moment – secondary moment created by the vertical loads acting on the structure when the structure deflects from its unloaded position

g. Point-of-fixity – location on the pole at ground line or below ground line where the maximum moment occurs

h. Raking – the practice of installing a straight pole out of plumb, or at an inclined angle

i. W/t – ratio of the width of the pole (flat-to-flat) to the plate thickness

j. Ultimate load – the maximum design load which includes the appropriate overload factor specified

3.0 CODES AND STANDARDS

Codes, standards, or other documents referred to in this specification shall be considered as part of this specification. The following codes and standards are referenced:

a. American Institute of Steel Construction (AISC), *Specification for the Design, Fabrication and Erection of Structural Steel for Buildings*, latest edition.

b. American Society of Civil Engineers (ASCE) Standard, *Design of Steel Transmission Pole Structures*, Manual 48, latest edition.

c. American Society for Testing and Materials (ASTM), various standards, latest version.

d. American Concrete Institute (ACI), *Building Code Requirements for Reinforced Concrete*, ACI 318, latest edition.

e. American Welding Society (AWS), *Structural Welding Code*, AWS D1.1, latest edition.

f. American National Standards Institute (ANSI), *National Electrical Safety Code*, ANSI C2, latest edition.

g. Society for Protective Coatings (SSPC, formerly Steel Structure Painting Council), *Surface Preparation Specification*, SSPC SP6/NACE NO. 3, latest edition.

4.0 CONFLICT BETWEEN THIS SPECIFICATION, DRAWINGS, AND REFERENCED DOCUMENTS

In the event of conflict between this specification and the above referenced documents, the requirements of this specification shall take precedence. In the case of conflict between several referenced documents, the more stringent requirement shall be followed. If a conflict exists between this specification or the referenced documents and the attached drawings, the attached drawings shall be followed. If clarification is necessary, contact the Owner or Owner's representative.

5.0 GENERAL REQUIREMENTS

The design, fabrication, allowable stresses, processes, tolerances, and inspection shall conform to the American Society of Civil Engineers (ASCE) Standard, *Design of Steel Transmission Pole Structures, Manual 48-11,* latest edition, with the following additions and/or exceptions:

a) Pole Structure Design

i) Pole designs shall be prepared from the attached specification, configuration drawings and design loads. PLS-CADD printouts may be provided as part of these specifications with minimum design loads shown in the 'Structure Loads' column. The structure shall be capable of withstanding all specified loading cases including secondary stresses from foundation movements ~~when specified in Attachment C~~, but not considering the possible restraining effect of conductors or shield wires. The structure shall withstand the loads without failure, permanent distortion, or exceeding any specified deflection limitations. Loads are in pounds (lbs.) and include all appropriate overload factors. PLS-CADD "LCA" files may be supplied in lieu of printouts.

5.1.2 Vibratory Pole Bases (VPB) diameter for the non-tapered section shall be as indicated on Drawing No. TMF-VPB. A circumferential weld shall connect the

tapered section to the non-tapered section. See Drawing No. TMF-VPB. Tapered section of Vibratory Pole Bases shall match up with pole taper. Permanent identifiable marks are required on the Vibratory Pole Bases including nameplate, angle bisect and/or transverse axis orientation for proper alignment prior to implanting into ground.

a. Vibratory Pole Base design shall meet ASCE Manual 48-11 for local buckling.

b. Vibratory Pole Base shall have a minimum wall thickness of three-eighths inches (3/8″).

c. The Vibratory Pole Base shall be capable of withstanding all specified load cases including secondary stresses.

d. Vibratory Pole Bases of angled structures shall have a permanent identifiable mark indicating the bisect of the associated structure. Vibratory Pole Bases of tangent structures shall have a permanent identifiable mark indicating the transverse axis of the associated structure. This will help facilitate proper orientation.

e. Frequency and stroke amplitude ranges for the vibratory hammer shall be provided by the manufacturer.

5.1.3 Wind pressures shown in the loading criteria shall be multiplied by the appropriate shape factor applied to the poles. Pressures in psf shall be computed as follows:

$$p = W \times C_d$$

Where p = pressure on projected area of the pole normal to wind, W = wind pressure, and C_d = shape (or drag) factor.
Shape factors for computing the wind on poles are:

Round	1.0
Hexagon	1.4
Octagon	1.4
Dodecagon	1.0
Square	1.6

5.1.4 The maximum design unit stress under full design load shall be the minimum yield strength as stated in applicable ASTM specifications for the particular application and types of loads, including load factors.

5.1.5 Poles shall be designed with a minimum number of joints. Field welding shall not be allowed as part of the design of a new pole. The shaft joints to be made in the field shall be slip joints or bolted flange joints. Slip joint length shall be at least one and one-half (1-1/2) times the largest inside diameter of the female section. Bolted flange joints may be used for medium angle and heavy angle guyed structures and X-braced H-frame structures. If approved by the Owner or Owner's representative, a strap across the pole splice to prevent separation of the

male and female sections of the pole may be used for X-braced H-frame structures. Approval must be obtained prior to bid.

5.1.5.1. Manufacturer shall verify slip joint fit before shipment. Joints should not interfere with vangs, through holes, ladder clips, grounding provisions, or jacking nuts.

5.1.5.2. Sufficient jacking lugs and permanent orientation marks shall be provided at all slip joints to ensure proper alignment and complete overlap of the joint.

5.1.6 The ultimate load in guys shall not exceed sixty-five percent (65%) of the rated breaking strength of the guy.

5.1.7 Design of anchor bolts shall be in accordance with the latest edition of ACI-318, *Building Code Requirements for Reinforced Concrete*, assuming a concrete strength as specified by the Owner.

5.1.7.1 When anchor bolts are specified, they shall have the top two feet (2′-0″) galvanized. Anchor bolts shall be threaded at the top end a distance equal to the base plate thickness, plus the thickness of two (2) anchor bolt nuts, plus two and one-half inches (2-1/2″). Each anchor bolt shall include two (2) heavy hex nuts.

5.1.7.2 Welding on anchor bolts will only be allowed in the bottom twelve inches (12″). Only one length of anchor bolt shall be used on each pole. Anchor bolts/clusters shall have a permanent mark indicating the structure type, structure number, orientation, and top of concrete.

5.1.7.3 Anchor bolts shall be designed to be shipped as a rigid cage with top and bottom plates holding the anchor bolts in place. The anchor bolt thread shall be protected during shipping. The anchor bolts shall be welded to the holding plate in the bottom of the cage. The top template shall be designed to be removable and to support the assembled cage during lifting and setting operations without detrimental deformations. Bolt clusters shall be designed to be rigid enough to withstand the normal jolts of shipping, handling and installation with no displacement of bolts from the proper positions within the cluster.

5.1.7.4 The removable template at the top shall have a set of marks to show the centerline for tangent structures and the angle bisector for angle structures. If the angle bisector is unclear due to multiple line angles on the structure, the anchor bolt drawings must clearly denote the anchor bolt orientation in relationship to the line angles. The set of marks shall be (2) marks along the same line 180° to each other. Matching marks are to be on the base plate of the structure so proper alignment can be made.

5.1.8 Minimum plate thickness for all pole components shall be three-sixteenths inch (3/16″). Minimum tip diameter for all poles shall be ten inches (10″).

5.1.9 Structures which are to be direct embedded shall have bearing plates. Bearing plates shall have a diameter not more than two inches (2″) greater than the maximum pole diameter.

5.1.9.1 Galvanized poles shall have a drain hole at the bottom. The drain hole shall not be more than 20% of the bottom plate surface area.

5.1.9.2 Direct embedded steel poles shall have ground sleeves. Ground sleeves shall have a minimum length of four feet (4′-0″) centered at groundline.

5.1.9.3 The Ground sleeve shall have a minimum thickness of three-sixteenths inch (3/16″) and shall be centered at the ground line. A seal weld shall be provided around the ground sleeve. The ground sleeve shall not be considered in strength calculations.

5.1.10 Poles shall have nearly a uniform taper throughout their entire length. The maximum difference in tapers between two (2) pole sections measured by the diameters shall be .20 inch/ft. for poles with variable taper.

5.1.11 Poles with elliptical cross sections shall have a minor axis dimension equal to at least seventy-five percent (75%) of the major axis dimension.

5.1.12 Engineered/Unguyed Structures

Structure deflections at pole top shall be calculated under camber loading. Structure height shall be the height of the pole from the top of the base plate, or designated ground line, to the top. See load diagrams or PLS-CADD printouts, 'Structure Loads' column for camber loading.

5.1.12.1 Structures may be pre-cambered if the pole deflection exceeds one percent (1%). Deflections less than one percent (1%) shall be raked as necessary in the field. The Materialman shall provide a pre-cambered summary and clearly denote the pre-camber/rake orientation on the structure drawings. **(Raking is Not Applicable for this Project)**

5.1.12.2 The Materialman shall use the Loading Diagrams provided in Attachment B or PLS-CADD printouts to design the designated unguyed structures. The Materialman is responsible for determining the "worst-case" orientation of the wind load in combination with the tension and apply it in the design calculations.

5.1.12.3 The Materialman shall calculate the deflections for the sixty degrees Fahrenheit (60°F) initial tension and sixty degrees Fahrenheit (60°F) final tension load cases. The Materialman shall limit the difference in deflection produced by these two (2) load cases to six inches (6″) or less.

5.1.12.4 Deflections of single-shaft structures under camber loading shall not exceed one (1.0%) percent of the structure height.

5.1.12.5 Deflections of H-Frame structures due to the wire tension change across the structure and any angle resultant tension, under camber loading, shall be no more than one half (1/2) the top diameter of the designed tubular steel pole.

5.1.12.6 Deflections of switch structures under factored loading shall not exceed two (2%) percent of the structure height under all loading conditions.

Switch support beams shall be checked for deflection. Engineer's drawings will show deflection limitations and/or minimum switch support beam diameter. **(Not applicable for this project)**

5.1.12.7 The manufacturer is responsible for repairing or replacing any structures which are delivered to the site with manufacturing errors. Repair and/or replacement costs shall include the structure itself, as well as any associated construction costs.

5.1.12.8 If pole raking is necessary due to deflection, the raking dimension and orientation shall be clearly marked on the Materialman's Detail Drawings.

5.1.12.9 Switch structure equipment loadings and attachment details shall be obtained by the Pole Manufacturer through coordination with the specified Switch Manufacturer. **(Not applicable for this project)**

5.1.12.10 If shop cambering is required, the manufacturer shall pre-fit multi-piece poles together prior to cambering.

5.1.12.11 The manufacturer shall verify at the plant prior to shipment that the appropriate orientation and magnitude of pre-camber is built into those structures requiring shop cambering.

5.1.13 Standard Class Designations

5.1.13.1 Tangent and guyed angle structures have been specified using RUS Standard Steel Pole Class Designations shown in Table 1 unless noted otherwise.

5.1.13.2 Pole designs shall be prepared for the attached Standard Class design loads. The poles shall be designed to meet ASCE Manual No. 48-11, "Design of Steel Transmission Pole Structures," design methods. The point-of-fixity shall be considered to be located at a distance from the pole bottom that is equal to seven percent (7%) of the pole length.

The pole shall be symmetrically designed such that the strength required in any one direction shall be required in all directions about the longitudinal axis.

5.1.13.3 Using the corresponding values in Table 1, the poles shall be designed for the following requirements.

a. The pole shall develop the minimum ultimate moment capacity required in Table 1 at a distance of five feet (5′-0″) from the pole top.

b. The pole shall develop the minimum ultimate moment capacity above the point-of-fixity that is calculated by multiplying the tip load in Table 1 by the distance to the tip load.

c. The geometry and taper of the pole shall be uniform throughout their entire length (top to butt).

5.1.13.4 The poles shall be designed to withstand the specified tip loading in Table 1 without exceeding a pole deflection of ten percent (10%) of the pole length above the point-of-fixity when tested in accordance with ASCE Manual No. 48-11.

5.1.13.5 Overall length of poles shall be designed and manufactured in incremental lengths of five feet (5′-0″).

TABLE 1
Strength Requirements

Standard Class Designations for Steel Poles	Minimum Ultimate Moment Capacity at 5 ft from Pole Top (ft. Kips)	Horizontal Tip Load Applied 2 ft from Pole Top (lbs.)
S-20.0	160	20000
S-19.0	152	19000
S-18.0	144	18000
S-17.0	136	17000
S-16.0	128	16000
S-15.0	120	15000
S-14.0	112	14000
S-13.0	104	13000
S-12.0	96	12000
S-11.0	88	11000
S-10.0	80	10000
S-09.0	72	9000
S-08.0	64	8000
S-07.4	57	7410
S-06.5	50	6500
S-05.7	44	5655
S-04.9	38	4875
S-04.2	32	4160
S-03.5	27	3510
S-02.9	23	2925
S-02.4	19	2405
S-02.0	15	1950

5.1.13.6 Poles shall be designed for the loads generated from handling and erecting without causing permanent deformation or damage to the pole when handled according to the manufacturer's instructions. Handling and erecting loads shall include but not be limited to, a one (1) point (tilting) pickup and a two (2) point (horizontal) pickup.

5.1.13.7 The maximum design unit stress shall be the minimum yield strength as stated in applicable ASTM specifications for the particular application and types of loads, including overload factors.

5.1.13.8 The top of the pole shall be permanently covered with a structural steel plate that is welded to the top of the pole. The pole shall be delivered with the pole cover attached in place.

5.1.13.9 Pole design and design calculations shall be the responsibility of the manufacturer.

5.1.14 Arms shall be designed so the end of the arm is at the specified height under a loading of initial conductor tension, sixty degrees Fahrenheit (60°F), no wind, and no overload factors. Arms shall not deflect vertically more than two inches (2″) at the end of the arm under heavy ice conditions (without any overload factors applied). See Attachment B for Design Loads and Guide Drawings.

5.1.14.1 Arms shall be upswept or straight, tapered, steel tubular members, of any cross-sectional type, which meet the dimensions shown on the attached drawings.

5.1.14.2 Arm end plate connection details for hardware attachment shall be typical of those shown on the attached drawings. The arms shall be hermetically sealed when a painted finish is specified. Galvanized arms shall have drain holes where appropriate

5.1.15 Lifting lugs are optional. The manufacturer shall supply all instructions for handling and erection of poles and arms.

5.1.16 Deadend plates or vangs shall be designed/checked for the maximum resultant loading from the appropriate Vertical, Transverse, and Longitudinal components in the load trees and/or columns labeled "Loads From Back Span" or "Loads From Ahead Span" in the PLS-CADD printout. All load cases shall be considered. Do not use the loads from the column labeled "Structure Loads" for designing/checking vang designs.

5.1.17 In the design of connections for vangs, brackets, or stiffeners attached to the pole shaft, care shall be taken to distribute the loads sufficiently to protect the wall of the pole from local buckling.

5.1.18 Thru-vang shall penetrate both sides of the pole with attachment holes on both sides.

5.1.19 Each pole shall be permanently marked on the pole shaft seventy-two inches (72″) above ground line and on the bottom of base plate or bearing plate with the following identifying information:

- Manufacturer's Identification
- Structure Type
- Height and Class
- Structure Number
- Ultimate Ground Line Moment
- Owner's Name
- Date Manufactured

Each Vibratory Pole Base shall be permanently marked on the shaft within six inches (6") above the groundline with the following information:

- Manufacturer's Identification
- Diameter and Length
- Structure Number
- Owner's Name
- Date Manufactured

The method of identification shall be approved by the Owner. In addition, there shall be clear indication or marks for handling or sling points, storage rack points, and lifting joints for standing the pole and vibratory pole base.

5.1.20 Grounding Attachments

5.1.20.1 One (1), two (2)-hole NEMA grounding pad shall be provided on the side of each pole as specified in the Structure Dimensions (Framing Drawings) located in Attachment A.

5.1.20.2 See Attachment D – Drawing No. TMS-5 for NEMA Grounding Pad Detail.

5.1.20.3 Grounding pads and threads shall not be painted or covered with other coatings.

5.1.20.4 Poles shall be pre-drilled with a nine-sixteenth inch (9/16″) hole behind each threaded hole of a two (2)-hole NEMA pad to permit the use of various bolt lengths in completing a grounding connection.

5.1.20.5 One (1) heavy hex, stainless steel grounding nut shall be provided where indicated on Structure Dimensions (Framing Drawings). The grounding nut shall have standard one-half inch (1/2″), thirteen (13) UNC threads. Threads shall not be painted or covered with other coatings.

5.1.21 Clips for removable ladders shall be located as shown on the enclosed Framing Drawings or as indicated in the specification. Each ladder clip shall be designed to support a minimum 1,200 lb. shear working load. The clips shall be welded to the pole surface. Ladder clips shall be located to avoid interference between ladders, other attachments, material and equipment to be mounted on the pole (See Attachment D Miscellaneous Drawings). **(Not applicable for this project)**

5.1.22 Removable step bolts shall be provided with spacing as indicated beginning eight feet (8′-0″) above ground line and extending to the structure top. Each step lug and step bolts shall be capable of withstanding a minimum of 600 lb. working load. Step bolts mounting nuts shall be spaced at one foot-three inches (1′-3″) and oriented to provide maximum ease of climbing. **(Not applicable for this project)**

5.1.23 Removable pole steps with permanent clips shall be provided as indicated (Drawing No. PS-1) beginning at ground line and extending to eight feet (8′-0″) above ground line. Pole steps and clips shall be spaced at one foot-three inches

(1′-3″) and oriented to provide maximum ease of climbing. **(Not applicable for this project)**

5.1.24 Weathering steel structures shall be designed to eliminate water and refuse traps. **(Not applicable for this project)**

5.1.24.1 Tubular sections shall be sealed from moisture entering the inside of the pole. Factory drilled pole holes shall be plugged to prevent moisture intrusion during shipping. For field drilled poles and factory drilled poles, manufacturer shall provide silicon sealant to seal all through-bolt holes. Non-drilled poles when assembled shall be effectively sealed to prevent moisture intrusion.

5.1.24.2 Connections shall be designed to reduce the effect of pack-out by preventing moisture from entering the joint or by designing the connection to allow moisture to easily drain off.

5.1.24.3 Plastic plugs shall be installed in all nuts welded to the structure and all tapped holes.

~~5.1.25 Application requirements: (See Attachment C)~~

5.2 Pipe Pile Design **(Not applicable for this project)**

The design, fabrication, allowable stresses, processes, tolerances, and inspection shall conform to the latest edition ASTM 252, "Welded and Seamless Steel Pipe Piles" for the steel pipe pile and the latest edition ASTM A36 for the other associated steel material. Grade 2 shall be used for the pipe piles.

5.2.1 The pipe pile diameter shall be as indicated on Drawing No. TMF-SPPF in Attachment A. Piles shall be fabricated as round or 12-sided. The 12-sided pipe pile diameter shall be measured flat-to-flat.

5.2.2 All welding to be in accordance with the latest edition of AWS D1.1. Use appropriate electrode for steel grade types (E70 Min.). Circumferential and longitudinal welds are to be complete-penetration.

5.2.3 After fabrication, hot dip galvanize the pile as specified per ASTM A123. Provide additional holes if needed for handling during galvanizing.

5.2.4 Corrocote shall be applied to pipe pile from top of pile to ten (10') feet below top of pile. See paragraph 5.5.1.d Coatings for the Embedded Portion of the Pole for details.

5.2.5 Pipe piles shall be stamped with one-inch (1") lettering indicating the structure number. Stamping shall be done at both ends of the pipe pile.

5.2.6 Pipe pile vendor shall provide the six (6) one-inch (1") diameter heavy hex galvanized nuts and six (6) one-inch (1") diameter by twelve inch (12") long galvanized leveling bolts and ensure these nuts and bolts are compatible with each other. This hardware shall be hot dip galvanized per ASTM A307.

5.2.7 Two (2) hole NEMA grounding pads shall be provided on opposite sides at two levels of the pipe piles as shown on Drawing TMF-SPPF located in Attachment A (Total of 4 grounding pads).

5.2.8 Reference Drawing TMF-SPPF for steel pipe pile fabrication details and all associated materials and hardware.

5.3 Materials

5.3.1 All materials shall comply with the applicable requirements of ASTM specifications. Any modifications to ASTM specifications must be approved by the Owner's representative prior to bidding.

5.3.2 Poles, arms, and conductor brackets shall conform with ASTM A36, ASTM A572, ASTM A581, ASTM A588, ASTM A871, or ASTM A595.

5.3.3 Base plate shall conform with ASTM A572, ASTM A588, ASTM A633, or ASTM A595.

5.3.4 Anchor bolts shall conform to ASTM A615, Grade 60 or 75.

5.3.5 Other bolts and nuts shall conform, as applicable, to ASTM A307, ASTM A325, ASTM A354, ASTM A394, or ASTM A687. Locknuts shall be provided for each structure bolt, or American Nut Company (ANCO) type self-locking nuts may be used. Locknuts shall be the galvanized MF or ANCO type.

5.3.6 Anchor bolts, structural plate, and weld material, shall meet ASCE requirements for Charpy tests.

5.3.7 For galvanized structures, steel used for the pole shaft and arms shall have a silicon content less than .06 percent.

5.3.8 Steel pipe piles shall conform, as applicable, to ASTM A252. All other steel material associated with the pipe pile shall conform to ASTM A36.

5.4 Fabrication

5.4.1 All welding shall be in accordance with the American Welding Society Code AWS D1.1, latest edition. Welders shall be qualified in accordance with AWS .1 welding procedures.

5.4.2 One hundred percent (100%) penetration welds shall be required in, but not limited to, the following areas:

- circumferential welds (C-welds) joining structural members,
- longitudinal welds in the female portion of the joint within the slip joint area, plus 6 inches;
- welds at the butt joints of back-up strips,
- base plate to shaft weld,
- longitudinal welds for a minimum length of three inches (3″) where there are adjacent C-welds, flange welds, base welds and ends of tubes.

5.4.3 Full penetration or equivalent ninety percent (90%) partial penetration with fillet overlap shall be used for arm-to-arm brackets, vang-to-plate shaft, and arm box joints.

5.4.4 Quality and acceptability of every inch of the full penetration welds shall be determined by visual and ultrasonic inspection.

5.4.5 All other penetration welds shall have sixty percent (60%) minimum penetration. Quality and acceptability of all welds other than full penetration welds shall be determined by visual inspection, supplemented by magnetic particle, ultrasonic or dye penetrant inspection.

5.4.6 All weld back-up strips shall be continuous the full length of the welds. Care shall be exercised in the design of welded connections to avoid areas of high stress concentration which could be subject to fatigue or brittle fractures.

5.4.7 Field welding shall not be permitted except with the Engineer's and Owner's approval and with the manufacturer's direction in repairing a pole.

5.4.8 All parts of the structure shall be neatly finished and free from kinks or twists. All holes, blocks, and clips shall be made with sharp tools and shall be clean-cut without torn or ragged edges.

5.4.9 Before being laid out or worked in any manner, structural material shall be straight and clean. If straightening is necessary, it shall be done by methods that will not injure the metal.

5.4.10 Shearing and cutting shall be performed carefully and all portions of the work shall be finished neatly. Copes and re-entrant cuts shall be filleted before cutting.

5.4.11 All forming or bending during fabrication shall be done by methods that will prevent embrittlement or loss of strength in the material being worked.

5.4.12 Holes for connection bolts shall be one-sixteenth inch (1/16″) larger than the nominal diameter of the bolts. Holes in the flange plates for bolted splices shall be one-eighth inch (1/8″) larger than the bolt diameter. Holes in the base plates for anchor bolts shall be three-eighths inch (3/8″) larger than the nominal diameter of the anchor bolts. The details of all connections and splices shall be subject to the approval of the Owner or his representatives.

5.4.13 Holes in steel plates which are punched must be smooth and cylindrical without excessive tear out or depressions. Any burrs that remain after punching shall be removed by grinding, reaming, etc.

5.4.14 Holes of any diameter may be drilled in plate of any thickness. Care shall be taken to maintain accuracy when drilling stacks of plates.

5.4.15 Holes may be made by use of a machine guided oxygen torch. Flame cut edges shall be reasonably smooth and suitable for the stresses transmitted to them.

5.4.16 The overall length of the assembled structure should not be less than six inches (6″) of the specified length and not more than twelve inches (12″).

5.4.17 Tolerances

Fabrication tolerances shall be as follows:

a. Length of single piece or flanged poles ± 3″

b. Cross section of poles: Diameter of 36″ or less +1/4″, -1/8″. Diameter greater than 36″ +1/2″, -1/4″, circumference of all poles - 0″

c. Spacing between "arm to pole" connections vertically ± 3/4″

d. Location of hardware with respect to top of pole ± 1″

e. Pole Butt plate perpendicular to pole 1/16″ for 12″ as measured on a perpendicular axis

f. Straightness of pole ± 1/2″ from center line

g. Location of a drilled hole in a piece ± 1/8″

h. Spacing between holes: Base plates ± 1/8″, same connection ± 1/16″ (non-accumulative)

i. Anchor bolts: Length +3″, -0″; thread length +2″, -0″

j. Length of coated portion on anchor bolts +12″, -0″

k. Distance between anchor bolts in cluster ± 1/8″ (non-accumulative)

l. Arms: Length ± 1″, Rise ("W" dimension ± 1″ per 10′ of arm length)

m. Angles shown ± 2°

n. Length of overlap of slip joint, +5″, - 10% of slip joint length

o. Thru Vang Vertical Spacing ± 1/4″

p. Thru Vang Angle and Orientation ± 2°.

5.5 Finishes

5.5.1 The following finishes are acceptable: galvanizing, zinc primer and painting, weathering steel, and below grade coating.

a. Galvanizing – All structures and structural components which are hot-dip galvanized shall meet all the requirements of ASTM A123 or ASTM A153. Measures shall be taken to prevent warping and distortion according to ASTM A384 and to prevent embrittlement according to ASTM A143. Poles made of ASTM A588 steel shall not be galvanized due to the high silicon content of the steel. One (1) gallon of zinc enriched paint shall be provided with each five (5) poles. Provide detailed instructions of proper application and use of zinc enriched paint.

b. Zinc Primer and Painting – Poles which are to be painted shall be hermetically sealed to prevent corrosion of interior surfaces. After shot or sand blasting and cleaning in accordance with the *Steel Structure Painting Council's Surface Preparation Specification*, SSPC-SP6, a zinc primer of three (3) mils dry film thickness (DFT) and two (2) coats of finish paint, each three (3) mils DFT shall be applied to all exterior surfaces in accordance with the paint supplier's recommendations. One (1) gallon each of primer and finish paint shall be supplied with each five (5) poles. A guarantee against flaking or fading of the paint for a

minimum of five (5) years shall be provided. **(Not applicable for this project)**

c. Weathering Steel – Steel shall conform to ASTM A588 or A871. After fabrication, poles made of weathering steel shall be cleaned of oil, scale, etc. in accordance with the *Steel Structure Painting Council's Surface Preparation Specification*, SSPC-SP6, to ensure uniform and rapid formation of the protective oxide layer. **(Not applicable for this project)**

d. Coatings for the Embedded Portion of the Pole – When poles are to be directly embedded, or use a vibratory pole base, a sixteen (16) mil (minimum dry film thickness), two (2) component hydrocarbon extended polyurethane coating that is resistant to ultraviolet light shall be applied on the exposed surface of the embedded portion of the pole. The coating shall extend from the butt to two feet (2′-0″) above ground line or to the top jacking nut on the vibratory pole base, whichever is lower. Other coatings shall be approved by the Owner prior to their use.

5.5.2 Bolts and nuts with yield strengths under 100,000 psi shall be hot-dip galvanized per ASTM A153 and ASTM A143, or mechanically coated with zinc in accordance with ASTM B454, Class 50. Bolting materials with yield strengths in excess of 100,000 psi shall not be hot-dip galvanized. Instead, they shall be painted with zinc enriched paint or mechanically coated with zinc per ASTM B454, Class 50.

5.5.3 Compliance with coating thickness requirements shall be checked with a magnetic thickness gauge.

5.6 Inspection and Testing

5.6.1 The Owner and the Owner's designated agents shall have free entry at all times while work is being carried on, to all parts of the manufacturer's plant to inspect any part of the production of the poles covered by this specification.

5.6.2 Steel members which are bent or warped or otherwise improperly fabricated shall be properly repaired or replaced at the manufacturer's expense.

5.6.3 The cost of tests made by the manufacturer (except full scale load tests on poles), including cost of the certified test reports, shall be considered included in the price.

5.6.4 The manufacturer shall make tests in accordance with ASTM A370 and ASTM A673 to verify that the material used in the structures meets the impact properties.

5.6.5 Mill test reports showing chemical and physical properties of all material furnished under this specification shall be maintained by the manufacturer for a period of five (5) years and shall be traceable to the structure.

5.6.6 All plates over one and one-half inch (1-1/2″) thick shall be ultrasonically tested to assure against defects which could lead to lamellar tearing.

5.6.7 Welders or welding operators shall be qualified in accordance with the provisions of AWS D1.1.

5.6.8 The manufacturer shall make certified welding reports for each structure. The reports covering welding shall include all welds of a structure. Each weld shall be clearly identified; and the report shall consist of the method of testing, whether the weld is acceptable, the identification of the structure, the date, and the name and signature of the inspector. Records of welding procedure and welding operator test results shall be kept for six (6) years by the Materialman and shall be available for review by the Engineer or Owner.

5.7 Structure Testing **(Not applicable for this project)**

5.7.1 The structures which are to have full-scale load tests performed on them are listed in Attachment C.

5.7.2 Details of the test procedures and methods of measuring and recording test loads and deflections shall be specified by the manufacturer prior to testing and shall be subject to the review and approval of the Owner or his representative.

5.7.3 Deflections shall be recorded in the transverse and longitudinal directions when applicable. Deflection measurements shall be taken under the no load condition both before and after testing.

5.7.4 Material procurement for test poles shall be identical to material procurement procedures for regular production run poles.

5.7.5 A full report listing the results shall be submitted after completion of all testing. Copies of mill test reports shall be included in the load test report. The report shall also include a complete description of the load tests with diagrams and photographs.

5.7.6 The Owner or his representative reserves the right to be present during testing and shall be notified two (2) weeks prior to the start of structure fabrication.

5.8 Shipping

5.8.1 Each shipment shall be accompanied by a checklist of all parts, identifiable by structure type and number. Arms, bolts, and miscellaneous hardware will be identified by the list for match up with the respective pole shaft and shall be boxed or bundled. All parts required for any one structure shall be in one (1) shipment, if possible.

5.8.2 The Owner and Owner's representative shall be notified prior to shipment that such shipment is to take place, and they reserve the right to inspect the components prior to shipment. The notification shall give quantities; weight, name of common carrier used, and expected time of arrival with at least two (2) working days' notice of delivery. Delivery of all items of material shall be made at such time as to permit unloading between the hours of 9:00 a.m. and 3:00 p.m., Monday through Thursday, holidays excluded.

5.8.3 The anchor bolts shall be welded to the holding plate in the bottom of the cage. A removable template shall be used at the top of the cage and shall be marked to show the centerline for tangent structures and the angle bisector for angle structures. Matching marks are to be on the base plate so proper alignment can be made. Bolt clusters shall be rigid enough to withstand the normal jolts of shipping and handling with no displacement of bolts from the proper positions within the cluster.

5.8.4 Unless otherwise agreed to by the Owner, the anchor bolt cage shall be shipped at least thirty (30) days prior to pole shipment.

5.8.5 Salt-treated wood blocking and urethane foams shall not be used when shipping or storing weathering steel poles.

5.8.6 Delivery shall be made either to a single designated location or to the individual structure locations.

6.0 INFORMATION TO BE SUPPLIED BY THE MANUFACTURER

6.1 Information to be Supplied with the Proposal

a. Calculated shipping weight of each structure and pipe pile excluding anchor bolts. Separate weights shall be given for crossarms and poles.

b. Calculated shipping weight of anchor bolts,

c. Ultimate ground line reactions (including overload factors) in poles and guy wires,

d. Anchor bolt size, length, and locations (bolt circle diameters)

e. Type of material of major components (ASTM number),

f. Description of pole and pipe pile shaft, including thickness, length, diameter, cross-sectional geometry, and method of fastening each shaft component,

g. Data showing the design of the arm, arm connections, arm attachment plates, and brackets,

h. Design exceptions,

i. Manufacturer's standards, physical and mechanical dimensions for all steel pole height and class combinations used in the project being bid on.

6.2 Documentation to be Supplied for the Owner's Approval Prior to Fabrication

Documentation includes final design calculations for pole shaft, base plate, anchor bolts, crossarms, and other appurtenances, including their connections for all structures. The following information shall be supplied:

a. For the loading cases with overload factors, the total shear, axial forces, moments, stresses or stress ratios, moments of inertia furnished, section moduli, cross-sectional areas, deflections w/t's for polygonal and d/t's for round cross sections at all splices, at arm attachment points (top and bottom), and at least every ten feet (10′-0″) along the pole.

b. For the critical loading case, shear and axial forces, moments, stresses, section moduli, cross-sectional areas at the arm connections, bolt stresses in the arm connection, and deflection at the end of the arm.

c. Anticipated deflections at the top of the pole and at the ends of the arms shall be indicated for each pole for the normal, everyday loading condition of sixty degrees Fahrenheit (60°F), no wind, no overload factors.

d. For all specified loading cases, reactions and ground line moments shall be supplied.

e. Detail drawings for each structure type giving weights of structure components, dimensions, and bill of materials.

f. Assembly instructions and erection drawings. Slip joint lengths and allowable tolerances. Special handling instructions.

6.3 Final Documents shall be supplied to the Owner for the items in paragraph 6.2.e. after erection of all structures and prior to final payment

6.4 Test Reports (as requested)

a. Certified mill test reports for all structural material,

b. Certified welding reports for each structure,

c. Impact property test reports showing that the material used in the structures meets the impact properties,

d. Test reports on coating thickness,

e. Report of structure testing, when required, including photographs, diagrams, load trees, etc.

f. Material, workmanship, inspection travelers, and material certified mill test reports shall be maintained on file for a minimum of six (6) years by the Materialman, and shall be made available to Greenville Utilities Commission or the Engineer upon request at no charge.

7.0 APPROVAL, ACCEPTANCE, AND OWNERSHIP

7.1 Final designs must be approved by the Engineer before material ordering and fabrication. Material ordering and fabrication prior to approval will be at supplier's risk. It is understood that award of this contract does not constitute acceptance of design calculations submitted with the bid, if corrections are required in the final structure designs due to manufacturer's errors, omissions, or misinterpretations of the specifications, the quoted price shall not change. Approval of the drawings and calculations by the Engineer does not relieve the supplier of responsibility for the adequacy of the design, correctness of dimensions, details on the drawings, and the proper fit of parts.

7.2 After delivery, the poles will be inspected and shall be free of dirt, oil blisters, flux, black spots, dross, tear-drop edges, flaking paint or zinc; and in general, shall be smooth, attractive, and unscarred. Poles not meeting this requirement shall be repaired or replaced by the fabricator at no additional cost to the Owner.

TECHNICAL SPECIFICATIONS – TUBULAR STEEL STRUCTURES

INSTALLATION SPECIFICATIONS

1.0 GENERAL

1.1 The new construction, rearrangements, relocations, modifications, and removals shall be complete in accordance with the Plans, Specifications, Staking sheets, and Assembly Drawings. All work shall be done in a thorough and workmanlike manner.

1.2 The latest edition of the National Electrical Safety Code shall be followed. All construction shall conform to that required for medium loading district. Deviations from the Plans, Specifications, and Construction Drawings will not be permitted except upon written permission of the Engineer.

2.0 STEEL POLES

2.1 Inspection

The Contractor shall not install a pole that, in his opinion, or the opinion of the Commission or Engineer, has been damaged or is otherwise unsafe. The Contractor shall promptly report any damaged or questionable pole or other component to the Commission and Engineer and confirm the report in writing.

2.2 Handling and Storage

2.2.1 Steel shall be lifted and supported during manufacturing, stockpiling, transporting, and erection operations only at the points shown on the Contract and Shop Drawings. Nylon slings shall be used to avoid damage to pole finish. Transportation, site handling, and erection shall be performed with appropriate equipment and methods and by qualified personnel. Poles shall not be dragged on the ground or stored directly on the ground. Stored poles shall be elevated from the ground using wood or other suitable non-abrasive blocking. Poles are to be stored with identification marks clearly visible.

2.2.2 The Contractor shall have slings of sufficient length and strength rating to accommodate pole handling per the manufacturer's recommendations.

2.2.3 The Contractor will be responsible for any damage to the poles and structural members' arms resulting from his handling, transporting, or storing procedures. Poles and structural members' arms shall be stored above the ground using wood or suitable non-abrasive blocking. See "Handling Steel Poles" Guide Drawings in the Assembly Drawing section this Contract.

2.3 Repair or Alteration

2.3.1 Repair

Bent, twisted or otherwise damaged structural members shall not be repaired or installed except at the written direction of the Engineer. Repair methods shall be approved by the manufacturer. Damaged base plates or butt splice plates shall not be repaired or installed. Pole wall sections shall not be repaired in the area of slip joints or lap splices.

2.3.2 Touch-Up

It will be the responsibility of the Contractor to touch up all galvanized steel pole and bolt surfaces or Ameron Dimetcote painted surfaces that are damaged by the Contractor during handling, transporting, storing, or erecting. Galvon or similar touch-up material for galvanized surfaces or Ameron Dimetcote for painted surfaces will be furnished by the Commission, and will be applied in accordance with the manufacturer's recommendations.

Areas of the pole to be below the ground line shall be repaired prior to pole installation with materials designated by the manufacturer to inhibit corrosion.

2.3.3 Mismatched Bolts and/or Holes

The Engineer shall be promptly notified of the discovery of mismatched bolts and holes, misaligned connections, or misaligned foundation bolts. The Engineer will decide upon the corrective action to be taken.

2.4 Lifting and Setting

2.4.1 All poles shall be lifted in accordance with the pole manufacturer's recommendations, and with such precaution required to eliminate the possibility of bending or overstressing any section. Nylon slings shall be used to avoid damage to pole finish. During lifting, all flexible components shall be restrained to prevent any damage to insulators or pole finish.

2.4.2 Before setting surface mounted poles, the bottom anchor bolt nuts shall be leveled unless otherwise directed by the Engineer. After setting, if the pole is not to be raked it shall be plumbed to within one-half of one percent (0.5%) or 0.005 times the pole length. Such plumbing shall take into account any built-in camber.

2.4.3 No surface mounted pole shall be set on a foundation before it has been established by ASTM testing methods that the concrete meets the minimum compressive strength specified.

2.5 Pole Installation, Assembly, and Framing

2.5.1 All poles shall be set plumb and in alignment except at line angle points. At line angles where horizontal post insulators are stacked on one side of the pole or suspension insulator construction is used, poles shall be offset on the bisector of the angle so that conductors will hang directly over the point of intersection in line with the tangent in both directions. All poles shall be plumb after conductors are strung. Where poles are set along the edge of cuts or embankments, or where the soil is liable to be washed out, special precautions shall be taken to ensure durable foundations and the setting depth shall be measured from the lower side of the hole.

2.5.2 Any unused holes are to be plugged and sealed using galvanized steel plugs supplied by the Contractor at his expense.

2.5.3 The poles may be delivered as two (2) or three (3) piece tubular steel poles. The Contractor is responsible for assembling the poles on site prior to their being installed. Additionally, the Contractor is responsible for providing equipment for joining the sections (i.e., jacks).

2.6 Bolts

2.6.1 All bolts and nuts shall be installed to torques specified by the pole manufacturer or the Engineer. Wrenches used in assembly of anchor bolts shall not deform nuts nor damage factory finish.

2.6.2 Upon completion of pole setting, conductor sagging and pole plumbing, all top and bottom anchor bolt nuts shall be secured by tack welding to the pole base plate. The weld area shall be cleaned, primed and painted in accordance with the manufacturers' recommendations.

2.6.3 Care should be exercised during all phases of construction to protect all bolt threads. Nuts should operate on bolt threads without forcing. In case of anchor bolt thread damage during pole installation, repairs shall be made as directed by the Engineer.

3.0 VIBRATORY POLE BASE

3.1 Vibratory pole bases shall be installed by use of a vibratory hammer. The Contractor shall include the cost of the vibratory hammer in the pole labor installation unit.

3.2 Vibratory pole bases shall be installed in accordance with the construction assembly drawings. (See TMF-VPB)

3.3 Vibratory pole bases shall be installed with a frequency between 400 and 1600 vibrations per minute and a stroke amplitude between one-half inch (1/2″) and one and one-half inches (1-1/2″) maximum.

3.4 The Contractor is responsible for any damages incurred during vibratory pole base installation. The Contractor is responsible for obtaining the services of a geotechnical engineering firm to provide vibration monitoring.

3.5 Peak Particle Velocity shall be limited to two inches (2″) per second maximum for residences.

3.6 Ground vibrations shall be limited to 40 Hz minimum and should be monitored in areas in close proximity to building, walls, driveway, underground utilities, etc. to prevent damage.

4.0 CONCRETE FOUNDATIONS FOR STEEL POLES

4.1 Subsurface Conditions

Results of soil test borings taken along the proposed line are provided with these Specifications (See Book II, Exhibit No. 5). The Contractor shall familiarize himself with the subsurface conditions as shown on the boring logs, and exercise his own judgment as to the nature and difficulty of the proposed work. It should be noted in

particular that the ground water level may change from the level existing at the time of the test borings.

4.2 Line and Grade

The Engineer will set a hub at the pole center and provide a benchmark and reference hubs on the longitudinal and transverse center lines. The Contractor shall perform all subsequent layout work necessary to ensure that the foundation is constructed to the correct dimensions and in the locations specified on the Drawings. If the Contractor finds that the hubs have been disturbed, are missing or are in error, he shall stop work immediately and notify the Engineer who will replace the hubs as soon as practicable. The Contractor shall carefully protect all reference hubs and shall give such assistance as may be required when it is found necessary to replace or move the same.

4.3 Site Grading

In general, the natural earth at the pole site shall be disturbed as little as possible during construction. The ground surface shall be graded to provide drainage away from the pole and shall be reasonably smooth and compact. The Contractor shall comply with all Federal, State, and local regulations governing soil erosion and sediment control.

4.4 Drilled Cylindrical Foundation Excavation

4.4.1 General

The drilled cylindrical foundation diameter and depth shall be as shown on the Drawings. The hole shall be drilled with drilling equipment which will produce the excavation shown on the Drawings. Drill rigs which do not run true will not be acceptable.

4.4.2 Depth/Diameter Required

The depth/diameter noted on the Drawings is to be considered minimum. If in the opinion of the Engineer, unsuitable soils are encountered, the excavation shall be continued to whatever depth/diameter is necessary to obtain suitable bearing. If depth/diameter required by the Engineer is greater than depth/diameter shown on the Drawings, the additional excavation and volume of reinforced concrete to fill it will be paid for by the Commission.

4.4.3 Protection

The excavation shall be protected to prevent caving until the concrete/pole has been placed. The excavation shall be protected with a suitable cover until the concrete/pole has been placed.

4.4.4 Temporary Casings

Temporary casing will be required in the excavation if it becomes necessary for workmen to do hand excavation, remove obstructions, or clean out the lower sections prior to the placement of concrete. Temporary casings will also be required if soil characteristics or the infiltration of ground water make excavation walls unstable. The Contractor shall have immediately available for use on the job an ample supply of casing in the event it is needed to stabilize the excavation. Casing may be assembled using short pieces if jointing devices are of sufficient strength to allow assembled sections of casing to be pulled as a unit as concrete is being placed or immediately thereafter. The casing shall also be of such strength

and rigidity as to maintain the required excavation lines against the pressure of material sloughing from the sides of the excavation. All temporary casing shall be removed from excavations as concrete is placed or immediately thereafter, and in such a manner as to prevent sloughing material from dropping to the bottom of the excavation, falling on top of freshly placed concrete or intruding into the concrete mass.

4.4.5 Dimensional Tolerances

The location and dimensions of the foundation shall be as close as possible to those shown on the Drawings and staked in the field. The maximum allowable tolerance will be as follows:

(1) Top of the foundation shall be set to the elevation shown on Drawings, except where otherwise directed by the Engineer.

(2) The variation in elevation of the bottom of the drilled caisson from the specified depth shall be from zero to plus six inches (6″), except where required to be deeper due to soil conditions.

(3) Maximum deviation of the axis of the hole from the vertical shall be no more than one inch (1″) in eight feet (8′-0″).

(4) The diameter of the drilled caisson shall not be less than specified or more than four inches (4″) greater than specified.

4.5 Concrete For Surface Mounted Pole

4.5.1 Strength

The Contractor shall supply ready mixed concrete prepared in accordance with ASTM C94. It shall have a minimum compressive strength of 4,000 PSI at twenty-eight (28) days for surface mounted structures.

4.5.2 Slump Test

Consistency will be determined in the field by the slump test, in accordance with ASTM C143. The specified slump for all concrete shall be three to four inches (3″ to 4″). A minimum of one (1) slump test shall be made for each load of concrete used on the job site. If water is added at the job site to increase the slump, the recorded slump shall be that tested after the final addition of water.

4.5.3 Air Entrainment

Air entrained concrete shall be used in all applications where concrete will be exposed to moisture and cycles of freezing and thawing. The air content shall be between four percent and six percent (4% and 6%).

4.5.4 Concrete Testing

The Contractor shall be required to make four (4) test cylinders from each truck load of concrete used in pouring the foundation for the surface mounted structure in accordance with standard ASTM sampling procedures. Cylinders are to be cured and tested prior to the surface mounted pole erection. The test cylinders shall be broken as follows: one (1) cylinder at seven (7) days; two (2) cylinders at twenty-eight (28) days; one (1) cylinder at fifty-six (56) days if 4,000 psi is not

achieved by twenty-eight (28) days. It will be the Contractor's responsibility to arrange for onsite and laboratory testing by a qualified testing laboratory approved by the Engineer. The cost of testing will be borne by the Contractor. The Contractor will require the laboratory to send two (2) sets of compressive test reports to the Commission and Engineer, in addition to those copies furnished to the Contractor.

Testing will be in accordance with ASTM C31 and will cover compressive strength, slump, and quality of aggregates. In cases where the strength of the test cylinders for any portion of the work falls below the requirements specified herein, the Engineer may require the Contractor to secure test specimens of the hardened concrete represented by these cylinders. Specimens shall be secured and tested in accordance with ASTM C-42 and shall have a minimum diameter of three inches (3″). If the specimen test further substantiates that the concrete represented by the cylinders and specimens are below the strength requirements specified herein, the Engineer may order such concrete removed and replaced at the expense of the Contractor.

Dependent upon the location of the concrete section in question, the Engineer may approve low frequency ultrasonic testing or other non-destructive techniques as an alternate to core drilling and testing.

4.6 Concrete Placement

4.6.1 Dry Hole

Concrete shall be placed as soon as possible after excavation. Immediately prior to the placement of concrete, the excavation shall be cleaned of water, debris, ice, clods and piles of loose earth, and any other material which should be excluded from the concrete. Surfaces against which concrete is to be placed shall be free of frost, and in cold weather shall be enclosed or heated, if necessary, prior to placing concrete to insure this requirement is met. Water in the bottom of the excavation must be removed or absorbed. Equipment for placing concrete shall include a pump and two (2) vibrators in good working condition, hoppers and elephant trunks for directing the flow of concrete and an ample supply of sacked cement for use in drying the bottom of the excavation. The Contractor shall not place any concrete until the excavation, reinforcing steel and anchor bolts are checked and approved by the Engineer. In a drilled caisson where the contractor can free fall the concrete down the center of the caisson without having the concrete come in contact with the embedded items, which will cause segregation of the aggregate, the Contractor may place the concrete with the use of an elephant trunk or drop chutes and shall use vibrators. The maximum free fall distance shall be no more than five feet (5′-0″). If the Engineer sees the above method cannot be implemented, then the Contractor shall place the concrete for the first lift using hoppers and sections of elephant trunk or drop chutes. The normal procedure expected to be followed by the Contractor will be to place the concrete to an elevation approximately five feet (5′-0″) above the bottom of the caisson and vibrate this deposit with one (1) pass of the vibrator down to the bottom of the caisson and back to the top of concrete. Following this, the remainder of the concrete may be poured in two (2) or more lifts of equal height with one (1) pass of the vibrator down to the bottom of the lift and back up on each lift. In placing concrete, internally operated vibrators of a minimum diameter of two and one-quarter inches (2-1/4″) and having a speed of 5,000 rpm or more, are to be used. On the upper lifts of concrete, elephant trunks will not be required, but the placing of the concrete shall be done in such a manner as to prevent segregation of the aggregates.

4.6.2 Wet Hole

Immediately prior to the start of the concrete placement, water shall be pumped from the excavation to expose the bottom or, if a sump is used, leaving a depth of water not exceeding four inches (4″) in the sump. The use of cement to dry up the water left in the sump will then be permissible provided the rate of inflow is sufficiently slow to permit placement of concrete without increasing the water-cement ration. To meet this requirement, the Contractor must have cement ready to place into the excavation immediately after pumping, and also have adequate concrete at the site. If in the opinion of the Engineer, the influx of ground water is too great to obtain concrete of acceptable quality, it will be necessary for the Contractor to place concrete by tremie.

4.6.3 Tremie Method

If the inflow of water into the excavation is too rapid to permit placement of concrete in the dry, the Contractor shall place the concrete under water by the tremie method. In such cases, a special mix of concrete will be required with coarse aggregate (gravel), three-fourth inch (3/4″) maximum size, and a minimum of seven (7) bags of cement per yard. A retarding agent may be used if approved by the Engineer. The slump of the concrete, when being placed, shall be between five inches (5″) and seven and one-half inches (7-1/2″). Minimum mix strength of 4,000 PSI shall be maintained. No vibration of the tremie concrete will be required or permitted, but it will be permissible to vibrate the tremie pipe under certain conditions when the flow of concrete becomes sluggish. It will also be permissible to vibrate the casing, if used, when the excavation is filled with concrete at the time the casing pull is started. The tremie pipe shall have a minimum diameter of eight inches (8″) and shall be equipped with a watertight foot valve or gate at the discharge end which can be positively controlled from the ground surface. If joints are required in the tremie pipe, they shall be watertight. The entire assembly shall be watertight, and under no circumstances will concrete be permitted to flow through water in the tremie. In placing concrete, the discharge end of the tremie shall be placed no more than six inches (6″) above the bottom of the excavation and shall not be raised until the pipe has become submerged in the concrete to a depth which establishes a seal between the tremie pipe and the concrete sufficient to prevent entry of water into the tremie. The discharge end of the tremie shall be kept submerged in the concrete a sufficient depth to maintain, at all times, an adequate seal during underwater placement. Once started, the underwater placement shall proceed without interruption until this seal has been well established. At that point, the Contractor shall start removing the water being displaced by the concrete. The placing of concrete by tremie shall not be started until a supply of concrete is at the site sufficient to complete placing up to the ground surface. Concrete may be placed by tremie only when authorized by the Engineer.

4.6.4 Placement Temperature

The temperature of concrete when being placed shall be:

a. Not less than 40EF in moderate weather.

b. Not less than 50EF in weather during which the mean daily temperature drops below 40EF.

c. Not greater than 90EF during hot weather.

4.7 Protection

The Contractor shall protect all concrete against injury until final acceptance by the Commission. The Contractor shall be prepared to protect all concrete in accordance with the requirements of this paragraph. Temperature of concrete being poured shall be controlled by controlling the temperature of aggregate and mixing water. Mixing time and elapsed time between mixing and placing shall be kept at a minimum. The interior surfaces of forms and ground upon which concrete is to be placed shall be thoroughly wetted before concrete is poured. After the first frost and until the mean daily temperature in the vicinity of the work rises above 40EF for more than one (1) day, the concrete shall be protected against freezing for not less than forty-eight (48) hours after it is placed.

4.8 Finishing

Smooth, solid concrete surfaces are required throughout the work. The top surface of the concrete foundation shall be finished to conform to the detail shown on the Drawings. In general, steel trowel finish on the concrete is required. Care shall be taken in the steel troweling not to bring excessive fine material to the surface. Finishing of concrete surfaces shall be performed only by skilled workmen.

4.9 Surface Treatment

All exposed concrete shall be properly cured for seven (7) days by moist curing using a wetted burlap covering with craft paper or polyethylene sheets or by spray application of a liquid membrane-forming compound conforming to ASTM Designation C309-89 to prevent evaporation. The membrane shall be applied according to the manufacturer's recommendations. Surface defects shall be filled prior to application of the curing compound. All concrete surfaces on which curing compound has been applied shall be adequately protected for the duration of the curing period from any cause which will destroy the continuity of the curing membrane. No curing compound shall be used on surfaces requiring subsequent bonding.

4.10 Excavation and Backfill

4.10.1 Unsuitable Material

The Contractor shall excavate for the foundation to the dimensions and outline shown on the Drawings. Excavated material which conforms to the Specifications for backfill material may be used for this purpose. Materials which are not suitable for backfill and excess material shall be disposed of as directed by the Commission or Engineer.

4.10.2 Excavation Classification

All excavation will be classified as "common excavation." All excavation including soft shale, gravel, or other material which can be removed by hand or machine is defined as common excavation.

4.10.3 Excavation Preparation

Excavation in earth shall be to clean level surfaces of undisturbed material of adequate bearing value. Over-excavation shall be backfilled with well compacted six inch (6″) layers of stone or gravel base material, or concrete. If the over-excavation is unnecessary, the cost of the backfill shall be borne by the

Contractor. The quality of the soil and the adequacy of its bearing value shall be decided by the Engineer before backfill or concrete is placed in any excavation. Where water is encountered, the excavation shall be kept dry by pumping during the installation of the structure and during the backfilling process. If unsuitable material is encountered at the proposed bearing surface under the concrete foundation, the Engineer may require further excavation to reach sound bearing. Backfill labor and material for this type of required over-excavation will be supplied at the Contractor's expense and should be included in the Unit Price for "M-2 (Stone Backfill)" in the Proposal Section. The Contractor will be paid on a per cubic yard unit basis.

4.10.4 Gravel Base

The stone or gravel base cited in Section 4.10.3 shall consist of a mixture of graded aggregate, coarse and fine, together with soil binder. The coarse aggregate shall consist of sound, tough, durable particles or fragments of gravel or stone. The material shall be placed in six inch (6″) layers and thoroughly compacted.

4.10.5 Excavation Maintenance

The excavation shall be maintained in a safe, clean and sound condition up to the time of placement of concrete. The excavation shall be suitably protected when not attended. Whenever necessary, the Contractor shall re-excavate materials which have accumulated in the previously prepared excavation. Any muck or other unsatisfactory bearing material resulting from frost action or entrance of water into excavation previously prepared to the required depth for sound bearing shall be removed and replaced with well compacted stone or gravel backfill or concrete at the Contractor's expense.

4.10.6 Sheeting and Shoring

The Contractor shall do all bracing, sheeting and shoring necessary to support and protect all excavations as required for safety and to conform to laws and regulations of all governmental bodies having jurisdiction. When sheeting is used, it shall be removed during or upon completion of backfilling.

4.10.7 Backfill

Backfill around the foundation shall be carefully placed using the better materials of excavation near the foundations. All backfill around the foundation shall be compacted in six inch (6″) layers by means of mechanical tampers. When excavated material becomes so wet that, in the opinion of the Engineer, it is not suitable for backfill, the Contractor shall at his expense spread and aerate the material until the proper moisture content is attained, at which time the material shall be used as backfill around the foundation. The degree of compaction to be attained for all backfill shall be the equivalent density of adjacent undisturbed earth. Large stones, muck, frozen material, roots, or other undesirable material shall not be used for backfill. Selected earth borrow shall be used as backfill material when the excavated material has been deemed unsuitable by the Engineer. This material, furnished by the Contractor, shall be locally available earth which when placed and compacted in six inch (6″) layers will bind and compact around the foundation. Sources of this material shall be approved by the Engineer.

4.11 Reinforcing Steel

4.11.1 Grade

Reinforcing bars shall conform to the latest revision of ASTM Standard Specifications for Deformed Billet Steel Bars for Concrete Reinforcement, Designation A615 or A617, Grade 60.

4.11.2 Placement

Steel reinforcing bars shall be placed in the concrete wherever shown on the Drawings. Unless otherwise shown on the Drawings or directed, measurements made in placing the bars shall be to the center lines of the bars. Before the reinforcing bars are placed, the surfaces of the bars and the surfaces of any metal bar supports shall be cleaned of heavy flaky rust, loose mill scale, dirt, grease, or other foreign substances. After being placed, the reinforcing bars shall be maintained in a clean condition until they are completely embedded in the concrete. Main reinforcement shall have a minimum clear protective cover to the face of concrete as shown on the Drawings. Reinforcing bars shall be accurately placed and secured in position so that they will not be displaced during the placing of the concrete. Special care shall be exercised to prevent any disturbance of the reinforcing bars in concrete which has already been placed. Rust-proof metal chairs, metal hangars, metal spacers or other satisfactory metal supports may be used for supporting reinforcing bars. Precast concrete blocks may be used for supporting reinforcing bars.

4.12 Anchor Bolts

4.12.1 Material Assemblies

All anchor bolt assemblies furnished by the Commission and required for permanent installation in the foundations will be installed by the Contractor. Any anchor bolts damaged during installation shall be replaced by the Contractor to the original Specifications at no cost to the Commission. All pre-clustered anchor bolt assemblies shall be checked against the Drawings by the Contractor before pouring concrete to ensure the cluster has not been damaged and complies with the Specifications and Drawings.

4.12.2 Bolt Protection

Prior to setting, the threads on the upper end of each anchor bolt shall be given a light coat of oil or grease to prevent the adherence of concrete. When installed, the bolts shall be clean and the portions to be embedded in concrete shall be free of heavy scale, oil or other deleterious substances which would adversely affect the bond between the bolts and concrete. During the concrete finish and clean-up, the Contractor shall remove concrete adhering to the portions of anchor bolts extending above finished concrete grade. No pipe sleeves are to be installed with the anchor bolts. The bolts shall be accurately positioned. It will be the Contractor's responsibility to accurately set the bolts initially and to maintain the required accuracy of their positioning until final acceptance by the Engineer.

4.12.3 Assembly Tolerance

Deviations from specified positions of anchor bolts, after concrete has set, shall not exceed the following:

(1) Horizontal distance between centers of adjacent anchor bolts shall be within one-sixteenth inch (1/16″) of the specified distance, measured at the top of concrete.

(2) The elevation of the top of the lowest anchor bolt in a set shall not be less than specified, and that of the highest bolt shall not exceed the specified elevation by more than one-quarter inch (1/4″).

(3) Angular deviation from specified alignment of the installed anchor bolt set relative to the vertical center line shall not exceed one degree (1E).

(4) The foundation must comply with the specified requirements for line and grade in order to be accepted. No payment shall be made for any defective foundations until the Contractor has completed the necessary corrective work to the satisfaction of the Engineer. The Contractor shall bear the full expense of all such corrective work.

TECHNICAL SPECIFICATIONS – MATERIAL SPECIFICATIONS

1.0 SCOPE

Greenville Utilities Commission will furnish all transmission material items required for the construction, unless otherwise noted. The Contractor shall furnish all rebar and grounding material for tubular steel pole foundations. Greenville Utilities Commission will furnish up to and not to exceed one hundred ten percent (110%) of Engineer's estimated amount of concrete required for construction of tubular steel pole foundations. Any additional concrete necessary for completion of tubular steel pole foundations shall be at the Contractor's expense.

2.0 GENERAL

b) All materials shall be new, except items specified for reuse, and will be furnished by the Commission and the Contractor as outlined in the Statement of Work, paragraphs 1.2 and 1.3.

c) All materials issued to the Contractor must be acknowledged by a material receipt.

d) Materials removed and salvaged must be returned to the Commission's warehouse and a receipt will be issued to the Contractor for materials returned.

e) The Contractor will be charged for all materials removed which are neither reused nor returned to the Commission's warehouse. Current stock item prices will be used to determine the removed material charge.

f) A brief description of the materials is furnished hereinafter for the Contractor's information.

g) Reference to ASTM, NEMA, AWS, SSPC, or ACI Standard implies reference to the latest revision or to its replacement if it has been discontinued.

3.0 POLES – WOOD – *Not Applicable for this Project*

a) All poles shall meet the requirements of ANSI Standard "Specifications and Dimensions for Wood Poles 05.1," the latest revision thereof.

b) Poles shall be framed as indicated on the Drawings. All holes shall be field drilled and treated with a two percent (2%) solution of Copper Napthenate or other EPA approved preservative before framing.

c) New poles shall be Southern Yellow Pine or Douglas Fir and shall meet the requirements set forth in ANSI Specification and Dimensions for Wood Poles 05.1. Treatment shall be AWPA Standard C4 for the Preservative Treatment of Poles by Waterborne Process. The preservative shall be Chromated Copper Arsenate, CCA, conforming to AWPA Specification P5, or the latest revisions thereof.

4.0 POLES – TUBULAR STEEL – *Furnished by Owner*

a) All poles will meet the requirements of the Tubular Steel Structures Material Specifications of the Contract as specified beginning on page TSSMS-1.

b) Transmission and distribution underbuild pole-top assembly attachment point holes will be predrilled at the factory. However, the Contractor will be responsible for field drilling any other holes required for construction. Cost for drilling these holes shall be part of the pole top assembly unit. In no instances will additional charges be paid for drilling holes. The Contractor shall touch up the finish of all field drilled holes using high zinc content paint (Galvon) supplied by the pole manufacturer.

c) Poles may be delivered in two (2) or three (3) pieces. The Contractor is responsible for all field assembly required for these poles. Additionally, the Contractor is responsible for providing any equipment (i.e., jacks) required to join pieces.

d) All unused holes are to be plugged and sealed using a plastic hole plugs per the manufacturer's recommendations.

5.0 HARDWARE – *Furnished by Owner*

Hardware shall be hot-dip galvanized.

a) Bolts and nuts shall conform to ANSI Standards as follows:

- C135.1 for machine, carriage, and double-arming bolts
- C135.4 for eye bolts
- C135.3 for lag screws

b) Steel parts shall conform to ASTM Specifications A36.

c) Malleable iron shall conform to ASTM Specifications A47.

d) Galvanizing shall conform to ASTM Specifications A153.

6.0 GUY WIRE – *Furnished by Owner*

a) Guy wire shall be 7/16″ Extra High Strength Steel rated 20,800 pounds ultimate strength and supplied by the Owner.

b) All transmission guys shall be attached to steel poles via pole eye plates or pre-manufactured vangs built into the steel pole as shown on the drawings.

7.0 OVERHEAD GROUND WIRE – *Furnished by Owner*

A 7 No. 9 Alumoweld overhead ground wire shall be installed for both projects (Schedule 1 and Schedule 2).

8.0 ANCHORS – *Furnished by Owner*

a) Transmission anchors shall be double helix (8″ and 10″), with one and one-half inch (1-1/2″) square shaft rod and a twin eye, rated 23,000 lbs. in Class 6 soil. Combined with a twelve inch (12″) Helix-extension, the anchor is rated at 32,000 lbs. in Class 6 soil.

b) The anchors shall be installed per the manufacturer's recommendations.

c) The ultimate holding capacity of these anchors is dependent upon the soil properties. Holding capacity for Class 6 soil is 23,000 lbs. (32,000 lbs. when combined with a twelve inch (12″) Helix-extension).

d) The holding capacity of the anchors is dependent upon the torque values achieved while setting the anchors. Additionally, it will be necessary for the eye of the anchor to be installed a specific distance out of the ground in accordance with the construction drawings.

In order for the Contractor to meet the specification criteria for both torque and depth, it will be necessary to use multiple shaft length extensions in increments of three and one-half feet (3′-6″), and seven feet (7′-0″).

9.0 INSULATORS – *Furnished by Owner*

a) Suspension

i) Insulators shall be polymer and shall conform to ANSI, IEEE, ASTM, and AEIC Standards for insulators. All suspension insulators shall be gray.

8.1.2

Insulator Type	Flashover (kV)		Leakage (mm)	Suggested Manufacturer	Catalog Number
	Dry	Wet			
Polymer Suspension	510	450	3359	NGK Locke	251SS400CE

8.1.3 Suspension insulators shall be attached via shoulder eye through bolts or pre-manufactured vangs built into the steel pole.

b) Horizontal Post – Furnished by Owner

Polymer horizontal mounting line post insulators for 115 kV shall be Ohio Brass for steel pole mounting.

Insulator Type	Flashover (kV)		Leakage (mm.)	Suggested Manufacturer	Catalog Number
	Dry	Wet			
Polymer Horizontal Post (Two Hole Blade)	620	360	3045	NGK Locke	L2-SN291-13

Mechanical strength 7.4 kN, design cantilever load.

10.0 FIBERGLASS STRAIN INSULATOR – *Furnished by Owner*

Fiberglass strain insulator for use in guys shall have an ultimate strength of 30,000 pounds; shall have an insulating distance of seventy-eight inches (78″) and shall be equipped with clevis ends and the number of rollers required.

11.0 CONNECTORS AND SPLICES – *Furnished by Owner*

All connectors and splices for 336.4 kcmil ACSR conductor, 1272 kcmil AAC conductor, and 7 No. 9 Alumoweld OHGW shall be the compression type. Full tension compression splices shall develop strength equal to not less than ninety-five percent (95%) of the ASTM rated strength of the conductor. See Total Transmission Material List and Cross Reference, pages provided by Greenville Utilities Commission for preferred manufacturer and catalog numbers.

12.0 ARMOR RODS – *Furnished by Owner*

Where armor rods are installed on phase conductors or OHGW, they shall be of a type specifically designed for the conductor being protected and shall be manufactured with aluminum alloy, aluminized acceptable. Armor rods shall be installed with the midpoint within two inches (2″) of the center of the suspension clamp. The maximum distance between the ends of any two (2) individual rods within a bundle shall not exceed one-half inch (1/2″).

13.0 CONDUCTOR CLAMPS – *Furnished by Owner*

12.1 Trunion Clamps and Suspension Clamps

Suspension clamps and connecting pieces, material items on tangent and light/medium angle type pole top assemblies for 795 kcmil AAC 37/0 Strand – Arbutus, 1272 kcmil AAC 61 Strand – Narcissus and OHGW (7 No. 9 Alumoweld) conductors shall be sized to fit conductor with Armor Rod as manufactured by Preformed or approved equal. See Total Transmission Material List and Cross Reference, pages provided by Greenville Utilities Commission for preferred manufacturer and catalog numbers.

12.2 Cushion Grip Supports

Cushion grip supports on tangent and light/medium angle type pole top assemblies shall be sized to fit 795 kcmil AAC 37/0 Strand – Arbutus or 1272 kcmil AAC 61 Strand – Narcissus. See Total Transmission Material List and Cross Reference, pages provided by Greenville Utilities Commission for preferred manufacturer and catalog numbers.

14.0 DEADENDS – *Furnished by Owner*

All deadends for 795 kcmil AAC 37/0 Strand – Arbutus, 1272 kcmil AAC 61 Strand – Narcissus, and 7 No. 9 Alumoweld shall be bolted, quadrant type. See Total Transmission Material List and Cross Reference, pages provided by Greenville Utilities Commission for preferred manufacturer and catalog numbers.

15.0 GROUNDING – *Furnished by Owner*

15.1 All steel poles shall have driven grounds (transmission and distribution) as indicated on the Drawings. Guys and overhead ground wire shall be attached to the common ground which is the pole itself in the case of steel poles.

15.2 Ground rods shall be 5/8″ x 10′ galvanized steel. Extensions shall be added if necessary to obtain a verifiable ground resistance of 25 ohms or less. Ground rods shall be installed at the direction of the Engineer. Threaded ground rod couplings shall be used to secure each ground rod section as it is installed.

15.3 Ground wire for steel poles shall be No. 4 AWG soft drawn tinned copper wire unless otherwise specified.

15.4 Installation cost of ground rods to include testing of ground resistance and generating a report of test results.

The following is the minimum information to be included in the test report:

- Ambient Air Temperature
- Relative soil moisture content (i.e. Dry, Moist, Wet)
- Total number of rods installed to achieve 25 ohms
- Ground Resistance Reading after installation of each ground rod section

- Type of meter used
- Date and time of test
- Person or persons performing test.

All measurements to be made without connection to steel pole or neutrals

Ground Resistance Test reports to be submitted to Owner and Engineer for all installed structures.

16.0 STATIC GROUND BRACKETS – *Furnished by Owner*

The ground wire cable supports shall be Hughes Brothers 2855 series or approved equal for tangent and light angle structures.

17.0 CONDUCTOR – *Furnished by Owner*

Overhead conductor for the 230kV POD #3 Transmission Tap shall be 795 kcmil AAC 37/0 Strand – Arbutus for new construction.

Overhead conductor for the 115kV Transmission Line to Bells Fork Substation shall be 1272 kcmil AAC 61 Strand – Narcissus for new construction.

18.0 OWNER-FURNISHED MATERIAL STANDARDS – *Furnished by Owner*

The successful bidder will be provided a list of Owner-furnished material pages as a "Standard" for reference. The Commission may substitute other manufacturer's products of equal or better quality.

TECHNICAL SPECIFICATIONS – INSTALLATION SPECIFICATIONS

1.0 GENERAL

a) The new construction, rearrangements, relocations, modifications, and removals shall be complete in accordance with the Plans, Specifications, Plan & Profile Sheets, Staking Sheets, and Assembly Drawings. All work shall be done in a thorough and workmanlike manner.

b) The latest edition of the National Electrical Safety Code shall be followed. All construction shall conform to that required for a medium loading district. Deviations from the Plans, Specifications, and Construction Drawings will not be permitted except upon written permission from the Engineer.

c) The existing transmission line voltage is 115,000 volts, three-phase, three-wire, 60 Hz, with an overhead ground wire. The new construction is proposed to be 115,000 volts, three-phase, three-wire, 60 Hz, with an overhead ground wire.

2.0 REMOVALS

a) Removals shall consist of removing each and every item designated on the Drawings, the disassembling of structures into material items, and the transportation of the items from the site of the work to the storage area designated by the Commission.

b) Conductor removal shall include the coiling or reeling of the conductor removed in a workmanlike manner.

c) Anchor assemblies shall be removed by removing the anchor rod only. If the anchor rod cannot be unscrewed, the rod must be cut or bent down so as to be a minimum of eighteen inches (18″) below the ground line. Screw-type anchors shall be completely removed.

d) The removal shall include any necessary handling, resagging, and retying of conductors in those cases where an existing assembly unit will be removed and replaced by a new assembly unit and where any existing conductor is to be retained. Removal will also include any holding or handling of main line or tap conductors at tap lines, angles, and deadends where such is involved and the reinstalling of such conductor, including resagging and reconnection. It shall also include reinstalling any conductors temporarily detached.

e) The Contractor shall reinstall, at his own expense, any other items removed by him for his own convenience.

f) All materials removed as part of the work and not specified to be reused will remain the property of the Commission.

3.0 TRANSFERRING

a) Transferring shall consist of disconnecting existing material and reinstalling this material in a different location on the same structure or a new structure, provided the new structure is adjacent to the existing structure.

3.2 All unused holes in poles shall be plugged.

3.3 The transfer shall include any necessary handling, resagging, and retying of all conductors in those cases where an existing assembly unit will be removed and replaced by a new assembly unit and where any existing conductor is to be retained. Transfer will also include any holding or handling of all conductors at tap lines, angles, and deadends where such is involved and the reinstalling of such conductor, including resagging and reconnection. It shall also include reinstalling any conductors temporarily detached.

3.4 The Contractor shall reinstall, at his own expense, any other items removed by him for his own convenience.

4.0 POLES – WOOD AND/OR STEEL

a) Inspection

i) All main-line transmission poles will be steel.

ii) The Contractor shall not install a pole that, in his opinion, or the opinion of the Commission or Engineer, has been damaged or is otherwise unsafe. The Contractor shall promptly report any damaged or questionable pole or other component to the Commission and Engineer and confirm the report in writing.

b) Handling of Poles

i) The Contractor will be responsible for any damage to the poles and arms resulting from his handling, transporting, or storing procedures.

ii) Poles shall not be dragged along the ground. Fiberglass slings of adequate strength rating shall be used for handling all steel poles. Pole tongs, cant hooks, and other pointed tools capable of producing indentations more than one inch (1″) in depth shall not be used in handling wood poles. No tools shall be applied to the ground line section of any pole.

c) Pole Setting

For single-pole wood structures, the minimum setting depths shall be as follows:

Pole Length (Feet)	Setting Depth (Feet)
30	5.5
35	6.0
40	6.0
45	6.5
50	7.0
55	7.5
60	8.0
65	8.5
70	9.0
75	9.5
80	10.0
85	10.5
90	11.0
95	11.5

Additional embedment may be required for some construction units (See Plan & Profile Drawings). Where steel poles are used, see page TSSIS-5 paragraph 4.4, *Drilled Cylindrical Foundation Excavation*, paragraph 3.4.2, *Depth/Diameter Required.*

d) On sloping ground, the depth of the hole shall always be measured from the low-side of the hole.

e) Holes shall be approximately eight inches (8″) larger than the butt diameter of the pole unless noted otherwise and shall be at least as large at the bottom as at the top.

f) All poles shall be set plumb and in alignment except at running-corner line angle points or where all three (3) phases are stacked on one side of the pole. In these cases, poles shall be offset on the bisector of the angle so that conductors will hang directly over the point of intersection in line with the tangent in both directions. All poles shall be plumb after conductors are strung. Where poles are set along the edge of cuts or embankments, or where the soil is liable to be washed out, special precautions shall be taken to insure durable foundations and the setting depth shall be measured from the lower side of the hole. While backfilling, in no case shall the earth be backfilled to a greater depth than six inches (6″) without being tamped hard before the next layer is backfilled. The surplus earth shall be placed around the pole in a conical shape and packed tightly in order that water will drain away from the pole.

g) Holes in Pole

Transmission and distribution underbuild pole top assembly attachment point holes will be predrilled at the factory. However, the Contractor will be responsible for field drilling all other holes required for construction. Cost for drilling these holes shall be part of the pole top assembly unit. In no instances will additional charges be paid for drilling holes. The Contractor shall touch up the finish of all other holes with cold galvanizing.

5.0 ROCK ENCOUNTERED DURING EXCAVATIONS

The Contractor shall be responsible for the removal and disposition of solid rock when encountered in holes for wood poles and tubular steel poles. Solid rock shall be defined as solid, naturally-occurring mineral formations that cannot be effectively removed by conventional trenchers, backhoes, or pressure augers on line trucks. Loose rock or limestone in intermittent layers that result in "difficult digging" shall not be defined as solid rock excavations. "Solid rock" shall require the use of air hammers, blasting or other specialized equipment. (Note: Blasting must be approved by the Commission in accordance with local ordinances.)

An adder (M-1 (Rockhole)) will be quoted by the Bidder in the Proposal Section to establish a labor cost for rock excavations, including disposition to the Commission's landfill, on a per-cubic-yard basis. Quantities will be agreed upon jointly by the Contractor and the Commission (or Engineer) as the excavations occur. Over excavation to remove rock will not be counted in the quantity of rock excavations. The volume of rock excavation adder will be computed based on the normal pole hole diameter and depth, as if no rock were encountered. Rock adders will not apply to man-made surface treatments, such as asphalt, concrete or gravel.

6.0 POLES – TUBULAR STEEL

See Tubular Steel Structures Installation Specifications beginning on page S-18.

7.0 DAVIT ARMS

Davit arms are being used on some structures for this project. The arms and all attachment hardware are being supplied by the steel pole manufacturer. It will be the Contractor's responsibility to install the davit arms and ensure proper orientation of the arms.

8.0 GUYS AND ANCHORS

a) Guys shall be attachment type utilizing preformed guy grips. Guys shall be installed in locations specified by the Engineer. Points of attachment to poles shall be as shown on Construction Drawings. Guys shall be installed before conductors or overhead ground wires are strung.

b) All anchors and rods shall be in line with the strain. All anchors are to be single or multiple helix screw type or expanding rock type and shall be located as staked by the Engineer. Anchor rods shall be so installed that approximately six inches (6″) of the rod shall remain out of the ground or extend more than twelve inches (12″) out of the ground in cultivated fields. The setting depth of each anchor in regard to depth, torque, and position shall be inspected by the Commission's Construction representative and his approval given in writing. The Contractor shall fill out anchor installation reports, furnished by the Engineer, as each anchor is installed. No anchor installations shall be invoiced without copies of the installation reports properly filled out and attached.

c) All anchors shall be installed using a Hydraulic Torque Indicator control tool. Expanding rock type anchors shall be installed and torqued per manufacturer's recommendations.

d) Anchor locations shall be checked and verified by the Contractor prior to installation to assure that guys do not conflict with phase conductors. This is especially critical when transmission guying passes through distribution phase positions. Where fiberglass guy strain insulators are installed in guys, a minimum of ten inches (10″) must be maintained to any underbuild phase conductors.

e) Where multiple fiberglass guy strain insulators are to be installed, in one (1) guy strand, they shall be connected using a chain link of the appropriate size.

9.0 HARDWARE

a) Hardware shall be installed as indicated on the Drawings. All bolts shall be installed with nuts and locknuts. Bolts shall be long enough to accommodate the necessary nuts, washers, etc. without projecting more than one and one-half inches (1-1/2″) or less than one-half inch (1/2″) at the free end. They shall not project more than one-fourth inch (1/4″) into an eyenut installed.

b) All holes misdrilled shall be plugged and sealed using caulk and plastic plugs per the manufacturer's recommendations. No holes or voids are to be left unsealed when installation is complete.

10.0 INSULATORS

10.1 Care shall be exercised in handling and erecting insulators.

10.2 All insulators shall be handled with utmost care during storage, transportation, assembly, and installation. Particular care shall be taken to avoid bending stresses in insulator strings during handling. Insulators shall not be dropped. Insulators subjected to these or any other abuses or damage shall be permanently marked, rejected from the job and charged to the Contractor.

10.3 All insulators shall be protected from the accumulation of all foreign materials insofar as is possible. Mud, grease, and other foreign materials shall be cleaned from insulators using clean rags. Wire brushes may not be used for the cleaning of any insulator parts. Upon installation, all insulators shall be clean on all surfaces. Workmen shall not climb on insulators at any time.

11.0 GROUNDING ASSEMBLY

a) Wood Poles

i) Butt plates (M2-12) or driven ground rods (M2-11) shall be installed on all wood distribution poles as indicated on the Staking Sheets.

ii) Refer to the following drawings for the grounding of wood distribution poles:

M2-11
M2-12

b) Direct Embedded and Vibratory Base Steel Poles

i) Driven pole grounds (TM-9SP) shall be installed on all steel transmission poles as indicated on the Plan & Profile sheets.

ii) Steel transmission poles with distribution underbuild shall share a common ground rod (TM-9SP).

iii) Refer to the following drawings for the grounding of direct embedded steel transmission poles:

TM-2A, 2B, 2C
TM-9SP
TM-9R
TM-9X(S)

11.2.4 Installation cost of ground rods to include testing of ground resistance and generating a report of test results.

The following is the minimum information to be included in the test report:

- Ambient Air Temperature
- Relative soil moisture content (i.e. Dry, Moist, Wet)
- Total number of rods installed to achieve 25 ohms
- Ground Resistance Reading after installation of each ground rod section
- Type of meter used
- Date and time of test
- Person or persons performing test

All measurements to be made without connection to steel pole or neutrals.

Ground Resistance Test reports to be submitted to Owner and Engineer for all installed structures.

c) Surface Mounted Steel Poles

i) Driven pole grounds (TM-9SP) shall be installed on the surface mounted steel pole as indicated on the Plan & Profile sheets.

ii) Steel transmission poles with distribution underbuild shall share a common ground rod (TM-9SP).

d) Where transmission and distribution assemblies are joint use structures, a common ground shall be shared. For wood poles, the common ground will be a ground wire. For steel poles, the common ground will be the pole itself.

e) Guys and overhead ground wires shall be attached to the common ground.

f) The distribution neutral shall be attached to the common ground.

g) Ground rods shall be driven to their full length into undisturbed earth according to the unit assembly drawings. The top of the ground rod shall be located a minimum of one foot (1′-0″) below grade or as indicated otherwise on the Assembly Drawings.

h) Ground rods shall be 5/8″ x 10′-0″ galvanized steel for transmission. Extensions (TM-9R) shall be added if necessary to obtain a verifiable ground resistance of twenty-five (25) ohms or less.

i) Ground wire for transmission poles shall be No. 4 AWG soft drawn tinned copper wire.

12.0 CONDUCTORS

a) Distribution Conductors – ***Not Applicable for this Project***

i) Care shall be exercised to avoid kinking, twisting, or abrading the conductor in any manner. Conductors shall not be tramped on, run over by vehicles, or dragged over sharp rocks. The wire on each reel shall be inspected for cuts, kinks, or other injuries. Injured portions or crooked or imperfect splices in the conductor shall be cut out and the wire respliced.

ii) Conductors shall be pulled over suitable rollers or stringing blocks properly mounted on the pole or crossarm to prevent binding while stringing.

iii) Installation of conductors and accessories shall be done in accordance with manufacturer's recommendations.

iv) With post- and pin-type insulators, the conductors shall be tied in the top groove of the insulator on tangent poles and on the side of the insulator away from the strain at angles greater than ten degrees (10°). Post- and pin-type insulators shall be tight on the pins and on tangent construction the top groove must be in line with the conductor after tying in.

v) There shall not be more than one splice per conductor in any span and no splice shall be located within ten feet (10′-0″) of the conductor support. Splices will not be permitted in road or street crossing spans. Automatic splices are not permitted on primary, neutral, or secondary conductors.

vi) Utmost care shall be exercised in installing parallel groove clamps. The contact surface of the conductor shall be clean and bright. A steel brush shall be the principal cleaning medium; contact compound shall be used for all connections to aluminum conductors. Those same precautions for cleaning shall also apply to the conductor before splicing.

vii) Conductors shall be sagged in accordance with sag and tension charts or tables furnished by the Engineer. Under no circumstances will a decrease in the specified sag be allowed. Sagging by sighting between targets or dynamometer is recommended.

viii) The conductor temperature at the time and place of stringing shall be determined by a certified, thermometer inserted in a short section of conductor. The temperature at which the conductor is sagged and the spans in which sags are measured shall be recorded and the information given to the Engineer.

b) Transmission Conductors

i) The Contractor shall install all phase conductors and shield wires by the tension stringing method. This method shall result in the conductor having sufficient tension at all times to clear all obstructions by an amount adequate to provide safety to personnel and the public. The conductor shall not be allowed to touch or drag across the surface of the ground, any obstruction or guard structure.

ii) If at any time during the construction of the line the conductor should come into contact with the ground or should suffer any other form of damage the conductor shall be lowered and inspected by the Commission's designated Construction Representative. The Commission's Construction Representative

shall judge the method of repair or cleaning to be exercised by and at the expense of the Contractor. Forms of repair may include but will not be limited to cleaning of foreign matter, smoothing with suitable abrasives (emery cloth or equal), cutting and splicing, or replacing.

iii) The Contractor shall install guard structures at crossings of all other overhead utilities, all railroads, public roads, and navigable waterways. Other guard structures may be installed for the protection of the conductor. Guard structures shall be of such construction as to prevent the conductor from dragging on the structure surface since such contact would require conductor repair. Upon completion of conductor stringing in a line section, all guard structures shall be immediately removed in their entirety and all pole holes shall be backfilled and properly compacted to original grade. The Contractor shall be responsible for obtaining the required local, state, and/or federal permits for erection of guard structures on public rights-of-way.

The Contractor shall submit to the Commission a sketch of the guard pole installations with dimensions locating and outlining the number of guard poles and their placement on public rights-of-way. The Contractor shall supply this information two weeks in advance of the guard pole use. Once this sketch has been approved by the state, no changes regarding number and placement of guard structures will be allowed without proper written approval.

iv) The Contractor shall notify the Commission's designated construction representative at least five (5) days in advance of the intended date of conductor pulling across any transmission or distribution line, any highway, stream, or environmentally sensitive area (wetlands, etc.). The Contractor shall also directly notify any public authorities of such operations as may be required in permits, which the Commission or Contractor has obtained.

v) The Contractor shall make himself aware of potential sources of electrical contact, induction, or static charge buildup which may be encountered during construction of the line. The Contractor shall be responsible for conducting operations in such a manner as to avoid hazards of this type. Measures shall be taken by the Contractor to prevent dangerous voltages between various pieces of equipment and between equipment and ground in cases of accidental contact with foreign electric sources. Such measures shall include but not be limited to bonding of pulling equipment and installation of adequate conductor and equipment grounds during all phases of construction. The Contractor shall be responsible for the evaluation of hazards and the determination of protective methods. The Contractor's methods must be in compliance with OSHA Safety Regulations, and are subject to review by the Commission's Engineer and the Commission's Construction Representative.

vi) All equipment used by the Contractor shall be of such type and condition as to ensure installation of conductor without damage. Such damage would include strand overstress, birdcaging, marring of the surface, or the accumulation of foreign material. Tensioning and pulling equipment shall be operated in such a manner as to avoid overstressing of conductors or structures.

(1) The tensioner shall be of a double bullwheel design with an offset of approximately one-half (1/2) groove width between the tandem bullwheels. Bullwheels shall be arranged so that conductor enters the system on the left and exits on the right side of the system

(facing direction of pull). These directions shall be reversed for left-handed lay conductors.

Single V-groove bullwheels will not be allowed. Bullwheel grooves shall be of a polished smooth finish or may be elastomer lined. However, polished smooth bullwheel grooves will not be allowed where the pulling line passes in the same grooves as the conductor. The tensioner shall have a braking system capable of continuously holding a desired tension. Heat from the braking system shall not be transmitted to the conductor. Conductor reels shall be located behind the tensioner with a maximum recommended angle of two degrees (2°) for entry of conductor into the bullwheel. A constant back tension of approximately 1,000 pounds should be maintained on the conductor to minimize birdcaging in the tensioner and conductor over-running. The tensioner and puller shall be located so that under no condition is the average slope of the top conductor less than four (4) horizontal to one (1) vertical. If sagging temperature is 60°F or greater, the Commission's Construction Representative may allow a slope of as low as 3:1 to be used.

(2) Stringing blocks (stringing sheaves or travelers) shall be of such a design as to minimize conductor deformation during pulling and to enhance good sagging practice through low friction. Blocks shall be equipped with ball or roller bearings and shall be maintained in accordance with the manufacturer's recommendations. It is recommended that block grooves be elastomer lined. Unlined smooth polished grooves may be used for conductor stringing if the block material is aluminum or magnesium alloy. However, in no case shall unlined grooves be used if steel pulling line is used

vii) Pulling and sagging of conductor shall be accomplished as specified below.

(1) Pulling tensions shall be limited to seventy percent (70%) of the sag tension for the temperature at time of pulling, or 2,900 pounds, whichever is less. The Contractor is instructed to select pulling sites such that maximum sags near the tensioner position will not result in inadequate ground clearances. Block efficiency and pulling tension limits may preclude pulls of the maximum dimension noted above.

(2) Conductor shall not be left in stringing blocks for more than twenty four (24) hours before pulling to initial sags specified by the Commission's Engineer. If so directed by the Commission's Construction Representative, sag tables corrected for creep time shall be used. After being sagged, the conductor shall remain in the stringing blocks for twelve (12) hours prior to being clipped in. However, the total time in stringing blocks shall not exceed four (4) days, ninety-six (96) hours prior to clipping in.

(3) Conductor sagging shall be accomplished by use of a combination of dynamometer and sag boards. Sags will be checked at a minimum of three (3) locations for each mile of sag distance. No sag distance shall have less than two (2) spans checked before

acceptance. Sags shall be checked in each unusually long span and on each side of unusual horizontal or vertical angles. The Contractor and the Commission's Construction Representative will mutually agree on which spans are to be used as sag checks at least two (2) days prior to the commencement of a pulling operation. The Contractor shall make available to the Commission's Engineer for sag checking such instruments and setups as are being used to sag the conductor. Sag tolerances shall be minus zero (0) plus six inches (6″) from those furnished by the Engineer. Temperatures used in establishing sags shall be established by a certified etched-glass thermometer inserted in a sample conductor section exposed to sunlight and air temperatures the same as those to which the tensioned conductor is exposed.

(4) If emergency conditions or inclement weather require the pulling-sagging sequence to be interrupted before the completion of clipping in, it shall be the responsibility of the Contractor to make sure that adequate clearances exist under the conductor at all points and that the conductor is secure. The conductor tension shall not exceed seventy percent (70%) of the sag tension for the average temperature of the period. The Commission's Engineer will notify the Contractor of any adjustments required to the standard sag tables.

viii) Utmost care shall be exercised in installing parallel groove clamps. The contact surface of the conductor shall be clean and bright. A steel brush shall be the principal cleaning medium; contact compound shall be used for all connections to aluminum conductors. Those same precautions for cleaning shall also apply to the conductor before splicing.

ix) Jumpers and other leads connected to line conductors shall have sufficient slack to allow free movement of the conductors. Slack will be provided at least two (2) bends in a vertical plane, one in a horizontal plane or the equivalent.

13.0 RIGHT-OF-WAY – GENERAL

a) Access to right-of-way areas shall be from existing public or private roads or along existing Commission rights-of-way. Where private roads or trails are used, the Contractor shall obtain permission in writing from the property owner for their use with copies to be furnished to the Commission's Engineer.

b) All right-of-way clearing shall be completed for a section of the line before pole setting may begin. No poles shall be set with right-of-way not completely cleared.

c) All right-of-way clearing will be by the Commission.

d) At the completion of construction and clean-up the Contractor shall regrade all disturbed right-of-way areas to their preconstruction contours where practicable. All cuts or fills shall maintain a maximum slope of 3:1 in order to insure as little run off as possible. Any soil erosion and sedimentation devices required to stabilize and/or reduce further erosion shall be installed. All devices installed during construction and no longer required shall be removed. All disturbed or denuded areas shall be covered with topsoil, if required, fertilized, limed, seeded, strawed, and tacked as necessary. Fertilizer, lime, and seed rates and mixes shall be as specified by the local soil conservation service for

the time of year applied. All cost for right-of-way clean-up and restoration shall be included in the overall price of the project.

e) Maintenance of Existing Rights-of-Way

Existing rights-of-way, both public and private, must be maintained during construction in such a manner so as not to create a hazard. Deep ruts shall be backfilled and graded out. Denuded grass and vegetation areas shall be replanted with a suitable seed mixture. At the end of the construction, the right-of-way should be left in as good or better condition than it was before construction began. All cost of maintaining existing right-of-way and/or reseeding shall be borne by the Contractor.

f) Temporary Service or Access Roads

i. If, during the course of construction it should become necessary for the Contractor to construct, modify, widen, grade, or perform any other earth work in order to provide access to or work areas around any facilities covered in this Contract, he shall do so at his own cost.

ii. The Contractor shall be responsible for all permits required for such construction. He shall also be responsible for the installation and maintenance of any soil erosion and sediment control devices required by local, county, or state agencies.

iii. Any service roads required should follow existing trails, logging roads, maintenance roads, etc., as much as possible. New service road routes should take the best advantage of existing terrains. New service or access roads routes shall be reviewed with the Commission or Engineer prior to beginning construction.

iv. All cost associated with the construction, maintenance, removal, and rehabilitation of any area associated with the rights-of-way, access roads, service roads, etc., shall be included in the Contractor's overall price. A separate cost item will not be billed for this work.

g) Poles & Foundations in Wetlands

i. Any excavation for poles and/or foundations in wetland areas shall utilize extra precaution to avoid disturbing the root mat around the excavated area. Tree stumps and root mats must be left intact in forested wetlands.

ii. Any excess excavated soil in wetland areas must be removed from the wetland area and deposited (spread evenly) on higher ground.

iii. No concrete may be poured directly in wetland areas. The use of steel vibratory casings/forms must be used to prevent contact of concrete with surface waters. The cost of the casing/form must be included in the foundation unit.

iv. No mechanized clearing (bulldozers) in jurisdictional wetlands.

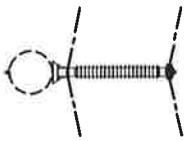
v. Minimize soil disturbance in jurisdictional wetlands (use mats where possible).

vi. Maintain preconstruction contours in jurisdictional wetlands.

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS FOR THE INSTALLATION OF 230kV POD TO BELLS FORK 115kV TRANSMISSION LINE

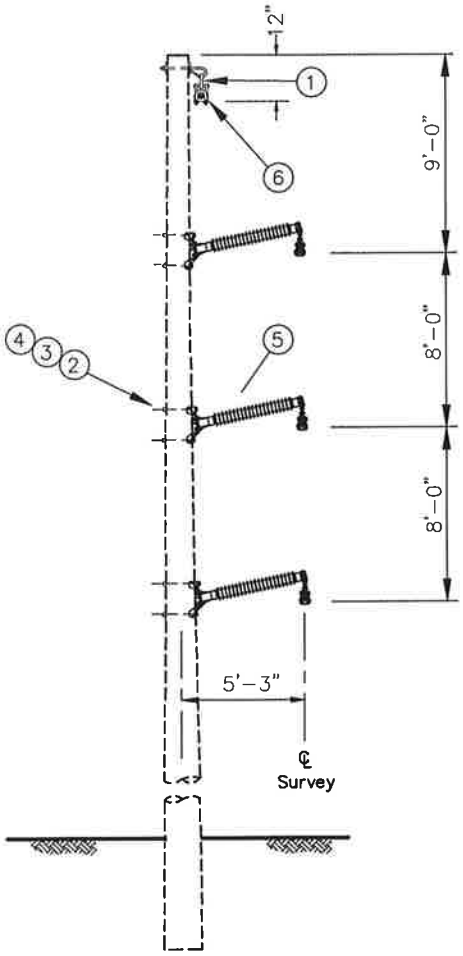
APPENDIX 1 – ASSEMBLY UNIT DRAWINGS

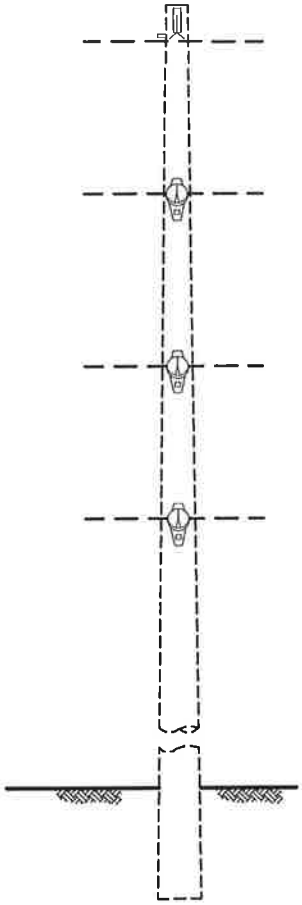


PLAN VIEW

NOTES:

1. For strength limitations of horizontal post, see appropriate combined. combined load chart.
2. Strength limitations of overhead ground wire support assembly, see TM-6A(S).
3. The following materials are to be specified on the plan and profile drawings and staking sheets: POLES, POLE GROUNDING ASSEMBLY, AND ANY ADDITIONAL GROUNDING OR FOUNDATION UNITS.
4. See structure offset tables and guy tables on plan and profile sheets.





"A" Indicates use as an angle structure
"T" Indicates use as a tangent structure

DWG. REF.	TP-115B2 A(S)	TP-115B2 T(S)	MATERIAL LIST DESCRIPTION	ITEM	DET.
1	1	1	OHGW Support Assembly, double bolt	–	TM-6A(S)
2	6	6	7/8" Bolt, Machine, by req'd length with nut	c	
3	6	6	Washer, Flat, 4"Sq x1/4",15/16" hole	d	
4	6	6	7/8" Locknut, MF Type	ek	
5	3	3	Insulator, Horizontal Post w/ Cushion Suspension	–	TM-3DM
6	1	1	OHGW ASSEMBLY, TANGENT	–	TM-4A

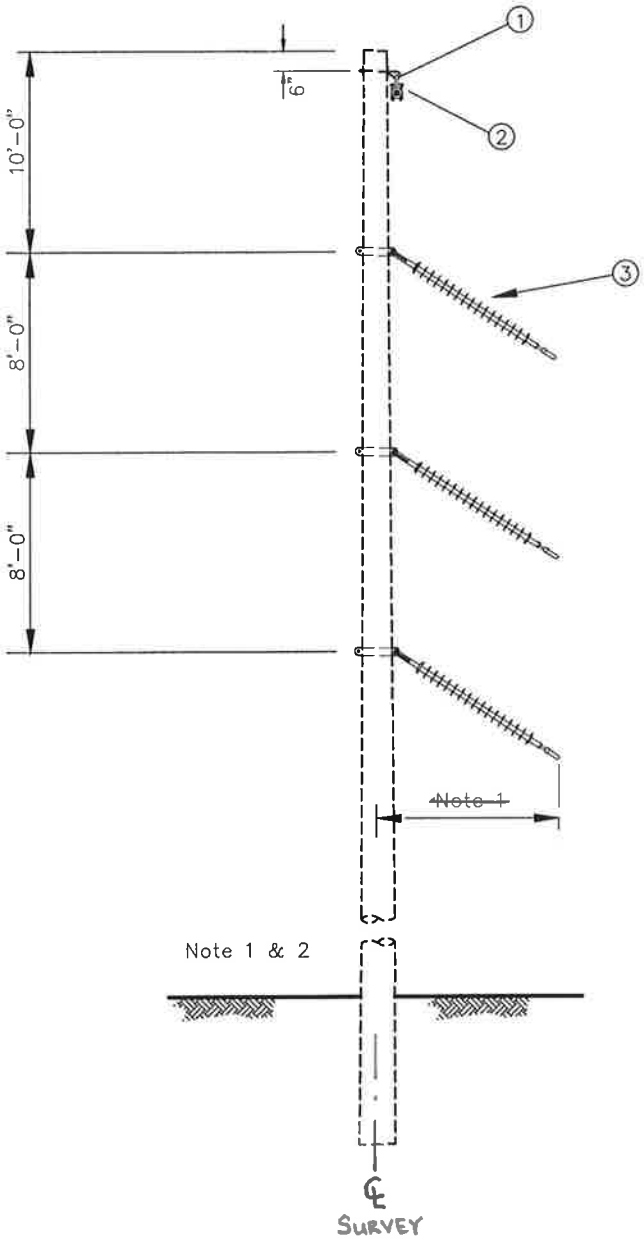
TRANSMISSION LINE VERTICAL STRUCTURE SMALL ANGLE HORIZONTAL LINE POST STEEL POLE

Booth & Associates, LLC
311 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0271

DSN.	AVS	DWN.	AVS
CKD.	DSH	APPD.	RSY
SCALE:	NTS	DATE:	04/25/16

DATE	REVISION

DWG. NO.
TP-115B2-A(S)
TP-115B2-T(S)



NOTES:

1. ~~See structure offset tables tables on plan and profile sheets~~
2. The following materials are to be specified separately on plan and profile drawings and staking sheets: POLES, POLE GROUNDING ASSEMBLY, AND ANY ADDITIONAL GROUNDING OR POLE FOUNDATION UNITS.

DWG. REF.	MATERIAL LIST			
	TS-4A(S)	DESCRIPTION	ITEM	DET.
1	1	Y-CLEVIS EYE, 90°, 1,900 LBS.	1002	
2	1	OHGW ASSEMBLY, ANGLE	–	TM-6B(S)
3	3	INSULATOR ASSEMBLY, ANGLE	–	TM-1CM
			–	

TRANSMISSION LINE VERTICAL STRUCTURE MEDIUM AND LARGE ANGLES STEEL POLE

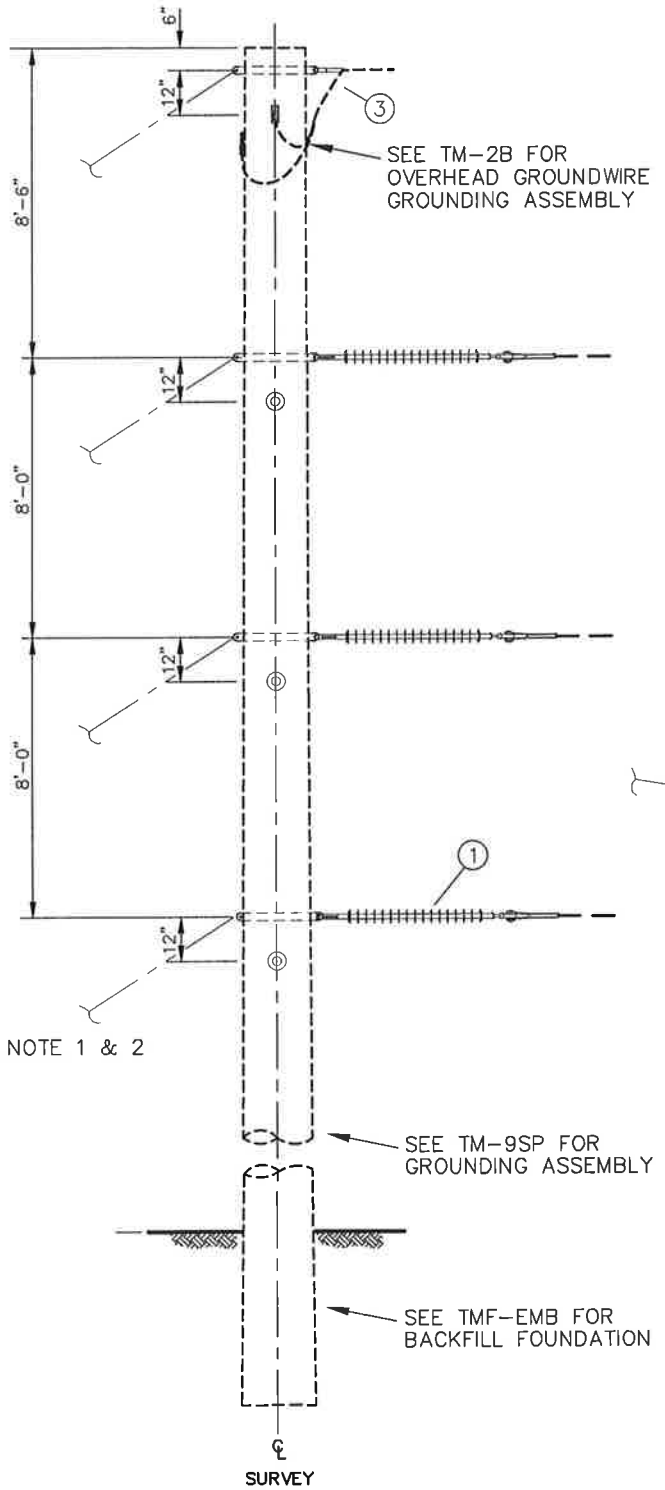
Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

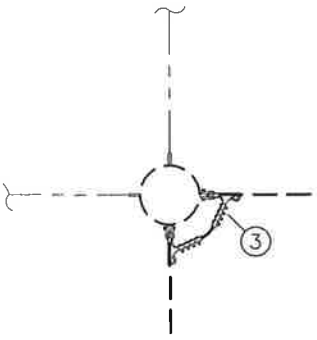
DSN.	AVS	DWN.	AVS
CKD.	BSF	APPD.	WPJ
SCALE:	NTS	DATE:	04/25/16

DATE	REVISION

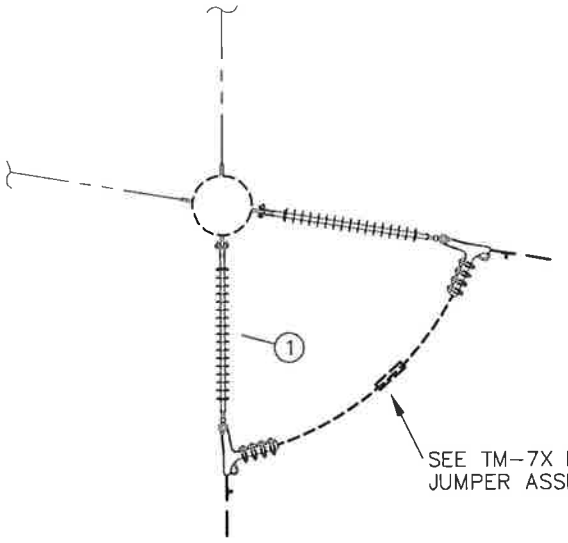
DWG. NO.

TS-4A(S)





PLAN
STATIC



PLAN
PHASE

NOTES

1. See Guy Tables on Plan and Profile Sheets
2. The following materials are to be specified on plan and profile drawings and staking sheets: POLES, POLE GROUNDING ASSEMBLY, GUYING ASSEMBLIES, ANCHORS AND ANY ADDITIONAL GROUNDING OR POLE FOUNDATION UNITS.

DWG. REF.	TS-5A(S)	MATERIAL LIST DESCRIPTION	ITEM	DET.
1	6	Deadend Assembly, Primary	–	TM-1EM
2	2	OHGW Assembly, Deadend	–	TM-4GM

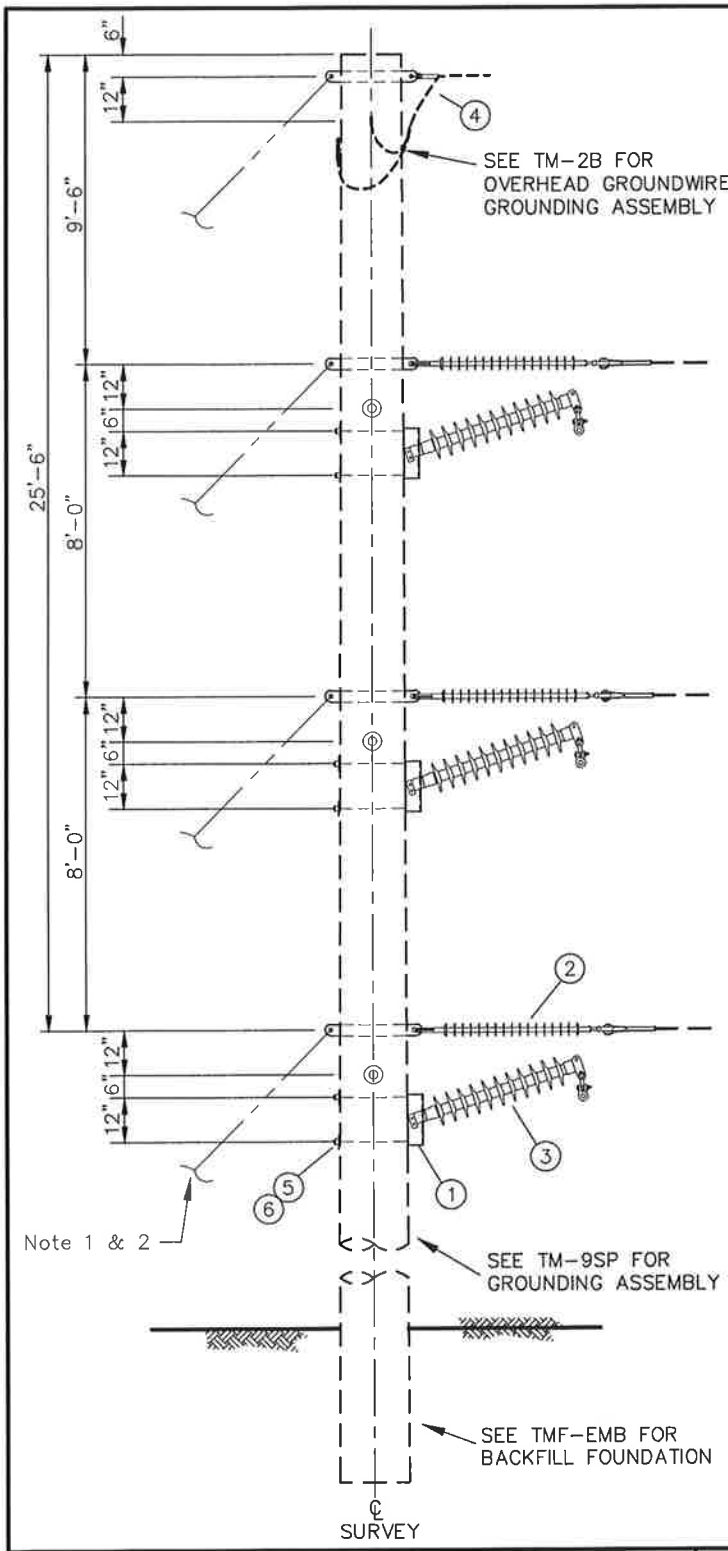
TRANSMISSION LINE VERTICAL STRUCTURE 115 kV SINGLE POLE DOUBLE DEADEND STEEL POLE (LIGHT TO MEDIUM ANGLE)

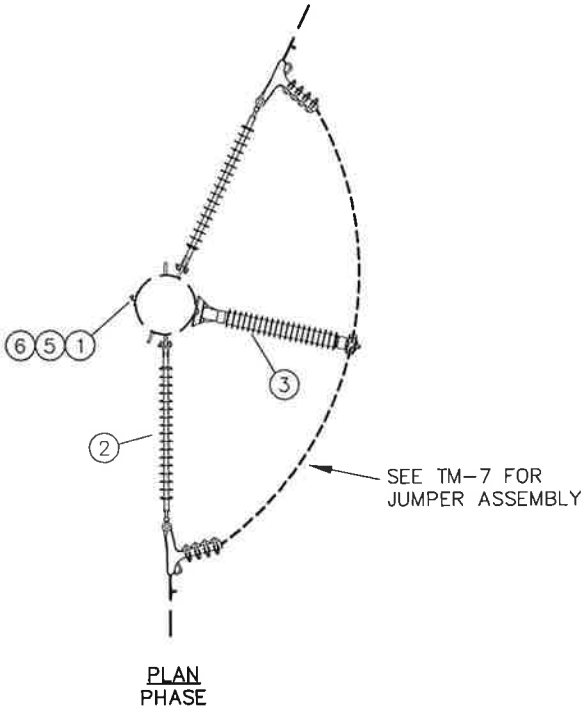
Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DSN.	AVS	DWN.	AAI
CKD.	AVS	APPD.	RSY
SCALE:	NTS	DATE:	09/22/15

DATE	REVISION

DWG. NO.
TS-5A(S)





NOTES:

1. See Guy Tables on Plan and Profile Sheets
2. The following materials are to be specified on plan and profile drawings and staking sheets: POLES, POLE GROUNDING ASSEMBLY, GUYING ASSEMBLIES, ANCHORS AND ANY ADDITIONAL GROUNDING OR POLE FOUNDATION UNITS.

MATERIAL LIST

ITEM	QTY.	DESCRIPTION	ITEM	DET.
1	6	Bolt, Machine, 7/8" x Required Length w/Nut	–	
2	6	Deadend Assembly, Primary	–	TM-1EM
3	3	Insulator, Horizontal Post, w/Cushion Grip	–	TM-3DM
		Suspension	–	TM-4GM
4	2	OHGW Assembly, Deadend	–	
5	6	Washer, Square, 4" x 4" x 1/4" w/ 15/16"	–	
		Hole	–	
6	6	Lock Nut, 7/8", MF Type	–	

TRANSMISSION LINE VERTICAL STRUCTURE 115 kV SINGLE POLE DOUBLE DEADEND STEEL POLE (LIGHT TO MEDIUM ANGLE)

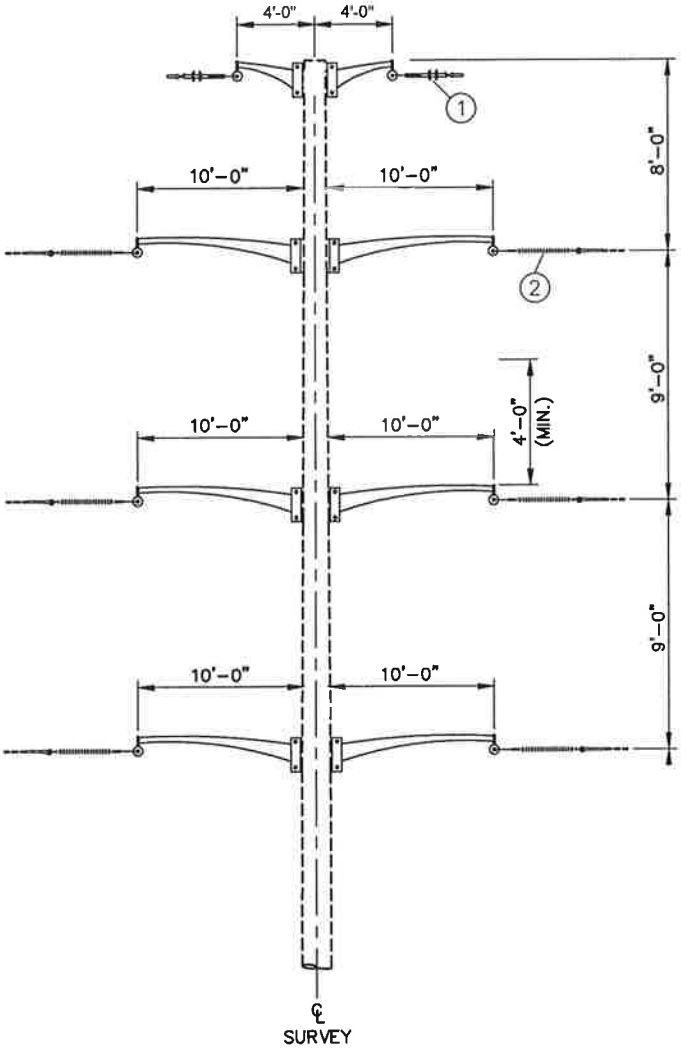
Booth & Associates, LLC

DSN.	TKB	DWN.	NBS
CKD.	RSY	APPD.	WPJ
SCALE:	NTS	DATE:	04/21/16

DATE	REVISION

DWG. NO.

TS-5AA(S)



NOTES

1. The following materials are to be specified on plan and profile drawings and staking sheets: POLES, POLE GROUNDING ASSEMBLY AND ANY ADDITIONAL GROUNDING OR POLE FOUNDATION UNITS.
2. STATIC ASSEMBLY TO BE SPECIFIED SEPARATELY.
3. DIMENSIONS SHOWN ARE TYPICAL. REFER TO PLAN & PROFILE SHEETS FOR INSTALLATION DIMENSIONS.

DWG. REF.	REQ'D	MATERIAL LIST DESCRIPTION	ITEM	DET.
1	4	OHGW Assembly, Deadend	–	TM-4GM
2	12	Deadend Assembly, Primary	–	TM-1EM

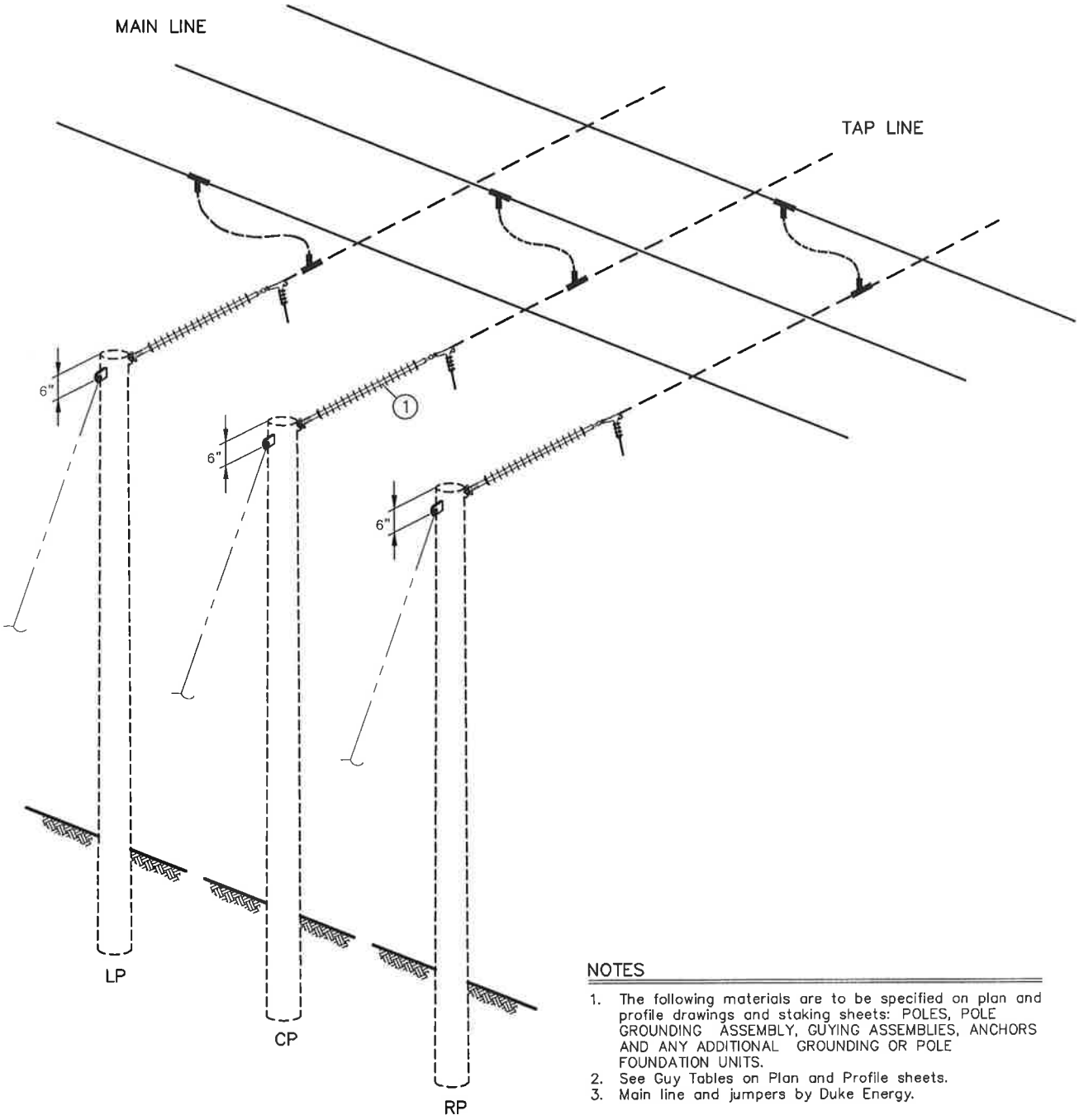
TRANSMISSION LINE VERTICAL STRUCTURE
115 kV SINGLE POLE DOUBLE DEADEND
STEEL POLE

Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DSN.	AVS	DWN.	AVS
CKD.	BCF	APPD.	RSY
SCALE:	NTS	DATE:	04/25/16

DATE	REVISION

DWG. NO.
TS-DC-DA-DE-115S



NOTES

1. The following materials are to be specified on plan and profile drawings and staking sheets: POLES, POLE GROUNDING ASSEMBLY, GUYING ASSEMBLIES, ANCHORS AND ANY ADDITIONAL GROUNDING OR POLE FOUNDATION UNITS.
2. See Guy Tables on Plan and Profile sheets.
3. Main line and jumpers by Duke Energy.

DWG. REF.	QTY.	MATERIAL LIST DESCRIPTION	ITEM	DET.
1	3	Deadend Assembly, Primary	–	TM–1EM
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–
–	–	–	–	–

TRANSMISSION LINE VERTICAL STRUCTURE 115 kV THREE POLE DEADEND STEEL POLES

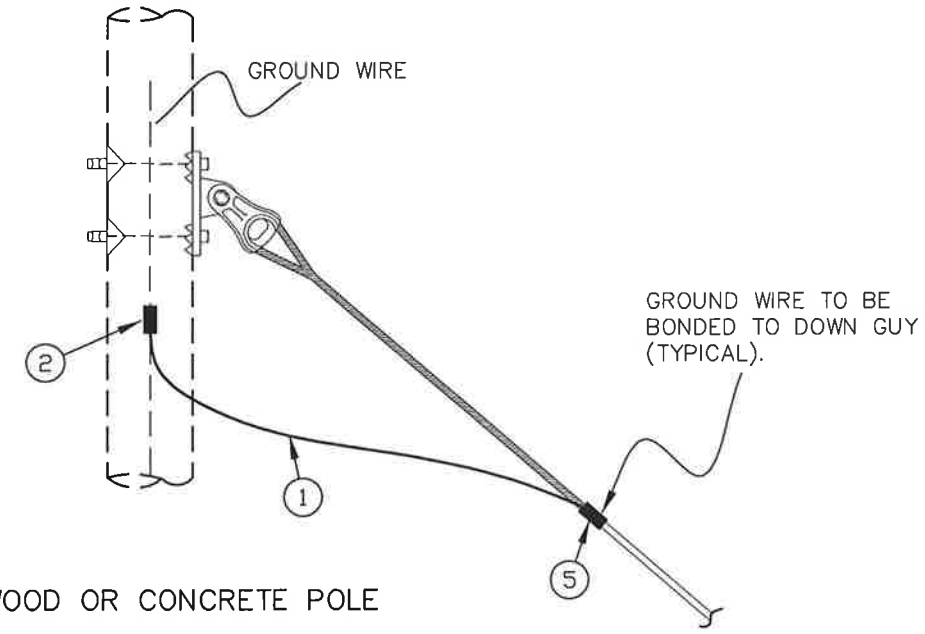
Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DSN.	AVS	DWN.	AVS
CKD.	BCF	APPD.	WPJ
SCALE:	NTS	DATE:	07/01/16

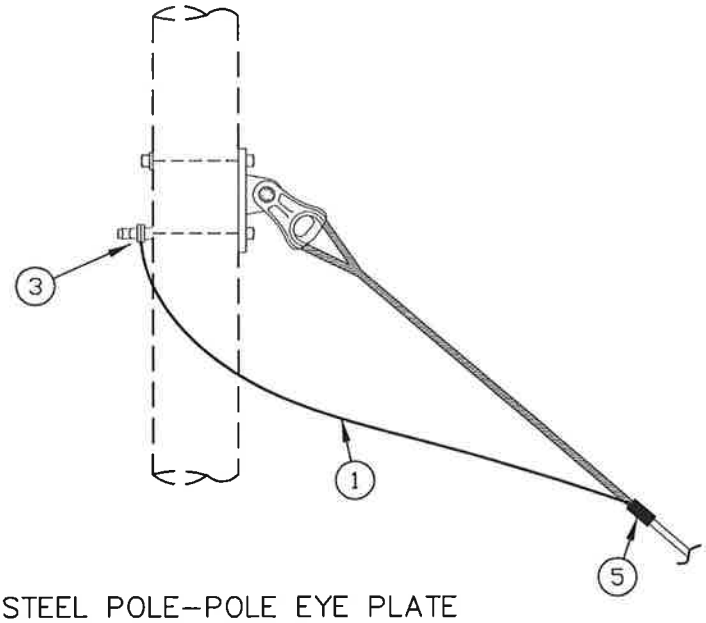
DATE	REVISION

DWG. NO.

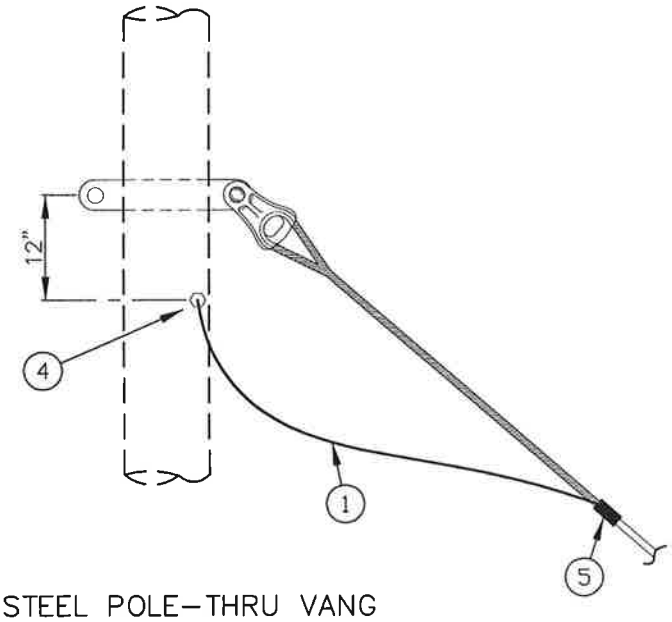
TH–TAP



WOOD OR CONCRETE POLE



STEEL POLE–POLE EYE PLATE



STEEL POLE–THRU VANG

LIST OF MATERIALS		
ITEM	QTY.	DESCRIPTION
1	5	Ground–Wire, #4 S.D. Tinned Copper (feet)
2	1	Connector–compression, #4 S.D. Tinned Copper to
		#4 S.D. Tinned Copper (Wood/Concrete Poles only)
3	1	Bonding Clip, for #4 S.D. Tinned Copper
4	1	Tank Ground Clamp, Bronze, 1/2" Long Stud, for
		#4 S.D. Tinned Copper
5	1	Connector – Compression, #4 S.D. Tinned Copper
		to Down Guy Wire

TRANSMISSION GUY GROUNDING GUIDE

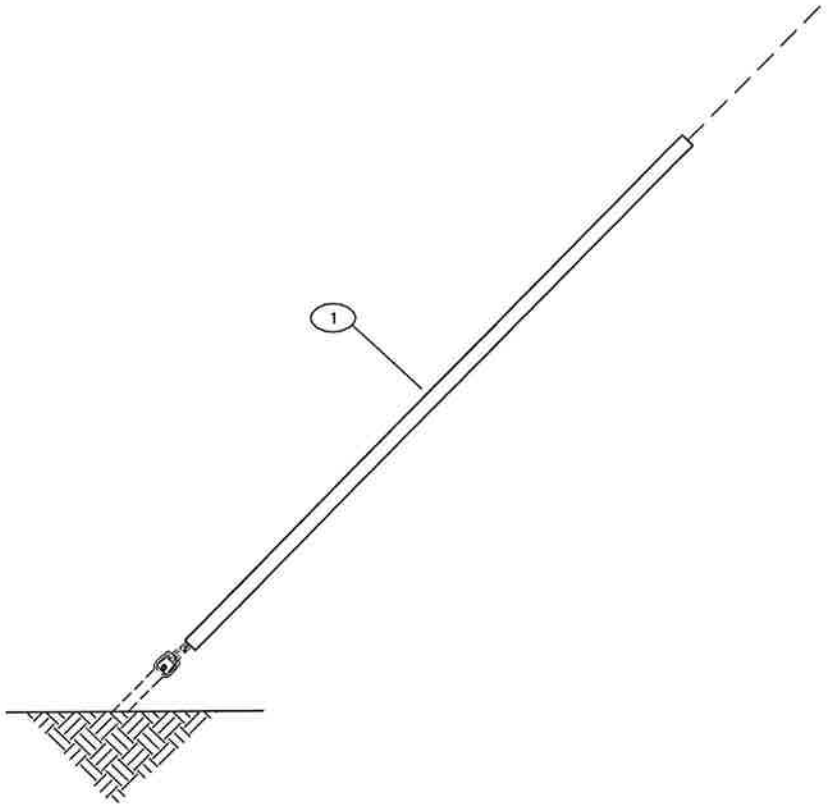
Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DSN.	DSH	DWN.	BLP
CKD.	DSH	APPD.	WPJ
SCALE:	NTS	DATE:	12/12/12

DATE	REVISION

DWG. NO.

TG–GG



LIST OF MATERIALS		
ITEM	QTY.	DESCRIPTION
1	1	Guy – Marker, White Plastic, 8'–0" Minimum

GUY MARKER

Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DSN.	PA	DWN.	BTP
CKD.	DSH	APPD.	WPJ
SCALE:	NTS	DATE:	12/12/12

DATE	REVISION

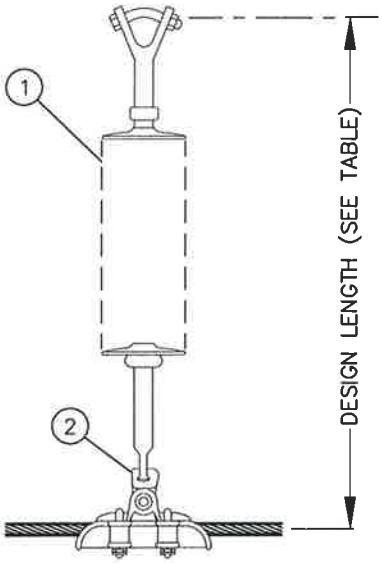
DWG. NO.

TG–GM

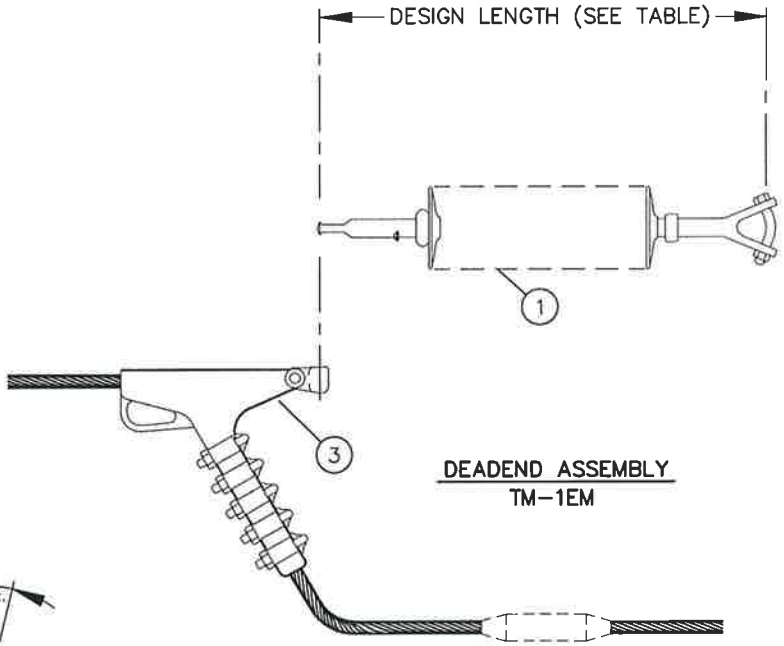
05GENERALGUY–T(S)

NOTES

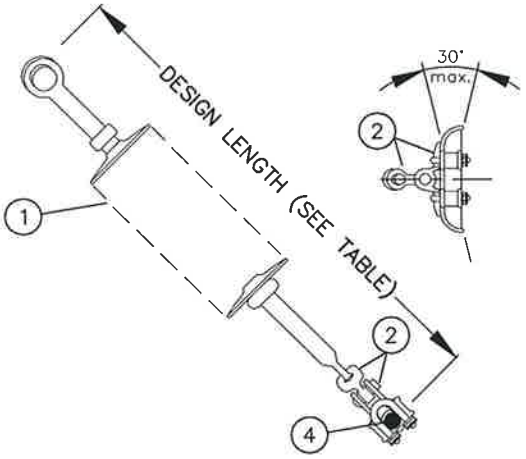
1. THE TABLE BELOW SHALL BE COMPLETED FOR EACH PROJECT.
2. SUITABLE SUSPENSION CLAMPS MUST BE SELECTED FOR THE CONDUCTOR BEING USED. THE FOLLOWING ARE TO BE CONSIDERED: TYPE OF CONDUCTOR, DIAMETER OF CONDUCTOR (CONSIDERING ARMOR RODS AND/OR LINERS), ETC.
3. THE CAPACITY OF THE HARDWARE MUST BE EQUAL TO OR GREATER THAN THE SPECIFIED MECHANICAL LOAD OF THE INSULATOR UNITS SHOWN IN THE TABLE BELOW



TANGENT ASSEMBLY
TM-1AM (OR) TM-1BM



DEADEND ASSEMBLY
TM-1EM



ANGLE ASSEMBLY
TM-1CM

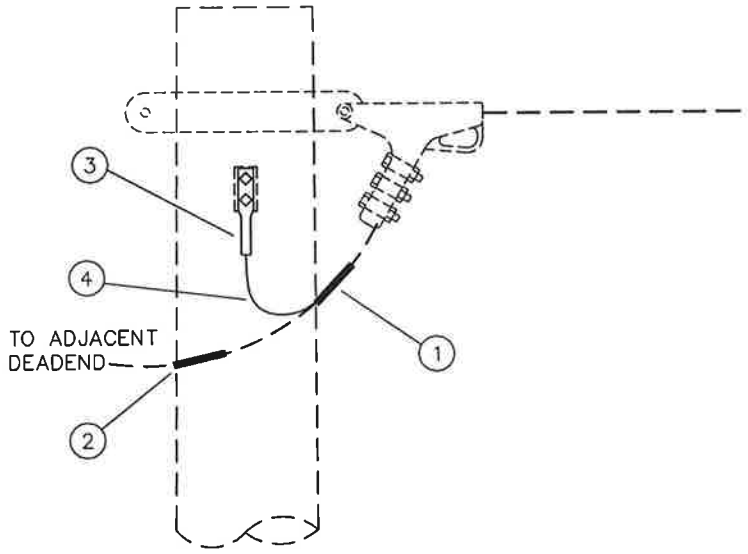
FURNISHED BY OWNER

115 kV	ASSEMBLY		
	TANGENT	ANGLE	DEADEND
QUANTITY OF UNITS	1	1	1
INSULATION LEVEL (kV)	138	138	138
LEAKAGE DISTANCE (in.)	132.2	132.2	132.2
SPEC. MECH. LOAD (lb.)	25,000	25,000	25,000
INSULATOR WEIGHT (lb.)	11.6	11.6	11.6
DESIGN LENGTH (in.)	58.1	58.1	58.1
COLOR OF UNITS	GRAY	GRAY	GRAY

DWG. REF.	ITEM	LIST OF MATERIALS DESCRIPTION	DET.
ISP	1	Insulator, Suspension. Polymer with Y-Clevis Cold and EyE Hot End	
ei	2	Clamp, Suspension & CLEVIS Eye	
ej	3	Clamp, Bolted D.E. & CLEVIS eye	
bv	4	Armor Rod for Transmission Conductor	
	5	Corona Ring for 115 kV Insulator	

Booth & Associates, LLC
511 Glenwood Avenue | Raleigh, NC 27603 CONSULTING ENGINEERS NC P-0221

DWN.	DATE:	DWG. NO. TM-1AM
CKD.	APPD.	
SCALE:		TM-1EM
DATE	REVISION	



TM-2A SINGLE DEADEND
TM-2B DOUBLE DEADEND
TM-2C TRIPLE DEADEND

LIST OF MATERIALS

ITEM	QTY. TM-2A	QTY. TM-2B	QTY. TM-2C	DESCRIPTION
1	1	1	1	Connector – Compression, OHGW
				to #4 S. D. Tinned Copper
2	–	1	2	Connector – Compression Sleeve, OHGW
				to OHGW
3	1	1	1	Connector – Compression Terminal, NEMA
				2-Hole for #4 S. D. Tinned Copper
4	5	5	5	Ground – Wire, #4 S. D. Tinned Copper (Ft.)

TRANSMISSION OHGW
STEEL POLE DEADEND GROUNDING ASSEMBLY

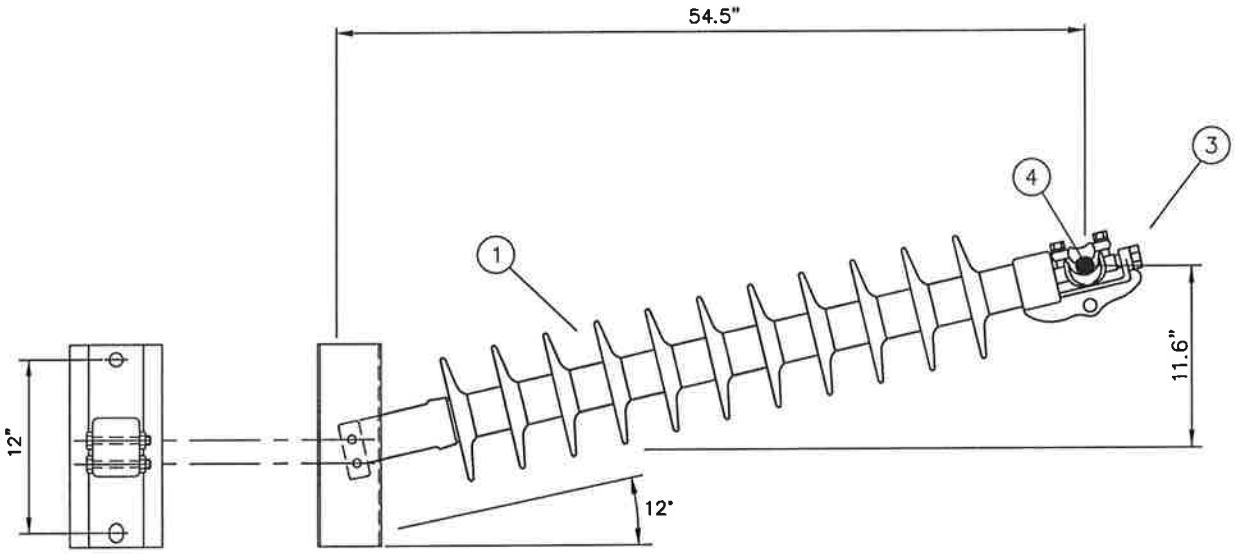
Booth & Associates, LLC
511 Glenwood Avenue | Raleigh, NC 27603 CONSULTING ENGINEERS NC P-0221

DSN.	WPJ	DWN.	JEH
CKD.	DSH	APPD.	WPJ
SCALE:	NTS	DATE:	12/10/12

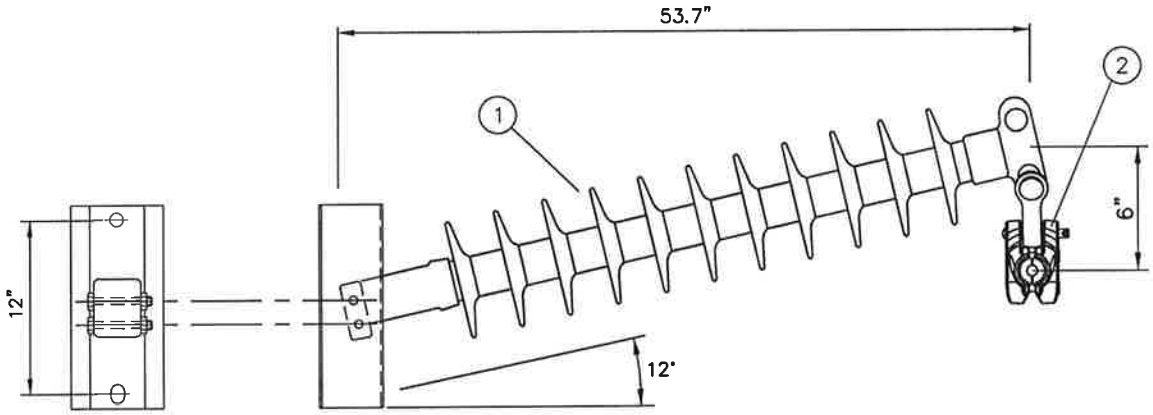
DATE	REVISION

DWG. NO.
TM-2A
TM-2B
TM-2C

05GENERALMISC-T(S)



TM–3BM – HORIZONTAL POST INSULATOR



TM–3DM – HORIZONTAL POST INSULATOR – TANGENT & SMALL ANGLE

NOTES:

1. For strength limitations see appropriate combined load chart.

DWG. REF.	ITEM	LIST OF MATERIALS DESCRIPTION
1	ea	Insulator, Polymer Horizontal Post
2		Clamp, Suspension Cushion Grip (to 30°) for Transmission Conductor with Y–clevis
3		Clamp, Trunion For Transmission Conductor
4		Armor Rod For Transmission Conductor

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

LINE POST ASSEMBLY

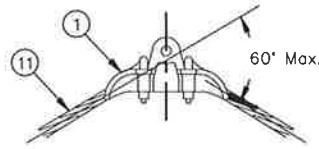
Booth&Associates, Inc.
1011 Schaub Drive | Raleigh, NC 27606 CONSULTING ENGINEERS

DWN.	PA	DATE:	02/06/09
CKD.	GQJ	APPD.	WPJ
SCALE:	NTS		08–6687

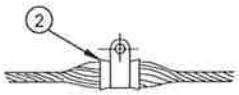
DATE	REVISION

DWG. NO.
TM–3BM
TM–3DM

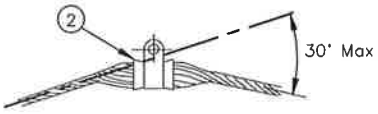
1406687MISC–T(S)



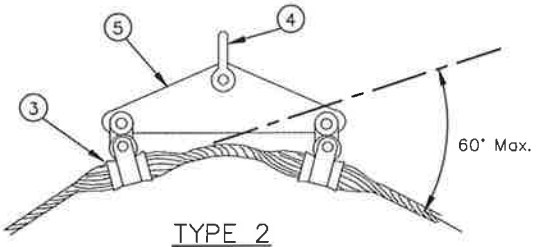
TANGENT & ANGLE CLAMP
TM–4A



TANGENT ASSEMBLY
TM–4B

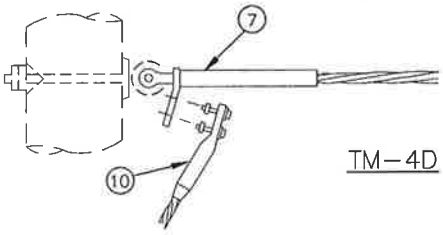


TYPE 1

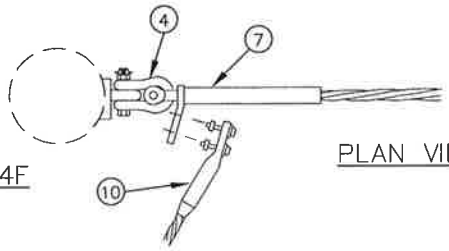


TYPE 2

ANGLE ASSEMBLY
TM–4C (Note 1)

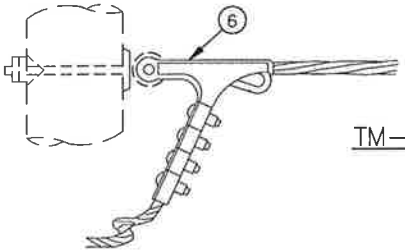


TM–4D

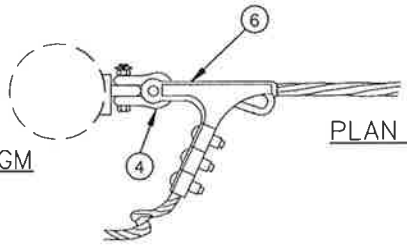


TM–4F

PLAN VIEW



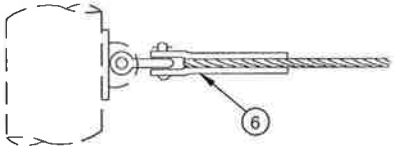
TM–4E



TM–4GM

PLAN VIEW

DEADEND ASSEMBLY



NOTES

1. The appropriate cushioned suspension angle assembly shall be installed for the line angles shown on the plan–profile drawings:

   A. For angles from 0 degrees to 30 degrees, use type 1
   B. For angles from 30 degrees to 60 degrees, use type 2

DWG. REF.	LIST OF MATERIALS		
	ITEM	DESCRIPTION	DET.
1	m	Clamp, Suspension (to 60°)	
2	el	Clamp, Cushioned Suspension	
3	el	Clamp, Cushioned Susp. & Clevis Eye	
4	bo	Anchor Shackle, 40,000 lbs. BNC	
5		Yolk Plate	
6	l	Clamp, Bolted Deadend (3–BOLT)	
7	lll	Clamp, Compression Deadend	
8		Link, Extension, Clevis 6"	
9	p	Jumper Connector, Compression	
10		Jumper Terminal, Compression	
11	r	Armor rod	

O.H.G.W. ASSEMBLIES
CUSHIONED SUSPENSION AND
SUSPENSION CLAMP

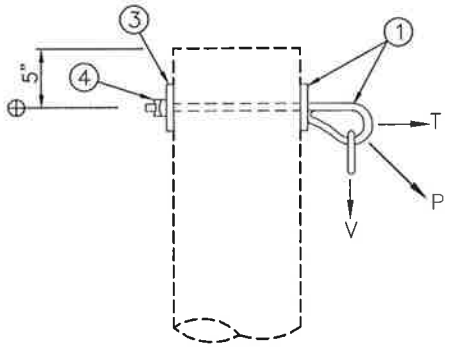
Booth & Associates, LLC
3811 Glenwood Avenue I Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DWN.	AAI	DATE:	04/25/16
CKD.	BCF	APPD.	WPJ
SCALE:	NTS		

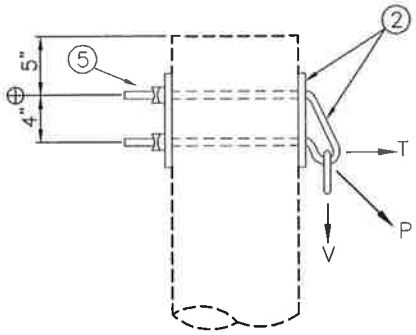
DATE	REVISION

DWG. NO.

TM–4



SINGLE BOLT O.H.G.W. SUPPORT
TM-6A(S)



DOUBLE BOLT O.H.G.W. SUPPORT
TM-6B(S)

NOTES

1. Designated strength limitations of the overhead groundwire support assemblies are:

	Allowable Vertical Load
TM-6A(S)	5,000 lbs.
TM-6B(S)	5,000 lbs.

DWG. REF.	TM-6		LIST OF MATERIALS	
	A	B	ITEM	DESCRIPTION
1	1	–	ed	Support, Single Bolt OHGW, 3/4" Dia.
2	–	1	ed	Support, Double Bolt OHGW, 5/8" Dia.
3	1	–	d	Washer, Flat, 4"Square x 1/4", 13/16" Hole
4	1	–	ek	3/4" Locknut, MF Type
5	–	2	ek	5/8" Locknut, MF Type

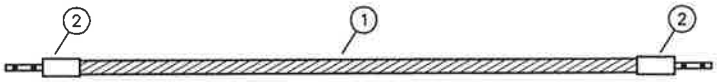
O.H.G.W. SUPPORT ASSEMBLY FOR STEEL POLES

Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

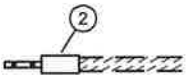
DWN.	PA	DATE:	12/10/12
CKD.	GQJ	APPD.	JCT
SCALE:	NTS		

DATE	REVISION

DWG. NO.
TM-6(S)

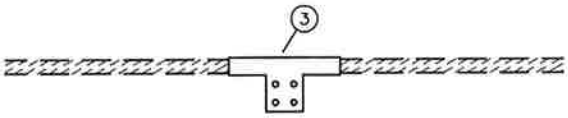


TM–7

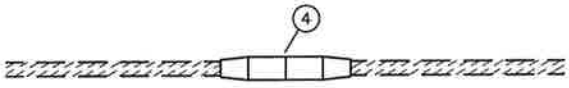


TM–7M

1 – JUMPER TERMINAL TO BE INSTALLED ON TAIL OF CONDUCTOR DEAD–ENDED IN BOLTED DEAD–END SHOE.



TM–7T



TM–7X

(336) – 336.4 ACSR "MERLIN"
(795) – 795.0 AAC "ARBUTUS"
(1272) – 1272.0 AAC "NARCISSUS"

NOTES:
1) ONLY ONE SPLICE SHALL BE ALLOWED PER JUMPER.
2) SPLICE SHALL BE INSTALLED TO CLEAR JUMPER SUPPORT.

NOTES:

1) ALL ALUMINUM BOLTED CONNECTIONS TO BE TORQUED TO MANUFACTURER'S SPECIFICATIONS.
2) SEE PLAN AND PROFILE FOR ADDITIONAL INFORMATION ON PLACEMENT OF JUMPERS AND CONDUCTOR SIZES.
3) CONDUCTOR SIZE INDICATED IN PARENTHESIS "(_)."
4) COMPRESSION CONNECTORS MAY BE SUBSTITUTED FOR APPROVED EQUIVALENT.
5) * AS REQUIRED

LIST OF MATERIALS

ITEM	DESCRIPTION
1	Conductor – Transmission Conductor, length as required.
2	Jumper Terminal, Compression, 4–Hole NEMA Flat Pad w/Aluminum Bolts for Transmission Conductor
3	Compression, Tee Connector Aluminum w/4–Hole NEMA Flat Pad for Transmission Conductor
4	Compression Jumper Sleeve for Transmission Conductor
*	Nuts, Bolts, Washers – Stainless, As Required

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

MISCELLANEOUS ASSEMBLY
CONDUCTOR JUMPERS

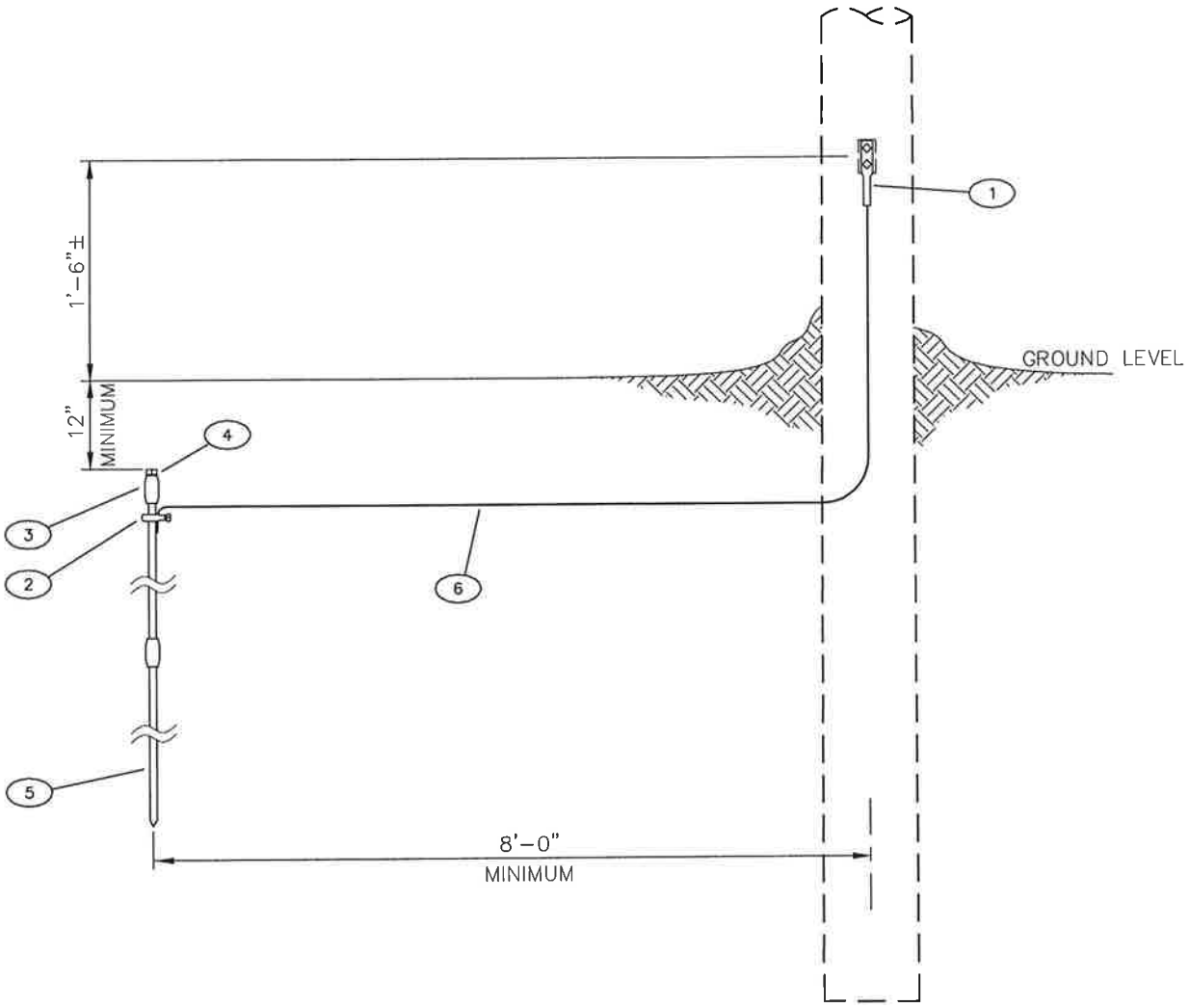
Booth & Associates, Inc.
1011 Schaub Drive | Raleigh, NC 27606 CONSULTING ENGINEERS

DWN.	PA/JEH	DATE:	02/18/09
CKD.	GQJ	APPD.	WPJ
SCALE:	NONE		08–6687

DATE	REVISION

DWG. NO.
TM–7
TM–7M
TM–7T
TM–7X
02/09

1406687MISC–T(S)



NOTES:

1) MAXIMUM GROUND RESISTANCE READING SHALL BE 25 OHMS. IF THE CLAMP-ON RESISTANCE MEASUREMENT METHOD IS USED, THE GROUND ROD SHALL BE INSTALLED AND TEMPORARILY BONDED UNTIL THE GROUND RESISTANCE READING IS TAKEN. ADDITIONAL ROD SECTIONS SHALL BE ADDED AS NECESSARY TO REDUCE RESISTANCE TO 25 OHMS MAXIMUM.

2) SPECIFY TM-9R FOR ADDITIONAL GROUND ROD SECTION AND COUPLING.

3) GROUND ROD TO BE INSTALLED IN UNDISTURBED SOIL.

LIST OF MATERIALS

ITEM	QTY. 9SP	QTY. 9R	DESCRIPTION
1	1		Connector – Compression Terminal, NEMA 2-Hole
			for #4 S. D. Tinned Copper
2	1		Ground – Rod Clamp, Galvanized, 5/8"
3	1	1	Ground – Rod Coupling, Galvanized, 5/8", Threaded
4	1		Ground – Driving Stud, Steel, 5/8"
5	1	1	Ground – Rod, Galvanized, 5/8" x 10'-0"
6	15		Ground – Wire, #4 S. D. Tinned Copper (Feet)

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

DRIVEN GROUND ROD
GROUNDING ASSEMBLY – STEEL POLE

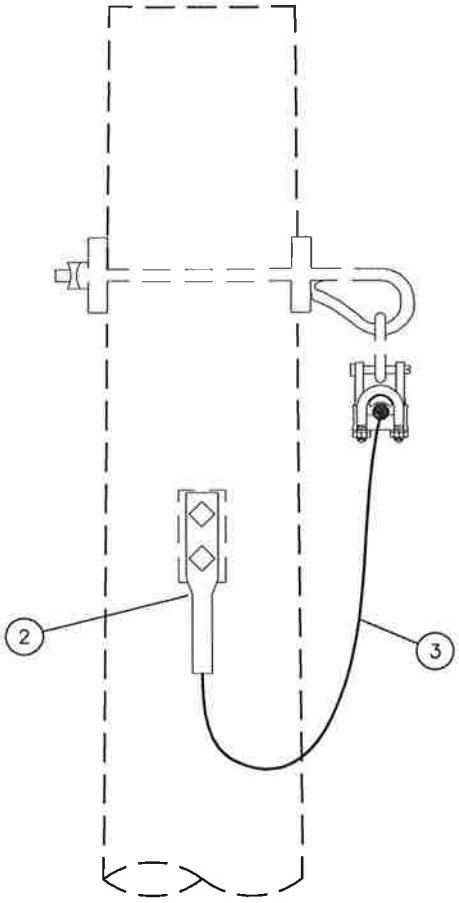
Booth&Associates, Inc.
1011 Schaub Drive | Raleigh, NC 27606 CONSULTING ENGINEERS

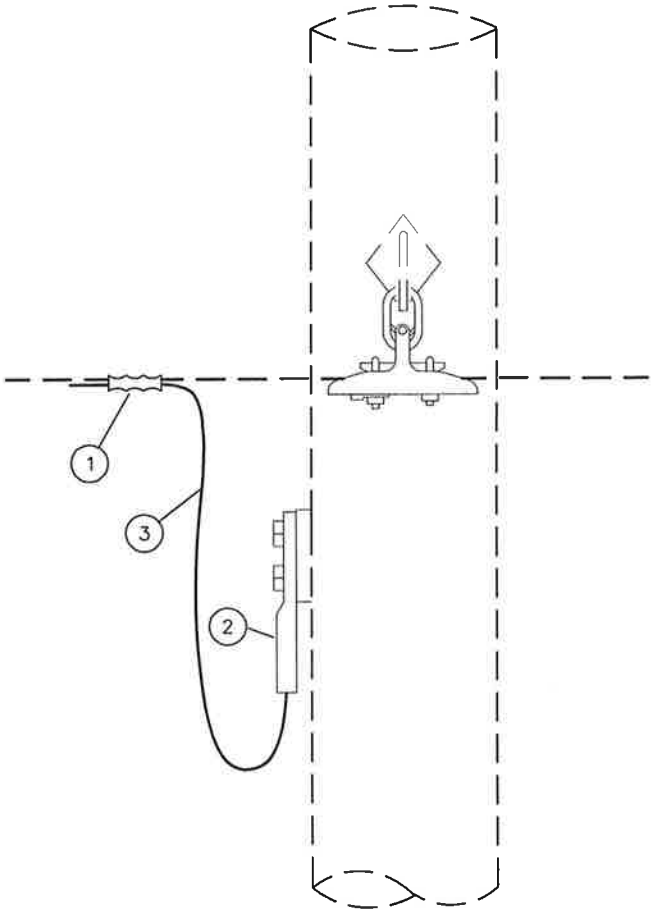
DWN.	PA	DATE:	01/09/09
CKD.	DSH	APPD.	WPJ
SCALE:	NONE		

DATE	REVISION

DWG. NO.
TM-9SP
TM-9R

1416687MISC-T(S)





LIST OF MATERIALS		
ITEM	QTY.	DESCRIPTION
1	1	Connector – Compression, Bi–metallic, 7 No. 9 Alumoweld to #4 S. D. Tinned Copper
2	1	Connector – Compression Terminal, NEMA 2–Hole for #4 S. D. Tinned Copper
3	5	Ground – Wire, #4 S. D. Tinned Copper (Feet)

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

OVERHEAD GROUND WIRE GROUNDING ASSEMBLY – STEEL POLE

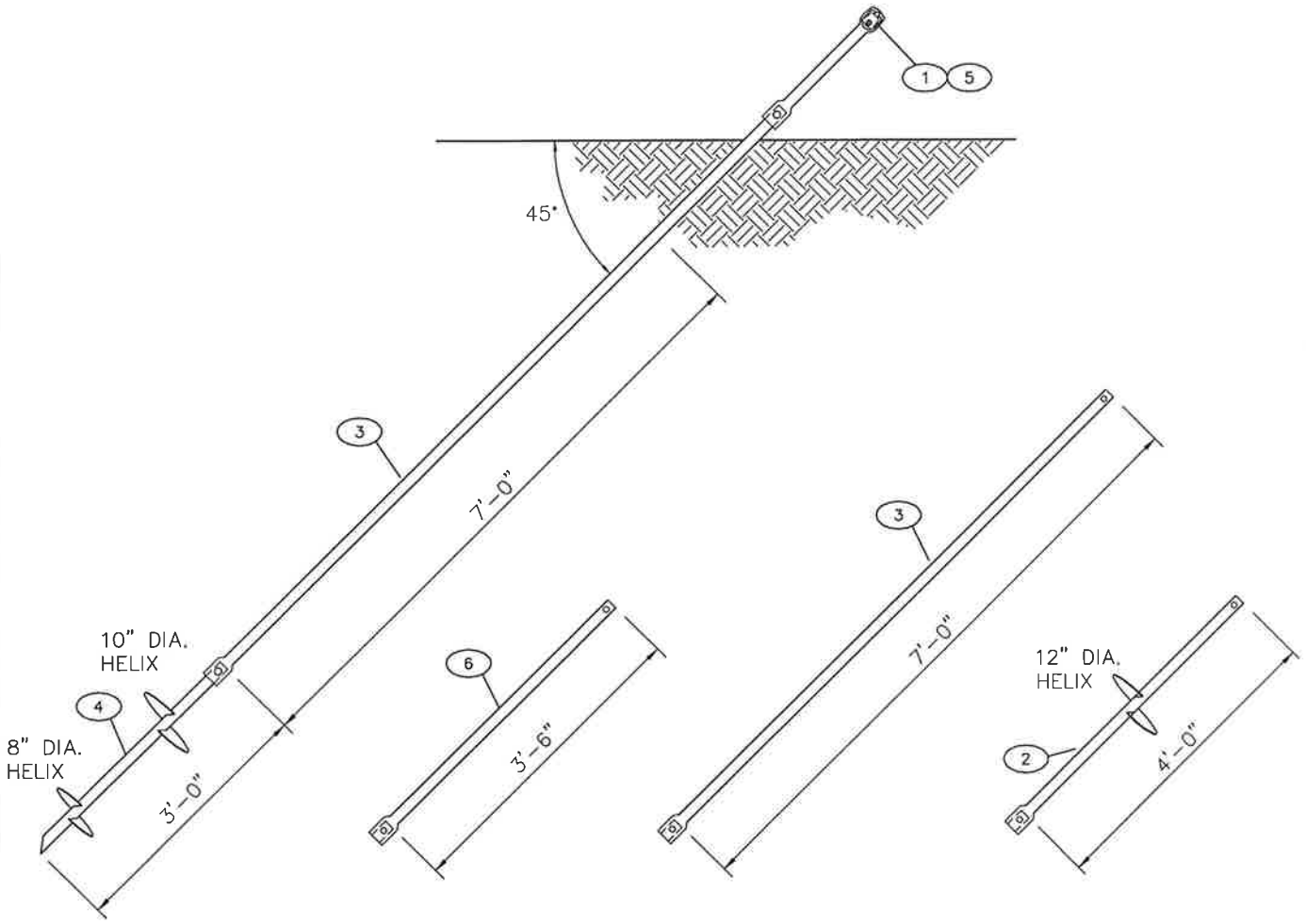
Booth & Associates, Inc.
1011 Schaub Drive | Raleigh, NC 27606 CONSULTING ENGINEERS

DWN.	PA	DATE:	01/09/09
CKD.	GQJ	APPD.	WPJ
SCALE:	NONE		08–6687

DATE	REVISION

DWG. NO.
TM–9X(S)

1406687MISC–T(S)



TA-2H TA-3.5E TA-7E TA-4HE

NOTES:

1) MAXIMUM WORKING LOAD VALUES BASED UPON USE OF ANCHOR IN CLASS 6 SOIL CONDITIONS.

2) MAXIMUM WORKING LOAD FOR THE TA-2H = 23,000 LBS.
MAXIMUM WORKING LOAD FOR THE TA-2H WITH THE TA-4HE = 32,000 LBS.

3) ANCHOR TO BE POWER INSTALLED USING TORQUE INDICATOR WITH A MINIMUM TORQUE VALUE OF:
2,300 FT.-LBS. FOR THE TA-2H
3,000 FT.-LBS. FOR THE TA-2H WITH THE TA-4HE
AND MAXIMUM OF 6,000 FT.-LBS.

4) WHEN SPECIFICALY CALLED FOR ON THE PLAN & PROFILE AND/OR STAKING SHEETS, THE TA-4HE (ITEM 2) SHALL BE INSTALLED CONNECTED DIRECTLY TO THE DOUBLE HELIX ANCHOR ASSEMBLY (ITEM 4) WITH THE SEVEN FOOT EXTENSION ASSEMBLY (ITEM 3) THEN BEING CONNECTED TO THE TA-4HE.

LIST OF MATERIALS

ITEM	QTY. TA-2H	TA-3.5E	TA-4HE	TA-7E	DESCRIPTION
1	1				Anchor – Clamp, Bonding
2			1		Anchor – Extension Assembly, 12" Helix
					(1-1/2" Square Shaft x 4'-0")
3	1			1	Anchor – Extension Assembly
					(1-1/2" Square Shaft x 7'-0")
4	1				Anchor – Double Helix (8", 10")
					(1-1/2" Square shaft x 3'-0")
5	1				Anchor – Twineye Assembly, for Double
					Helix Anchor
6		1			Anchor – Extension Assembly
					(1-1/2" Square Shaft x 3'-6")

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

TRANSMISSION AND DISTRIBUTION
ANCHOR ASSEMBLY

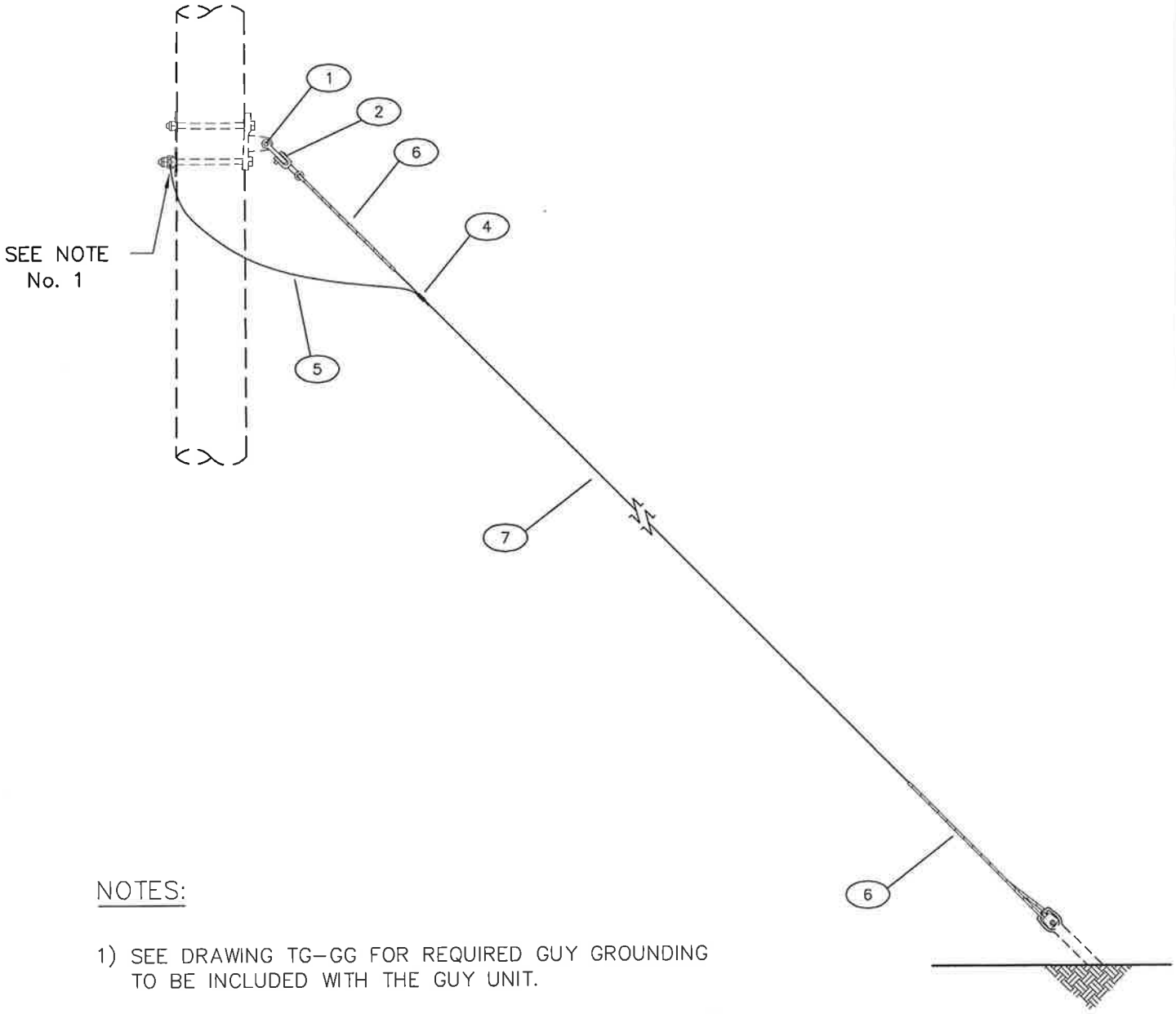
Booth & Associates, Inc.
1011 Schaub Drive | Raleigh, NC 27606 CONSULTING ENGINEERS

DWN.	JEH	DATE:	02/17/09
CKD.	WPJ	APPD.	WPJ
SCALE:	NONE		08-6687

DATE	REVISION

STRUCTURE NO.
TA-2H
TA-3.5E
TA-7E
TA-4HE

1406146GUY-T(S)



NOTES:

1) SEE DRAWING TG-GG FOR REQUIRED GUY GROUNDING TO BE INCLUDED WITH THE GUY UNIT.

2) SPECIFY SIZE OF GUY WIRE. MAXIMUM ULTIMATE RATED STRENGTH TO BE 33,000 Lbs. REFER TO SPECIFIC WIRE SPECIFICATIONS FOR RATED STRENGTH.

3) "M" INDICATES INCLUSION ON ANCHOR SHACKLE.

LIST OF MATERIALS

ITEM	QTY. 21A	QTY. 21A(M)	DESCRIPTION
1		1	Anchor Shackle, 30,000 Lbs. (Minimum)
2	1	1	Clevis – Thimble Type (40,000 Lbs)
3	1	1	Connector – Compression, #4 S. D. Tinned Copper
			to #4 S. D. Tinned Copper (Wood Poles Only)
4	1	1	Connector – Compression, Bi-metallic, Guy Wire
			to #4 S. D. Tinned Copper
5	5	5	Ground – Wire, #4 S. D. Tinned Copper (Feet)
6	2	2	Guy – Grip, Preformed, for Guy Wire
7	*	*	Guy – Wire, Guy Wire
			* As Required

SINGLE DOWN GUY – WITH PREFORMED GRIPS

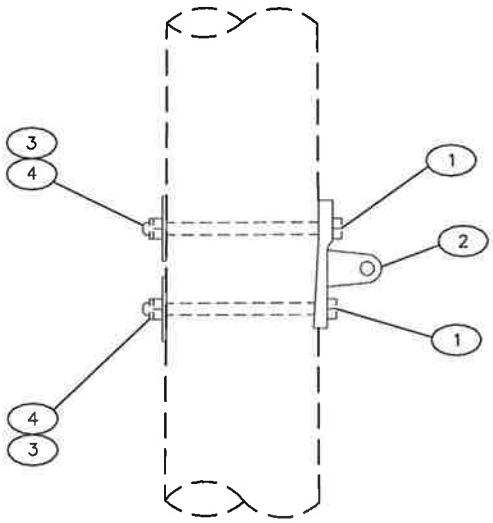
Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC P-0221

DSN.	WPJ	DWN.	BTP
CKD.	DSH	APPD.	WPJ
SCALE:	NTS	DATE:	12/12/12

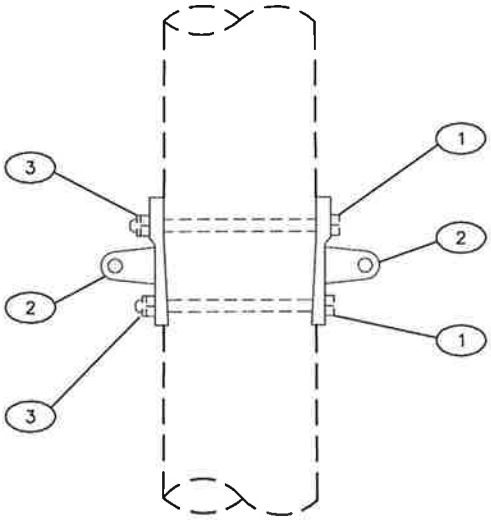
DATE	REVISION
01/17/13	CONSOLIDATE 21A & 21A(M)

DWG. NO.

TG-21A
TG-21A(M)



TG–27C(S)



TG–27D(S)

ITEM	QTY. TG–27C	QTY. TG–27D	LIST OF MATERIALS DESCRIPTION
1	2	2	Bolt – Machine, 7/8" x Required Length, w/ Nut
2	1	2	Pole Eye Plate, Single Eye, (Less Teeth)
			(36,000 Lbs. Minimum) w/ 15/16" Mounting Holes
3	2	2	Nut – Lock, 7/8", MF Type
4	2		Washer – Square, 4" x 4" x 1/4", w/ 15/16" Hole

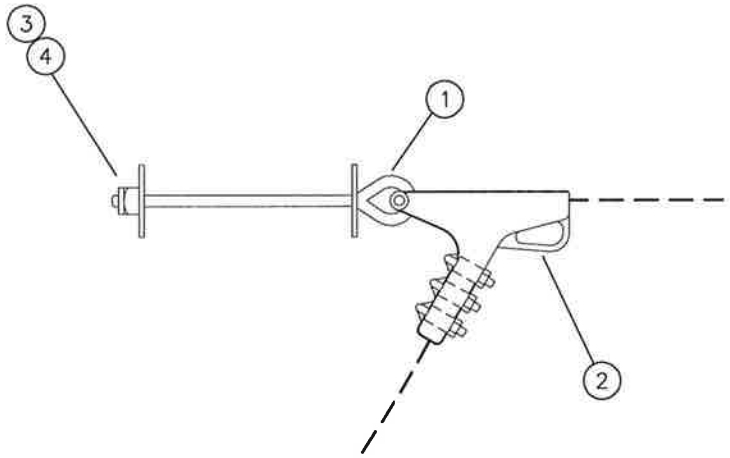
TRANSMISSION AND DISTRIBUTION LINE
GUY ATTACHMENT UNITS

Booth & Associates, LLC
2811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DSN.	WPJ	DWN.	BTP
CKD.	DSH	APPD.	WPJ
SCALE:	NTS	DATE:	12/12/12

DATE	REVISION

DWG. NO.
TG–27C(S)
TG–27D(S)



LIST OF MATERIALS		
ITEM	QTY.	DESCRIPTION
1	1	Bolt – Shoulder Eye, 3/4" x Required Length
2	1	Clamp – Bolted Deadend
3	1	Nut – Lock, 3/4"
4	1	Washer, Flat 4" Square x 1/4", 13/16" Hole

OVERHEAD GROUND WIRE DEADEND ASSEMBLY

Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DWN.	BTP	DATE:	01/25/13
CKD.	DSH	APPD.	WPJ
SCALE:	NONE		

DATE	REVISION
01/15/13	REVISE MATERIAL ID NUMBER

DWG. NO.

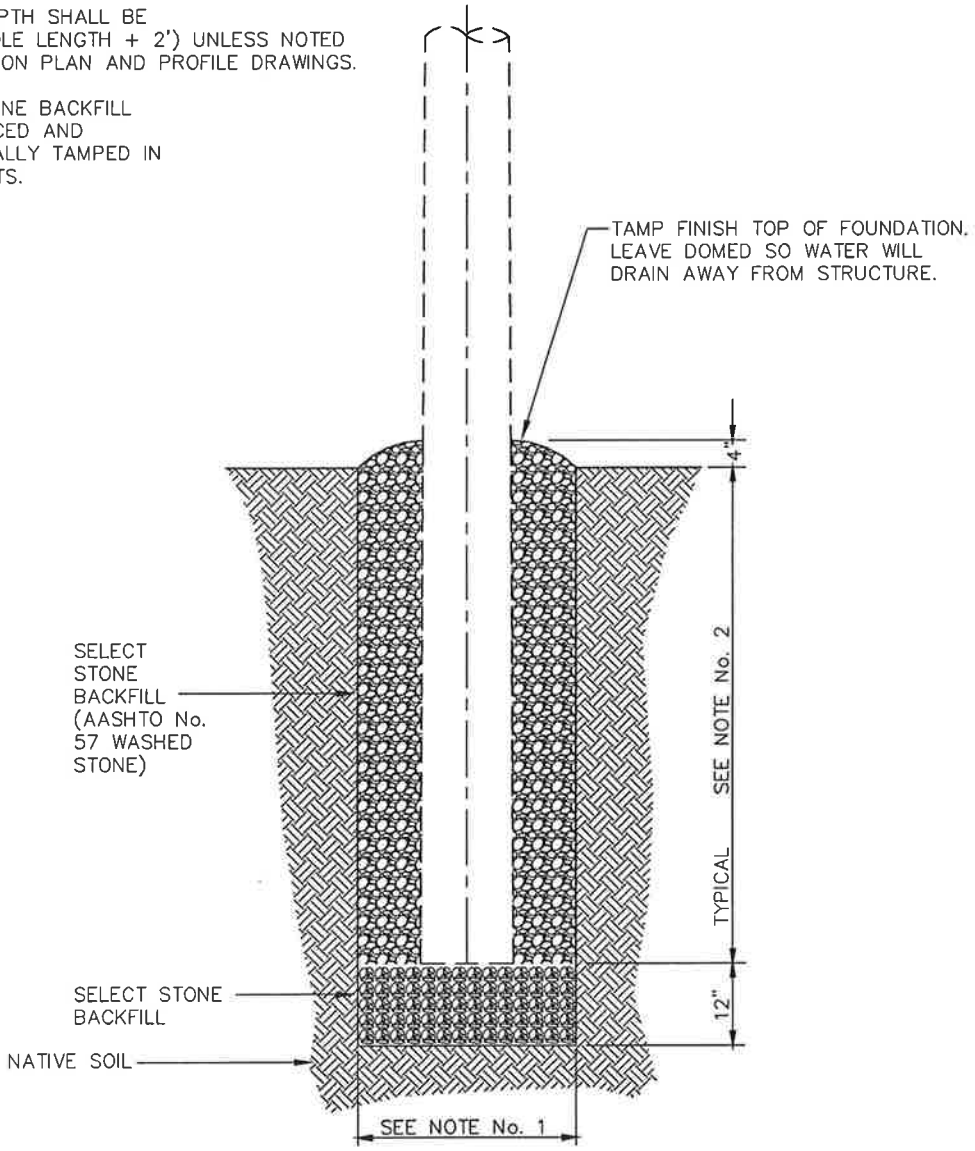
TM–ODE

NOTES:

1) HOLE DIAMETER SHALL BE EQUAL TO THE POLE BUTT DIAMETER PLUS 18", UNLESS OTHERWISE NOTED.

2) SETTING DEPTH SHALL BE (10% OF POLE LENGTH + 2') UNLESS NOTED OTHERWISE ON PLAN AND PROFILE DRAWINGS.

3) SELECT STONE BACKFILL TO BE PLACED AND PNEUMATICALLY TAMPED IN 6-INCH LIFTS.



TMF-EMB = SELECT STONE BACKFILL ENTIRE EMBEDMENT DEPTH

MATERIAL LIST		
ITEM	QTY	DESCRIPTION
	*	SELECT STONE BACKFILL
		* AS REQUIRED

SELECT STONE BACKFILL FOUNDATION

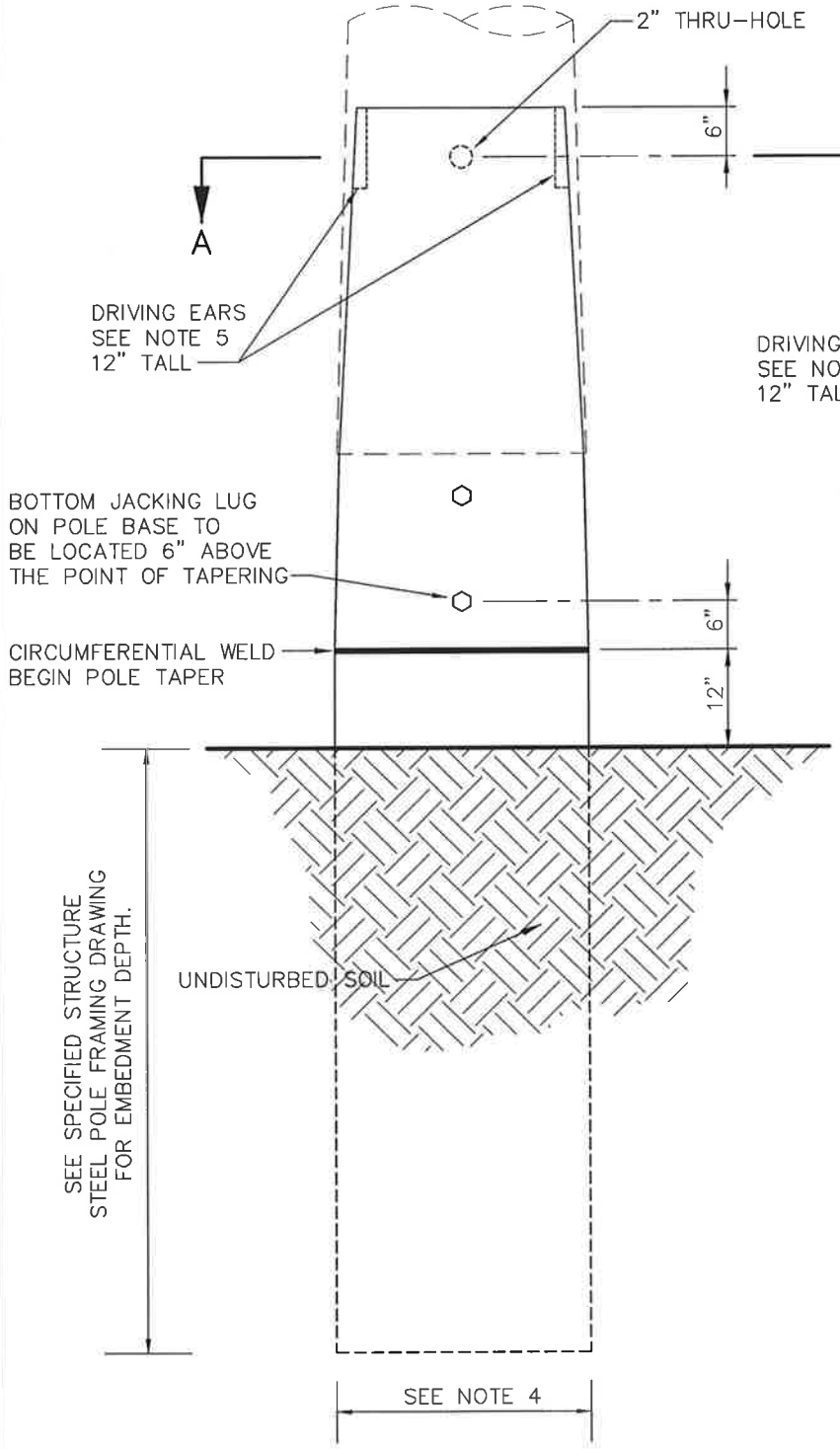
Booth & Associates, LLC
5011 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

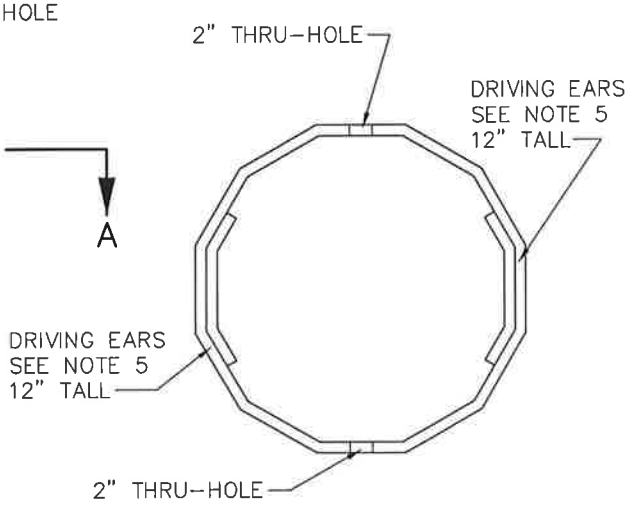
DSN.	WPJ	DWN.	BLP
CKD.	DSH	APPD.	WPJ
SCALE:	NTS	DATE:	01/23/13

DATE	REVISION

DWG. NO.
TMF-EMB

05GENERALFDN





SECTION A-A
N.T.S.

NOTES:

1) VIBRATORY POLE BASE TO BE INSTALLED USING VIBRATORY HAMMER. THE FREQUENCY AND STROKE AMPLITUDE RANGES FOR INSTALLATION OF THE POLE BASE TO BE PER MANUFACTURERS RECOMMENDATIONS.

2) TAPER OF POLE TO MATCH TAPER OF VIBRATORY POLE BASE.

3) OVERLAP LENGTH TO BE DETERMINED BY MANUFACTURER.

4) VIBRATORY BASE DIAMETERS SHOWN ON SPECIFIED STRUCTURE STEEL POLE FRAMING DRAWING ARE MINIMUM. POLE MANUFACTURER IS TO VERIFY VIBRATORY POLE BASE IS ADEQUATE FOR DESIGN LOADS.

5) MANUFACTURE SHALL DETERMINE ADEQUATE OF DRIVING EARS.

LIST OF MATERIALS

ITEM	QTY.	DESCRIPTION
	1	Vibratory Pole Base

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

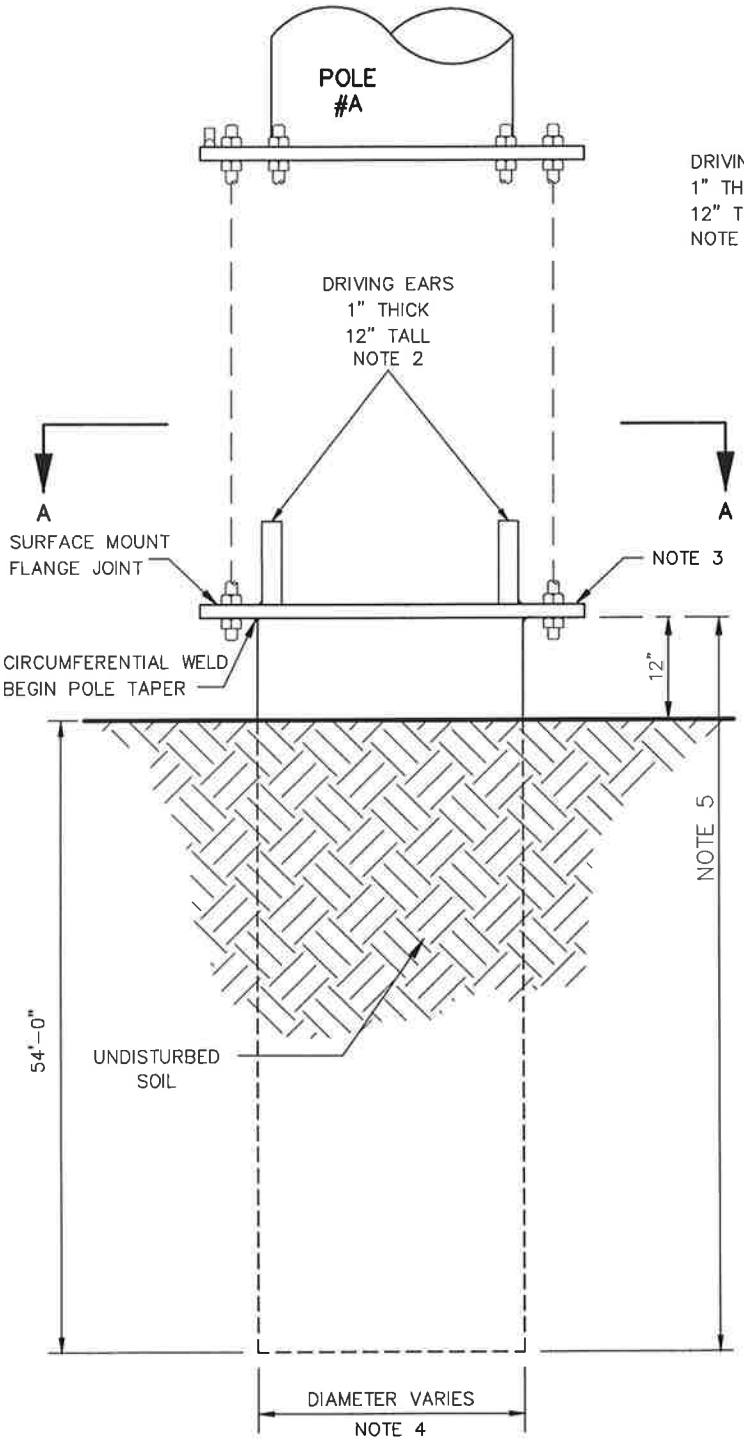
STEEL POLE FRAMING DRAWING
VIBRATORY DRIVEN POLE BASE
GUIDE ONLY

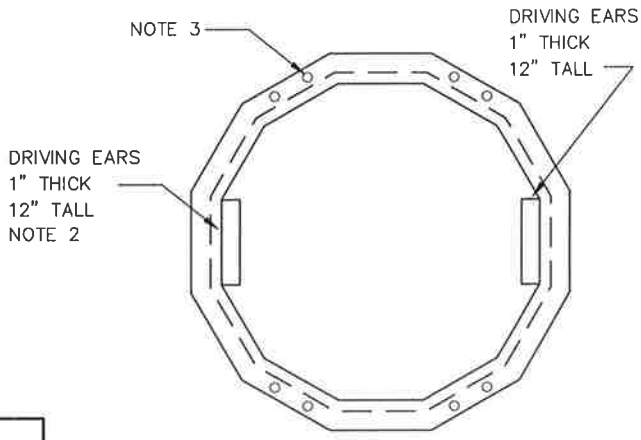
Booth & Associates, LLC
3811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DSN.	BCF	DWN.	AAI
CKD.	BCF	APPD.	WPJ
SCALE:	NONE	DATE:	06/17/16

DATE	REVISION

DWG. NO.
TMF-VPB





SECTION A–A

N.T.S.

NOTES:

1) VIBRATORY POLE BASE TO BE INSTALLED USING VIBRATORY HAMMER. THE FREQUENCY AND STROKE AMPLITUDE RANGES FOR INSTALLATION OF THE POLE BASE TO BE PER MANUFACTURERS RECOMMENDATIONS.

2) POLE MANUFACTURER TO DETERMINE APPROPRIATE DRIVING EARS FOR INSTALLATION. DIMENSIONS GIVEN ARE MINIMUM. POLE MANUFACTURER TO ENSURE SIZE AND CONNECTION OF DRIVING EARS WILL BE ADEQUATE FOR INSTALLATION BY VIBRATORY HAMMER.

3) FLANGE SIZE AND BOLT PATTERN TO BE DETERMINED BY MANUFACTURER. BOLT PATTERN OF POLE TO MATCH BOLT PATTERN OF FOUNDATION FLANGE JOINT.

4) VIBRATORY BASE DIAMETERS SHOWN ON SPECIFIED STRUCTURE STEEL POLE FRAMING DRAWINGS ARE MINIMUM. POLE MANUFACTURER IS TO VERIFY VIBRATORY POLE BASE IS ADEQUATE FOR DESIGN LOADS.

5) CORROSION INHIBITING COATING FROM POLE ABOVE BASE BOTTOM TO BOTTOM OF FLANGE JOINT.

LIST OF MATERIALS

ITEM	QTY.	DESCRIPTION
	1	VIBRATORY POLE BASE – SURFACE MOUNT FLANGE TYPE

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

STEEL POLE FRAMING DRAWING
VIBRATORY DRIVEN POLE BASE–FLANGE TYPE
GUIDE ONLY

Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DSN.	WPJ	DWN.	MJJ
CKD.	DSH	APPD.	WPJ
SCALE:	NONE	DATE:	09/20/12

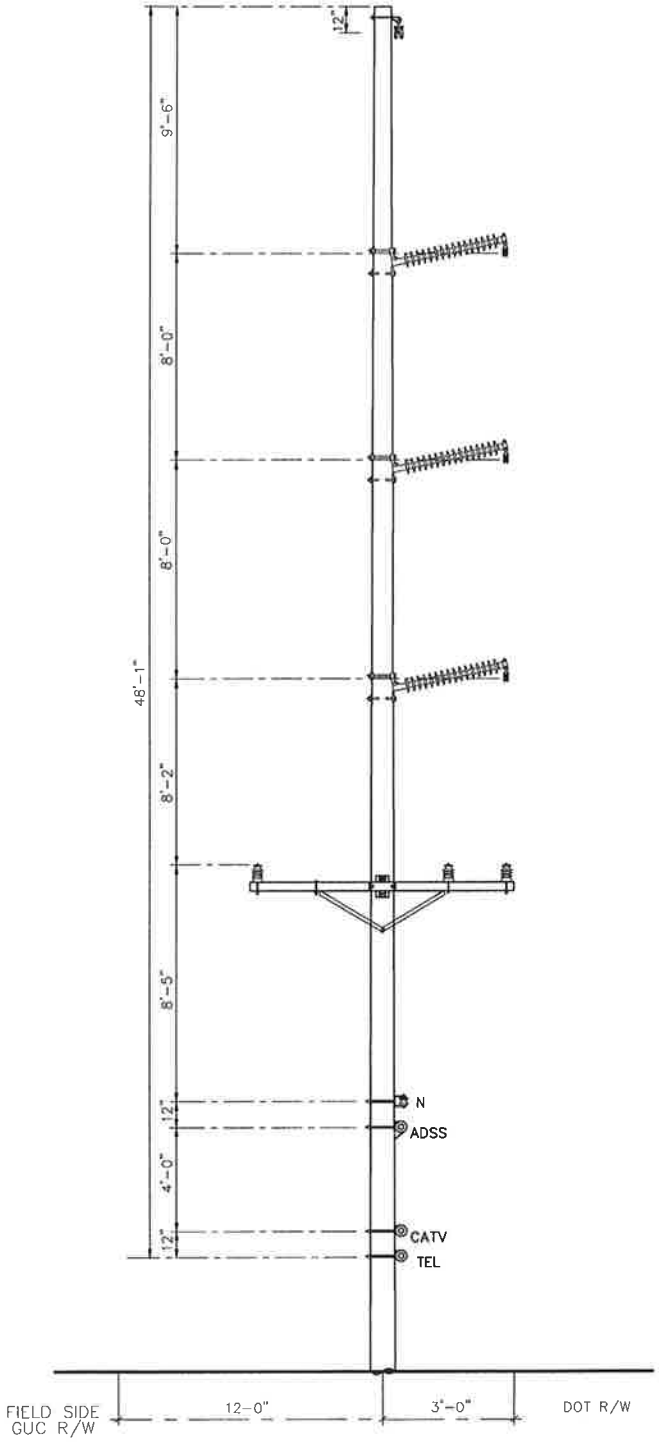
DATE	REVISION
07/25/16	MINOR REVISION

DWG. NO.
TMF–VPB–F–A

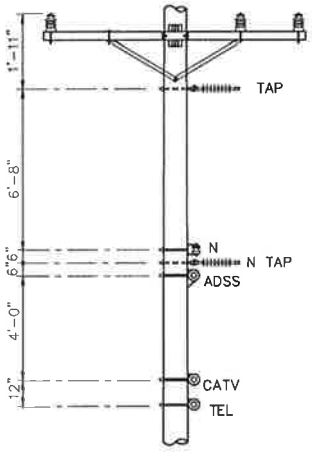
GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS FOR THE INSTALLATION OF 230kV POD TO BELLS FORK 115kV TRANSMISSION LINE

APPENDIX 2 – SPACING DRAWINGS



TANGENT TO LIGHT
ANGLE WITHOUT
PRIMARY TAP
0° – 5°



TANGENT TO LIGHT
ANGLE WITH
PRIMARY TAP
0° – 5°

STEEL POLE
115 kV TRANSMISSION
SINGLE POLE POST INSULATORS
12.47/7.2 kV DISTRIBUTION
SINGLE CIRCUIT CONSTRUCTION
SINGLE 10'–0" FIBERGLASS CROSSARM

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

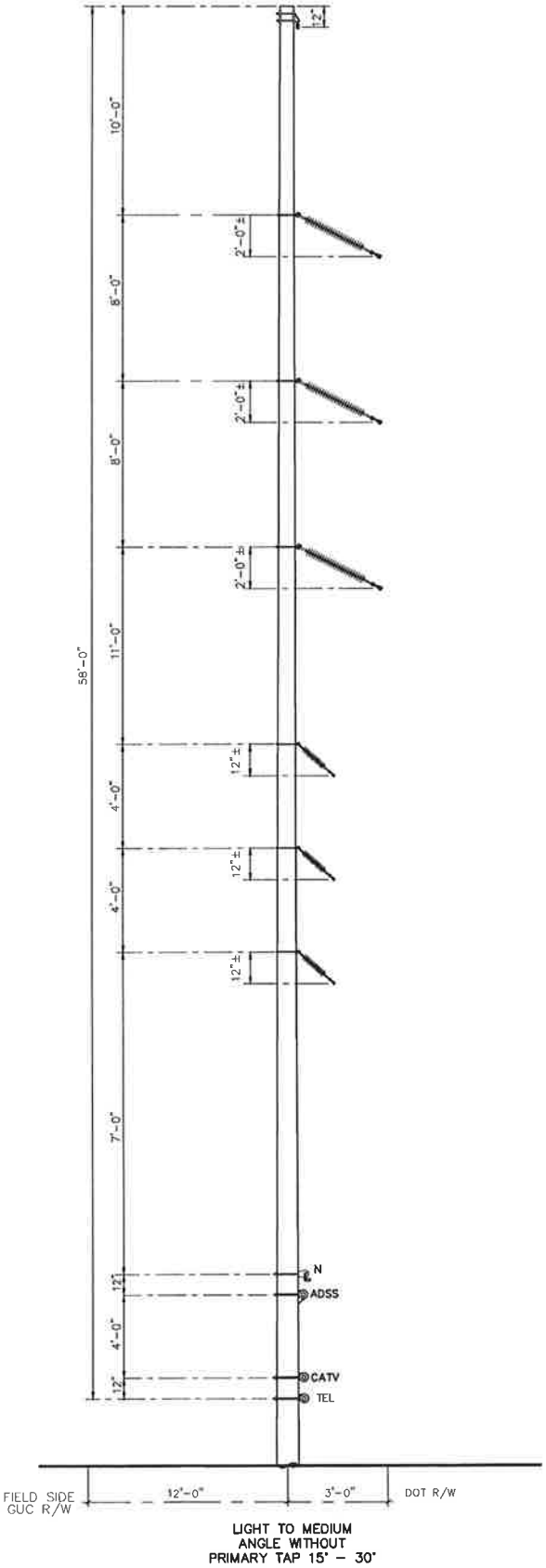
115 kV TRANSMISSION
TP–115B2–T(S) (POLE FOR POLE)
WITH DOUBLE CIRCUIT DISTRIBUTION UNDERBUILD
TYPICAL CONDUCTOR SEPARATION

Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DWN. AVS		DATE: 06/06/16	
CKD. BCF		APPD. WPJ	
SCALE: NTS		14–7798	
DATE	REVISION	DATE	REVISION

DWG. NO.
S–1B

1407798TCS



LIGHT TO MEDIUM
ANGLE WITHOUT
PRIMARY TAP 15° – 30°

STEEL POLE
115 kV TRANSMISSION
SINGLE POLE SUSPENSION INSULATORS
12.47/7.2 kV DISTRIBUTION
SINGLE CIRCUIT CONSTRUCTION
SUSPENSION INSULATOR

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

115 kV TRANSMISSION
TP–4A(S) (POLE FOR POLE)
WITH DOUBLE CIRCUIT DISTRIBUTION UNDERBUILD
TYPICAL CONDUCTOR SEPARATION

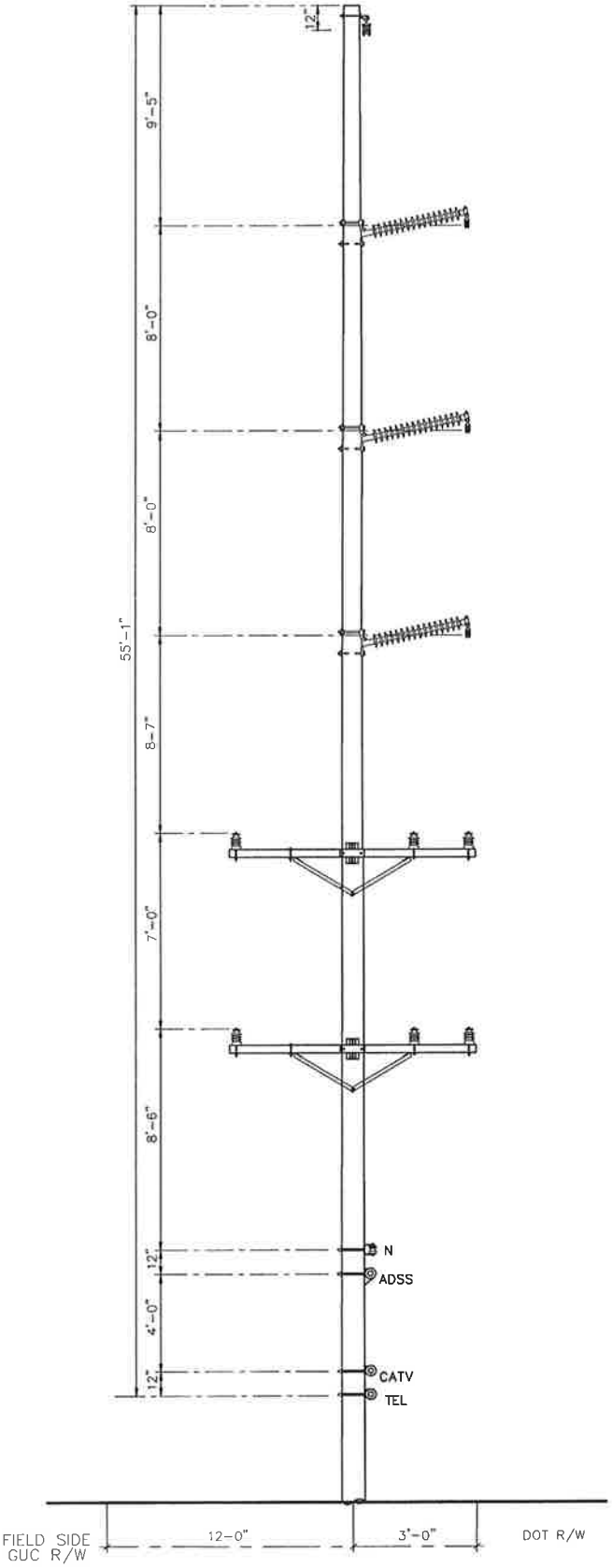
Booth & Associates, LLC
561 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DWN.	AVS	DATE:	06/06/16
CKD.	RSY	APPD.	WPJ
SCALE:	NTS		14–7798

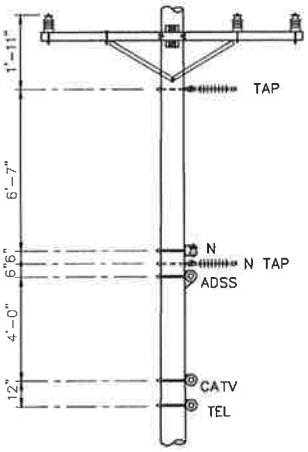
DATE	REVISION	DATE	REVISION

DWG. NO.
S–1C

1407798TCS



TANGENT TO LIGHT
ANGLE WITHOUT
PRIMARY TAP
0° – 5°



TANGENT TO LIGHT
ANGLE WITH
PRIMARY TAP
0° – 5°

STEEL POLE
115 kV TRANSMISSION
SINGLE POLE POST INSULATORS
12.47/7.2 kV DISTRIBUTION
DOUBLE CIRCUIT CONSTRUCTION
SINGLE 10'–0" FIBERGLASS CROSSARM

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

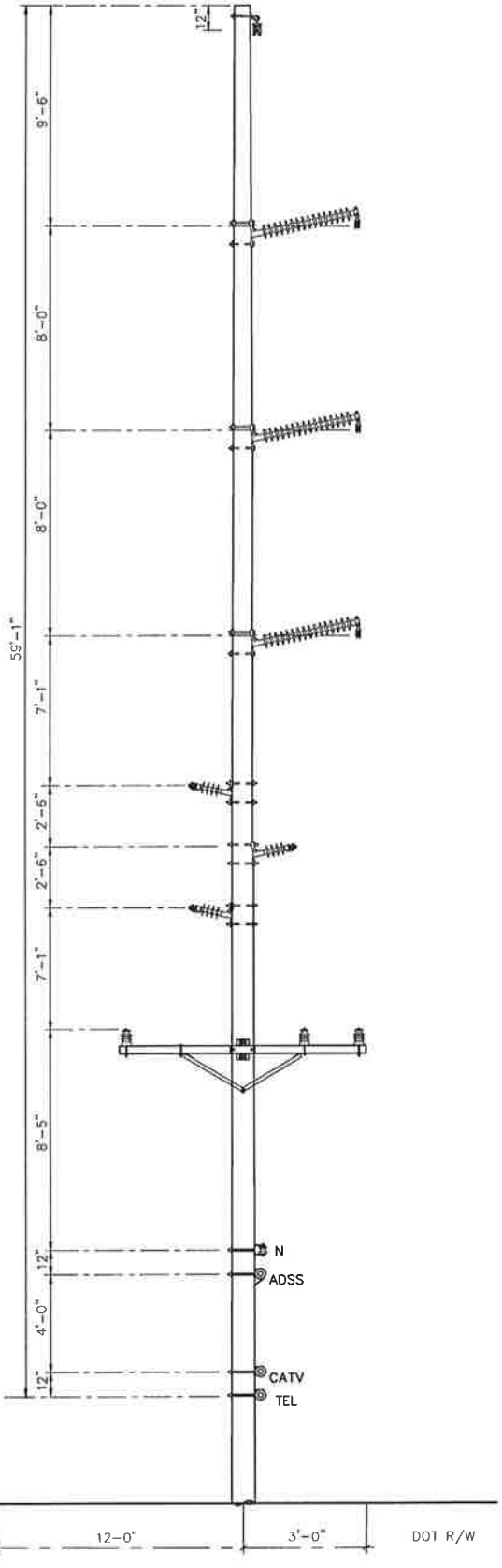
115 kV TRANSMISSION
TP–115B2–T(S) (POLE FOR POLE)
WITH DOUBLE CIRCUIT DISTRIBUTION UNDERBUILD
TYPICAL CONDUCTOR SEPARATION

Booth & Associates, LLC
5811 Glenwood Avenue | Raleigh NC 27612 CONSULTING ENGINEERS NC F-0221

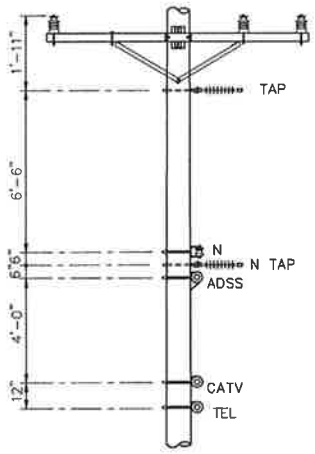
DWN. AVS		DATE: 06/06/16	
CKD. BCF		APPD. WPJ	
SCALE: NTS		14–7798	
DATE	REVISION	DATE	REVISION

DWG. NO.
S–2B–1

1407798TCS



TANGENT TO LIGHT
ANGLE WITHOUT
PRIMARY TAP
0° – 5°



TANGENT TO LIGHT
ANGLE WITH
PRIMARY TAP
0° – 5°

STEEL POLE
115 kV TRANSMISSION
SINGLE POLE POST INSULATORS
34.5/19.9 kV & 12.47/7.2 kV DISTRIBUTION
DOUBLE CIRCUIT CONSTRUCTION
SINGLE 10'–0" FIBERGLASS CROSSARM

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

115 kV TRANSMISSION
TP–115B2–T(S) (POLE FOR POLE)
WITH DOUBLE CIRCUIT DISTRIBUTION UNDERBUILD
TYPICAL CONDUCTOR SEPARATION

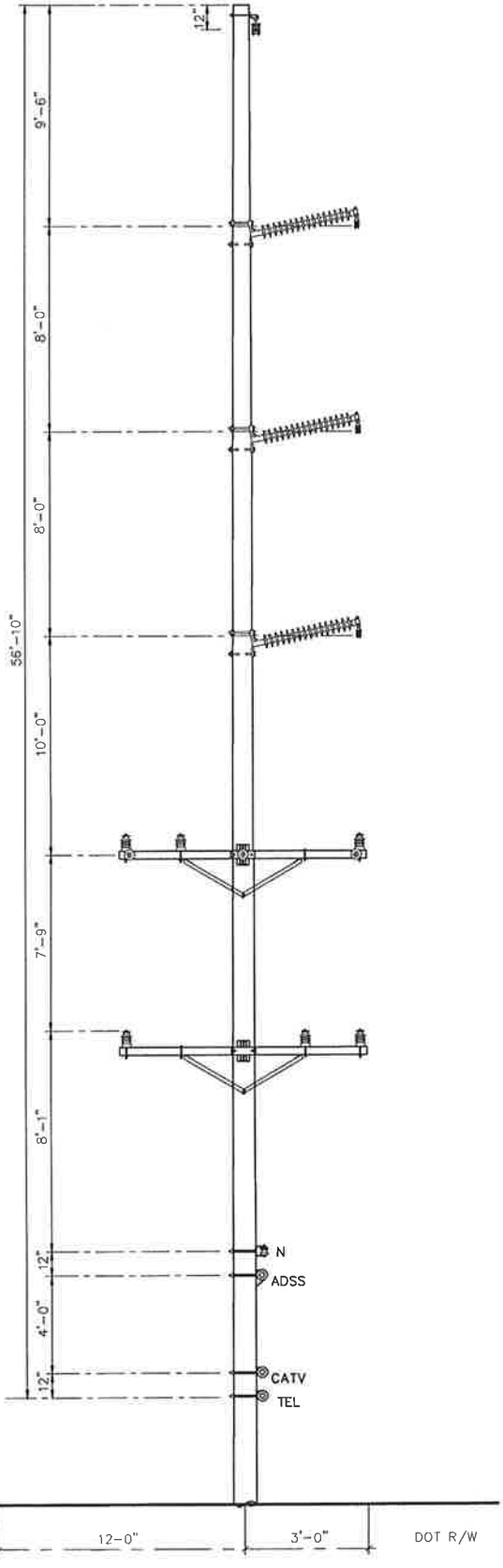
Booth & Associates, LLC
5011 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC F-0221

DWN.	BJB	DATE:	01/27/16
CKD.	BCF	APPD.	WPJ
SCALE:	NTS	14–7798	

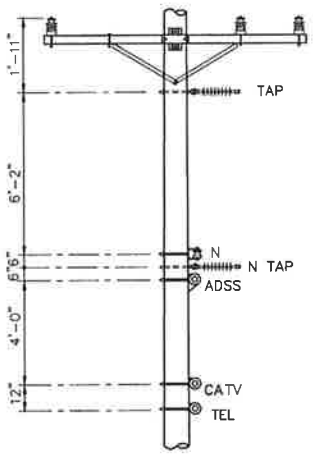
DATE	REVISION	DATE	REVISION

DWG. NO.
S–2B–2

1407798TCS



TANGENT TO LIGHT
ANGLE WITHOUT
PRIMARY TAP
0° – 5°



TANGENT TO LIGHT
ANGLE WITH
PRIMARY TAP
0° – 5°

STEEL POLE
115 kV TRANSMISSION
SINGLE POLE POST INSULATORS
34.5/19.9 kV & 12.47/7.2 kV DISTRIBUTION
DOUBLE CIRCUIT CONSTRUCTION
DUAL 10'-0" FIBERGLASS CROSSARM

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

115 kV TRANSMISSION
TP-115B2-A(S) (POLE FOR POLE)
WITH DOUBLE CIRCUIT DISTRIBUTION UNDERBUILD
TYPICAL CONDUCTOR SEPARATION

Booth & Associates, LLC
CONSULTING ENGINEERS NC F-0221

DWN.	BJB	DATE:	04/25/16
CKD.	BCF	APPD.	WPJ
SCALE:	NTS	14-7798	

DATE	REVISION	DATE	REVISION

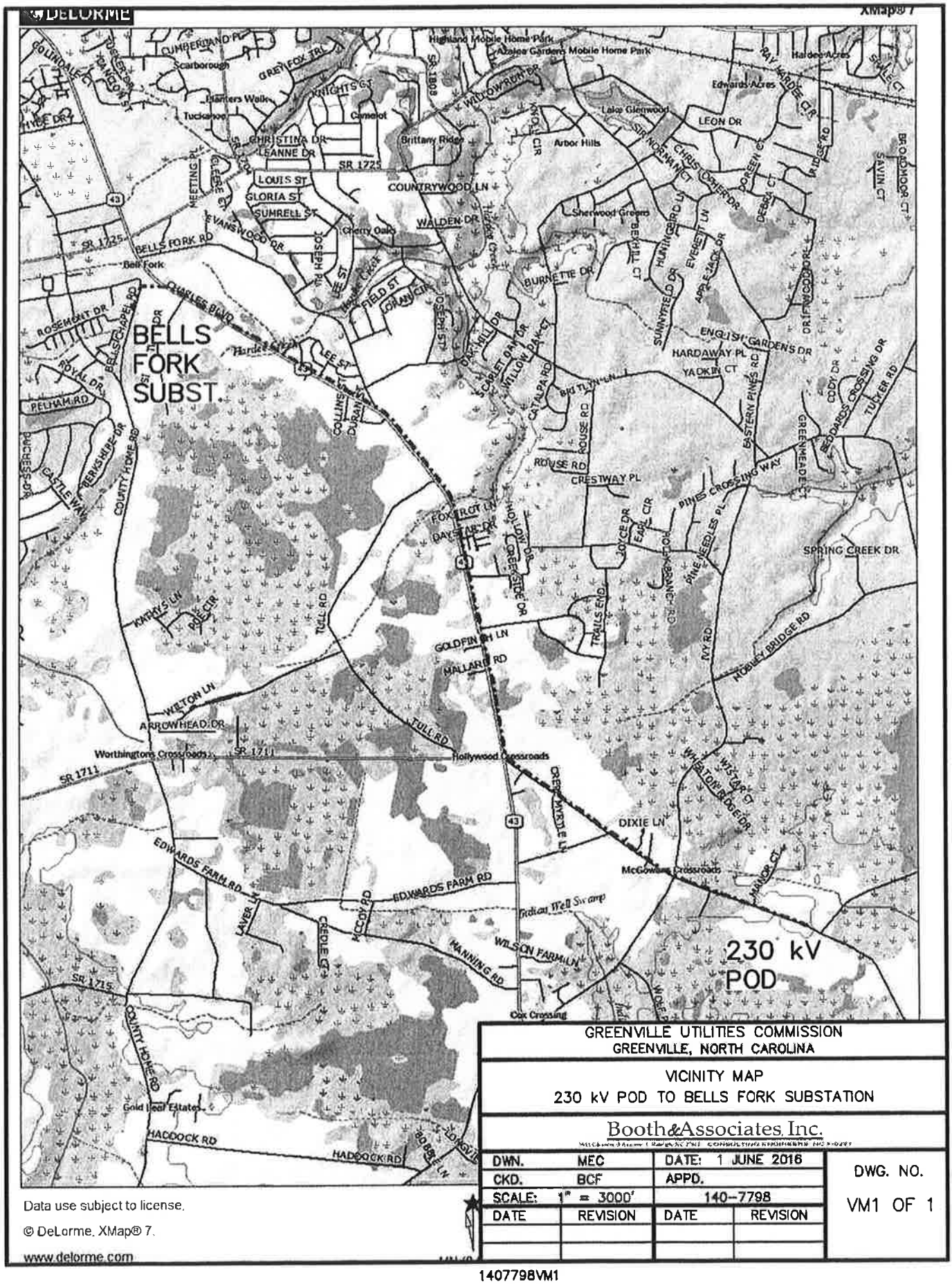
DWG. NO.
S-2B-3

1407798TCS

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS
FOR THE INSTALLATION OF
230kV POD TO BELLS FORK
115kV TRANSMISSION LINE

APPENDIX 3 – VICINITY MAP



GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

VICINITY MAP
230 kV POD TO BELLS FORK SUBSTATION

Booth&Associates, Inc.

DWN.	MEC	DATE: 1 JUNE 2016	DWG. NO.
CKD.	BCF	APPD.	VM1 OF 1
SCALE:	1" = 3000'	140-7798	

DATE	REVISION	DATE	REVISION

1407798VM1

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS
FOR THE INSTALLATION OF
230kV POD TO BELLS FORK
115kV TRANSMISSION LINE

APPENDIX 4 – BID AND CONSTRUCTION SCHEDULE

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS FOR THE INSTALLATION OF 230kV POD TO BELLS FORK 115kV TRANSMISSION LINE

BID AND CONSTRUCTION SCHEDULE

DATE	ITEM
October 12, 2016	Letter of Interest
November 1, 2016	Contracts to Bidders/Public Advertisement
November 16, 2016	Pre-Bid Conference
November 30, 2016	Bid Opening
December 5, 2016	Recommendation to Greenville Utilities Commission
December 19, 2016	Board Award of Contract
To Be Determined	Pre-Construction Conference
April 3, 2017	Construction Start
November 30, 2017	Construction Completion

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS
FOR THE INSTALLATION OF
230kV POD TO BELLS FORK
115kV TRANSMISSION LINE

APPENDIX 5 – STRINGING SAG TABLES

Greenville Utilities Commission
230 POD to Bells Fork 115kV Transmission Line
Sag & Tension / Stringing-Sag Table Index
October 31, 2016

TRANSMISSION SECTIONS

From Str.	To Str.	Conductor	Ruling Span (ft)	Design Tension Initial, NESC Medium (250B)	Percent of Ultimate Breaking Strength	Page Number Stringing Sag
GUC-TAP 1	GUC A-FRAME	Arbutus AAC	179	950	6.83%	SS-1
1	2A	7No.9 Alumoweld	192	1,700	13.46%	SS-2
		Narcissus AAC	185	3,000	13.64%	SS-3
1	POD-3 H-FRAME	7No.9 Alumoweld	214	1,000	7.92%	SS-4
		7No.9 Alumoweld	212	1,000	7.92%	SS-5
		7No.9 Alumoweld	210	1,000	7.92%	SS-6
		Narcissus AAC	210	2,500	11.36%	SS-7
		Narcissus AAC	213	2,500	11.36%	SS-8
1	33	7No.9 Alumoweld	275	1,700	13.46%	SS-9
		Narcissus AAC	274	6,500	29.55%	SS-10
2A	3A	Narcissus AAC	111	1,000	4.55%	SS-11
3A	4A	7No.9 Alumoweld	234	1,700	13.46%	SS-12
		Narcissus AAC	234	3,000	13.64%	SS-13
33	87	7No.9 Alumoweld	284	1,700	13.46%	SS-14, SS-15
		Narcissus AAC	284	6,500	29.55%	SS-16, SS-17
87	89	7No.9 Alumoweld	327	1,700	13.46%	SS-18
		Narcissus AAC	327	6,500	29.55%	SS-19
89	92	7No.9 Alumoweld	220	1,700	13.46%	SS-20
		Narcissus AAC	220	6,500	29.55%	SS-21
92	BELLS FORK H-FRAME	7No.9 Alumoweld	93	1,000	7.92%	SS-22
		7No.9 Alumoweld	94	1,000	7.92%	SS-23
		Narcissus AAC	95	500	2.27%	SS-24

Greenville Utilities Commission
230 POD to Bells Fork 115kV Transmission Line
Sag & Tension / Stringing-Sag Table Index
September 30, 2016

DISTRIBUTION SECTIONS

From Str.	To Str.	Conductor	Ruling Span (ft)	Design Tension Initial, NESC Medium (250B)	Percent of Ultimate Breaking Strength	Page Number Stringing Sag
1	1-1	Arbutus AAC	57	3,000	21.58%	S-25
		336 Merlin ACSR	57	1,500	17.28%	S-26
		144 Ct. Fiber - ADSS	57	1,127	44.06%	S-27
4-1	4A	Arbutus AAC	57	3,000	21.58%	S-28
		336 Merlin ACSR	57	1,500	17.28%	S-29
		144 Ct. Fiber - ADSS	57	1,245	48.67%	S-30
1	33	Arbutus AAC	275	2,500	17.99%	S-31
		336 Merlin ACSR	275	1,500	17.28%	S-32
		144 Ct. Fiber - ADSS	275	1,065	41.63%	S-33
33	50	Arbutus AAC	271	3,000	21.58%	S-34
33	87	Arbutus AAC	284	2,500	17.99%	S-35, S-36
		336 Merlin ACSR	284	1,500	17.28%	S-37, S-38
		144 Ct. Fiber - ADSS	284	1,074	41.99%	S-39, S-40
50	87	Arbutus AAC	289	3,000	21.58%	SS-41
87	89	Arbutus AAC	328	2,500	17.99%	SS-42
		Arbutus AAC	328	3,000	21.58%	SS-43
		336 Merlin ACSR	326	1,500	17.28%	SS-44
89	92	Arbutus AAC	220	3,000	21.58%	SS-45
		Arbutus AAC	220	3,000	21.58%	SS-46
		336 Merlin ACSR	220	1,500	17.28%	SS-47

Stringing Chart Report

Section #116 from structure #GUC-Tap 1 to structure #GUC A-FRAME, start set #3 'TRANSMISSION AHEAD', end set #3 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\arbutus_aac - 950#.wir', Ruling span (ft) 178.859
Sagging data: Catenary (ft) 602.8, Horiz. Tension (lbs) 449.93 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
178-11	6-4	6-5	6-7	6-8	6-9	6-11	7-0	7-1	GUC-Tap 1	5-2

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
475	466	457	450	442	435	428	421

Stringing Chart Report

Section #1 from structure #1 to structure #2A, start set #1 'OHGW BACK', end set #1 'OHGW BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1700#.wir', Ruling span (ft) 191.54
Sagging data: Catenary (ft) 4443, Horiz. Tension (lbs) 922.367 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
193-5	0-10	0-11	1-0	1-1	1-2	1-3	1-5	1-7	1	-27-5

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
1200	1102	1010	922	838	760	690	627

Stringing Chart Report

Section #4 from structure #1 to structure #2A, start set #4 'TRANSMISSION BACK', end set #3 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 3000#.wir', Ruling span (ft) 184.863
Sagging data: Catenary (ft) 1200, Horiz. Tension (lbs) 1432.8 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
186-10	3-0	3-3	3-5	3-8	3-11	4-1	4-3	4-6	1	-27-5

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
1761	1631	1524	1432	1354	1287	1229	1177

Stringing Chart Report

Section #2 from structure #1 to structure #POD-3 H-FRAME, start set #2 'OHGW AHEAD', end set #1 'OHGW AHEAD'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1000#.wir', Ruling span (ft) 213.551
Sagging data: Catenary (ft) 1529, Horiz. Tension (lbs) 317.42 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
217-7	3-6	3-8	3-9	3-11	4-1	4-3	4-5	4-6	1	-42-6

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
362	345	330	318	306	295	285	276

Stringing Chart Report

Section #6 from structure #1 to structure #POD-3 H-FRAME, start set #12 'OHGW AHEAD', end set #21 'OHGW AHEAD'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1000#.wir', Ruling span (ft) 212.217
Sagging data: Catenary (ft) 1532, Horiz. Tension (lbs) 318.043 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
216-3	3-5	3-7	3-9	3-11	4-1	4-2	4-4	4-6	1	-42-6

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
363	346	331	318	306	295	285	276

Stringing Chart Report

Section #7 from structure #1 to structure #POD-3 H-FRAME, start set #13 'OHGW BACK', end set #11 'OHGW AHEAD'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1000#.wir', Ruling span (ft) 210.351
Sagging data: Catenary (ft) 1535, Horiz. Tension (lbs) 318.666 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
214-3	3-4	3-6	3-8	3-10	4-0	4-1	4-3	4-5	1	-41-6

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
364	347	332	318	307	295	285	276

Stringing Chart Report

Section #11 from structure #1 to structure #POD-3 H-FRAME, start set #33 'TRANSMISSION AHEAD', end set #15 'TRANSMISSION AHEAD'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 2500#.wir', Ruling span (ft) 210.041
Sagging data: Catenary (ft) 1065, Horiz. Tension (lbs) 1271.61 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
212-10	4-9	5-0	5-2	5-5	5-7	5-9	6-0	6-2	1	-35-0

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
1442	1378	1322	1272	1226	1185	1148	1114

Stringing Chart Report

Section #16 from structure #1 to structure #POD-3 H-FRAME, start set #44 'TRANSMISSION AHEAD', end set #5 'TRANSMISSION AHEAD'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 2500#.wir', Ruling span (ft) 213.234
Sagging data: Catenary (ft) 1069, Horiz. Tension (lbs) 1276.39 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
216-0	4-11	5-1	5-4	5-6	5-9	5-11	6-1	6-4	1	-35-0

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
1443	1381	1326	1276	1232	1192	1155	1122

Stringing Chart Report

Section #5 from structure #1 to structure #33, start set #11 'OHGW BACK', end set #1 'OHGW BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1700#.wir', Ruling span (ft) 274.61
Sagging data: Catenary (ft) 3715.8, Horiz. Tension (lbs) 771.4 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
313-9	2-8	2-10	3-1	3-4	3-7	3-10	4-1	4-4	1	-7-10
316-2	2-8	2-11	3-1	3-4	3-7	3-11	4-2	4-5	2	-3-3
318-0	2-8	2-11	3-2	3-5	3-8	3-11	4-2	4-6	3	2-3
248-0	1-8	1-9	1-11	2-1	2-3	2-5	2-7	2-9	4	1-5
202-11	1-1	1-2	1-3	1-5	1-6	1-7	1-9	1-10	5	-0-0
205-0	1-1	1-3	1-4	1-5	1-6	1-8	1-9	1-10	6	1-5
165-0	0-9	0-9	0-10	0-11	1-0	1-1	1-2	1-2	7	0-2
165-0	0-9	0-9	0-10	0-11	1-0	1-1	1-2	1-2	8	0-0
258-0	1-9	1-11	2-1	2-3	2-5	2-7	2-9	2-11	9	0-5
313-3	2-8	2-10	3-1	3-4	3-7	3-10	4-1	4-4	10	1-11
310-9	2-7	2-10	3-0	3-3	3-6	3-9	4-0	4-3	11	2-1
267-2	1-11	2-1	2-3	2-5	2-7	2-9	3-0	3-2	12	-4-7
165-1	0-9	0-9	0-10	0-11	1-0	1-1	1-2	1-2	13	2-7
236-3	1-6	1-7	1-9	1-11	2-0	2-2	2-4	2-6	14	-1-0
235-1	1-6	1-7	1-9	1-10	2-0	2-2	2-4	2-5	15	-0-5
325-0	2-10	3-1	3-4	3-7	3-10	4-1	4-5	4-8	16	1-10
325-0	2-10	3-1	3-4	3-7	3-10	4-1	4-5	4-8	17	1-11
315-0	2-8	2-10	3-1	3-4	3-7	3-10	4-1	4-5	18	1-9
280-0	2-1	2-3	2-5	2-8	2-10	3-1	3-3	3-6	19	-4-5
230-0	1-5	1-6	1-8	1-9	1-11	2-1	2-2	2-4	20	0-0
190-0	1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	21	5-0
280-0	2-1	2-3	2-5	2-8	2-10	3-1	3-3	3-6	22	-0-4
280-0	2-1	2-3	2-5	2-8	2-10	3-1	3-3	3-6	23	-4-3
275-0	2-0	2-2	2-4	2-7	2-9	2-11	3-2	3-4	24	5-2
300-0	2-5	2-7	2-10	3-0	3-3	3-6	3-9	4-0	25	0-10
300-0	2-5	2-7	2-10	3-0	3-3	3-6	3-9	4-0	26	-0-2
300-0	2-5	2-7	2-10	3-0	3-3	3-6	3-9	4-0	27	0-4
325-0	2-10	3-1	3-4	3-7	3-10	4-1	4-5	4-8	28	0-8
196-4	1-0	1-1	1-2	1-4	1-5	1-6	1-7	1-8	29	0-0
265-7	1-11	2-1	2-2	2-5	2-7	2-9	2-11	3-1	30	11-6
199-11	1-1	1-2	1-3	1-4	1-5	1-7	1-8	1-9	31	6-1
119-9	0-5	0-5	0-5	0-6	0-6	0-7	0-7	0-8	32	3-3

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
970	897	830	770	716	668	626	587

Stringing Chart Report

Section #3 from structure #1 to structure #33, start set #3 'TRANSMISSION BACK', end set #5 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 6500#.wir', Ruling span (ft) 274.288
Sagging data: Catenary (ft) 2948.2, Horiz. Tension (lbs) 3520.15 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
307-5	2-11	3-3	3-7	4-0	4-5	4-10	5-3	5-8	1	-6-10
316-2	3-1	3-5	3-10	4-3	4-8	5-1	5-6	6-0	2	-3-3
318-0	3-2	3-6	3-10	4-3	4-9	5-2	5-7	6-0	3	2-3
247-11	1-11	2-1	2-4	2-7	2-10	3-2	3-5	3-8	4	1-5
202-11	1-3	1-5	1-7	1-9	1-11	2-1	2-3	2-5	5	-0-0
205-0	1-4	1-5	1-7	1-9	2-0	2-2	2-4	2-6	6	1-5
165-0	0-10	0-11	1-1	1-2	1-3	1-5	1-6	1-7	7	0-2
165-0	0-10	0-11	1-1	1-2	1-3	1-5	1-6	1-7	8	0-0
258-1	2-1	2-3	2-7	2-10	3-1	3-5	3-8	4-0	9	0-5
313-3	3-0	3-5	3-9	4-2	4-7	5-0	5-5	5-10	10	1-11
310-7	3-0	3-4	3-8	4-1	4-6	4-11	5-4	5-9	11	2-1
266-8	2-2	2-5	2-9	3-0	3-4	3-8	3-11	4-3	12	-4-7
164-8	0-10	0-11	1-0	1-2	1-3	1-5	1-6	1-7	13	-3-5
236-2	1-9	1-11	2-2	2-4	2-7	2-10	3-1	3-4	14	5-0
235-3	1-9	1-11	2-1	2-4	2-7	2-10	3-1	3-4	15	-0-5
325-0	3-3	3-8	4-1	4-6	4-11	5-5	5-10	6-4	16	1-10
325-0	3-3	3-8	4-1	4-6	4-11	5-5	5-10	6-4	17	1-11
315-0	3-1	3-5	3-10	4-3	4-8	5-1	5-6	5-11	18	1-9
280-0	2-5	2-8	3-0	3-4	3-8	4-0	4-4	4-8	19	-4-5
230-0	1-8	1-10	2-0	2-3	2-6	2-8	2-11	3-2	20	0-0
190-0	1-1	1-3	1-5	1-6	1-8	1-10	2-0	2-2	21	5-0
280-0	2-5	2-8	3-0	3-4	3-8	4-0	4-4	4-8	22	-0-4
280-0	2-5	2-8	3-0	3-4	3-8	4-0	4-4	4-8	23	-4-3
275-0	2-4	2-7	2-11	3-2	3-6	3-10	4-2	4-6	24	5-2
300-0	2-9	3-1	3-5	3-10	4-2	4-7	5-0	5-4	25	0-10
300-0	2-9	3-1	3-5	3-10	4-2	4-7	5-0	5-4	26	-0-2
300-0	2-9	3-1	3-5	3-10	4-2	4-7	5-0	5-4	27	0-4
325-0	3-3	3-8	4-1	4-6	4-11	5-5	5-10	6-4	28	0-8
196-4	1-2	1-4	1-6	1-8	1-10	2-0	2-2	2-4	29	0-0
265-7	2-2	2-5	2-8	3-0	3-4	3-7	3-11	4-3	30	11-6
199-8	1-3	1-4	1-6	1-8	1-10	2-0	2-2	2-5	31	6-1
119-1	0-5	0-6	0-7	0-7	0-8	0-9	0-9	0-10	32	2-3

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
4828	4337	3899	3520	3200	2925	2697	2503

Stringing Chart Report

Section #18 from structure #2A to structure #3A, start set #5 'TRANSMISSION AHEAD', end set #3 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 1000#.wir', Ruling span (ft) 110.917
Sagging data: Catenary (ft) 447, Horiz. Tension (lbs) 533.718 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
111-1	3-2	3-3	3-5	3-5	3-7	3-8	3-9	3-9	2A	-5-5

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
577	562	546	534	521	509	498	488

Stringing Chart Report

Section #20 from structure #3A to structure #4A, start set #11 'OHGW AHEAD', end set #1 'OHGW BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1700#.wir', Ruling span (ft) 234.118
Sagging data: Catenary (ft) 3984, Horiz. Tension (lbs) 827.078 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
236-7	1-5	1-6	1-8	1-9	1-11	2-1	2-3	2-6	3A	34-5

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
1066	981	900	826	759	698	644	596

Stringing Chart Report

Section #19 from structure #3A to structure #4A, start set #5 'TRANSMISSION AHEAD', end set #5 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 3000#.wir', Ruling span (ft) 233.742
Sagging data: Catenary (ft) 1277, Horiz. Tension (lbs) 1524.74 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
236-2	4-9	5-0	5-3	5-6	5-9	6-0	6-2	6-5	3A	34-5

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
1760	1671	1593	1524	1464	1408	1359	1315

Stringing Chart Report

Section #57 from structure #33 to structure #87, start set #11 'OHGW AHEAD', end set #1 'OHGW BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1700#.wir', Ruling span (ft) 283.881
Sagging data: Catenary (ft) 3493, Horiz. Tension (lbs) 725.147 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
288-10	2-5	2-7	2-9	3-0	3-2	3-5	3-8	3-10	33	-7-5
289-4	2-5	2-7	2-10	3-0	3-3	3-5	3-8	3-10	34	-0-10
289-4	2-5	2-7	2-10	3-0	3-3	3-5	3-8	3-10	35	-0-2
289-4	2-5	2-7	2-10	3-0	3-3	3-5	3-8	3-10	36	1-0
289-4	2-5	2-7	2-10	3-0	3-3	3-5	3-8	3-10	37	-0-8
289-4	2-5	2-7	2-10	3-0	3-2	3-5	3-8	3-10	38	0-2
151-10	0-8	0-9	0-9	0-10	0-11	0-11	1-0	1-1	39	1-2
251-6	1-10	2-0	2-1	2-3	2-5	2-7	2-9	2-11	39A	-0-0
180-0	0-11	1-0	1-1	1-2	1-3	1-4	1-5	1-6	40	-0-6
162-3	0-9	0-10	0-11	0-11	1-0	1-1	1-2	1-3	41	0-2
318-2	2-11	3-2	3-5	3-7	3-11	4-2	4-5	4-8	42	0-3
318-0	2-11	3-2	3-5	3-7	3-11	4-2	4-5	4-8	43	2-3
229-0	1-6	1-8	1-9	1-11	2-0	2-2	2-3	2-5	44	-3-6
229-0	1-6	1-8	1-9	1-11	2-0	2-2	2-3	2-5	45	-0-3
285-0	2-4	2-6	2-9	2-11	3-1	3-4	3-6	3-9	46	-0-7
271-0	2-1	2-3	2-5	2-8	2-10	3-0	3-2	3-5	47	-1-0
292-11	2-6	2-8	2-10	3-1	3-3	3-6	3-9	3-11	48	-0-10
217-1	1-4	1-6	1-7	1-8	1-10	1-11	2-1	2-2	49	-5-1
260-0	1-11	2-1	2-3	2-5	2-7	2-9	2-11	3-1	50	0-0
240-0	1-8	1-9	1-11	2-1	2-2	2-4	2-6	2-8	51	-0-8
260-0	1-11	2-1	2-3	2-5	2-7	2-9	2-11	3-1	52	-2-10
265-0	2-0	2-2	2-4	2-6	2-8	2-10	3-1	3-3	53	6-0
295-0	2-6	2-8	2-11	3-1	3-4	3-7	3-9	4-0	54	-3-6
220-6	1-5	1-6	1-7	1-9	1-10	2-0	2-1	2-3	55	0-2
296-10	2-6	2-9	2-11	3-2	3-5	3-7	3-10	4-1	56	1-6
312-0	2-10	3-0	3-3	3-6	3-9	4-0	4-3	4-6	57	-4-0
281-2	2-3	2-5	2-8	2-10	3-0	3-3	3-5	3-8	58	2-11
229-0	1-6	1-8	1-9	1-11	2-0	2-2	2-3	2-5	59	2-1
302-0	2-7	2-10	3-1	3-3	3-6	3-9	4-0	4-2	60	1-1
342-0	3-4	3-8	3-11	4-2	4-6	4-9	5-1	5-5	61	1-1
322-0	3-0	3-3	3-6	3-9	4-0	4-3	4-6	4-9	62	2-0
325-3	3-1	3-3	3-6	3-9	4-1	4-4	4-7	4-10	63	-1-1
285-1	2-4	2-6	2-9	2-11	3-1	3-4	3-6	3-9	64	-1-1
208-2	1-3	1-4	1-5	1-7	1-8	1-9	1-11	2-0	65	0-2
234-9	1-7	1-9	1-10	2-0	2-1	2-3	2-5	2-6	66	1-9
159-7	0-9	0-9	0-10	0-11	1-0	1-0	1-1	1-2	67	0-11
340-11	3-4	3-7	3-11	4-2	4-5	4-9	5-1	5-4	68	-2-4
338-9	3-4	3-7	3-10	4-1	4-5	4-8	5-0	5-3	69	-1-9
305-0	2-8	2-11	3-1	3-4	3-7	3-10	4-1	4-3	70	-0-1
336-0	3-3	3-6	3-9	4-0	4-4	4-7	4-11	5-2	71	-2-5
225-9	1-6	1-7	1-8	1-10	1-11	2-1	2-3	2-4	72	0-7
238-3	1-8	1-9	1-11	2-0	2-2	2-4	2-6	2-7	72A	0-3
295-0	2-6	2-8	2-11	3-1	3-4	3-7	3-9	4-0	73	1-1

301-0	2-7	2-10	3-0	3-3	3-6	3-8	3-11	4-2	74	-0-1
293-0	2-6	2-8	2-10	3-1	3-3	3-6	3-9	3-11	75	0-6
339-9	3-4	3-7	3-10	4-2	4-5	4-9	5-0	5-4	75A	-3-0
307-9	2-9	2-11	3-2	3-5	3-8	3-10	4-1	4-4	76	4-0
352-8	3-7	3-10	4-2	4-5	4-9	5-1	5-5	5-9	77	-0-6
265-11	2-0	2-2	2-4	2-6	2-9	2-11	3-1	3-3	78	1-2
281-1	2-3	2-5	2-8	2-10	3-0	3-3	3-5	3-8	79	-0-2
252-11	1-10	2-0	2-2	2-3	2-5	2-7	2-9	2-11	80	0-10
273-4	2-2	2-4	2-6	2-8	2-10	3-1	3-3	3-5	81	-0-3
319-1	2-11	3-2	3-5	3-8	3-11	4-2	4-5	4-8	82	1-10
178-10	0-11	1-0	1-1	1-2	1-3	1-4	1-5	1-6	84	3-10
272-7	2-2	2-4	2-6	2-8	2-10	3-0	3-3	3-5	85	1-5
196-4	1-1	1-2	1-3	1-5	1-6	1-7	1-8	1-9	86	2-10

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
902	836	777	725	677	635	597	564

Stringing Chart Report

Section #58 from structure #33 to structure #87, start set #15 'TRANSMISSION AHEAD', end set #5 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 6500#.wir', Ruling span (ft) 283.82
Sagging data: Catenary (ft) 2985, Horiz. Tension (lbs) 3564.09 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
288-7	2-7	2-10	3-2	3-6	3-10	4-2	4-6	4-10	33	-6-5
289-4	2-7	2-10	3-2	3-6	3-10	4-2	4-6	4-11	34	-0-10
289-4	2-7	2-10	3-2	3-6	3-10	4-2	4-6	4-11	35	-0-2
289-4	2-7	2-10	3-2	3-6	3-10	4-2	4-7	4-11	36	1-0
289-4	2-7	2-10	3-2	3-6	3-10	4-2	4-6	4-11	37	-0-8
289-2	2-7	2-10	3-2	3-6	3-10	4-2	4-6	4-10	38	0-2
151-9	0-9	0-9	0-10	1-0	1-1	1-2	1-3	1-4	39	1-2
251-6	1-11	2-2	2-5	2-8	2-11	3-2	3-5	3-8	39A	-0-0
179-11	1-0	1-1	1-3	1-4	1-6	1-7	1-9	1-11	40	-0-6
162-3	0-10	0-11	1-0	1-1	1-3	1-4	1-5	1-6	41	0-2
318-2	3-1	3-6	3-10	4-3	4-8	5-1	5-6	5-11	42	0-3
318-0	3-1	3-5	3-10	4-3	4-8	5-1	5-6	5-11	43	2-3
229-0	1-7	1-10	2-0	2-2	2-5	2-8	2-10	3-1	44	-3-6
229-0	1-7	1-10	2-0	2-2	2-5	2-8	2-10	3-1	45	-0-3
285-0	2-6	2-9	3-1	3-5	3-9	4-1	4-5	4-9	46	-0-7
271-0	2-3	2-6	2-9	3-1	3-4	3-8	4-0	4-3	47	-1-0
292-11	2-8	2-11	3-3	3-7	3-11	4-4	4-8	5-0	48	-0-10
217-1	1-5	1-7	1-9	2-0	2-2	2-4	2-7	2-9	49	-5-1
260-0	2-1	2-4	2-7	2-10	3-1	3-5	3-8	3-11	50	0-0
240-0	1-9	2-0	2-2	2-5	2-8	2-11	3-1	3-4	51	-0-8
260-0	2-1	2-4	2-7	2-10	3-1	3-5	3-8	3-11	52	-2-10
265-0	2-2	2-5	2-8	2-11	3-3	3-6	3-10	4-1	53	6-0
295-0	2-8	3-0	3-4	3-8	4-0	4-4	4-9	5-1	54	-3-6
220-3	1-6	1-8	1-10	2-0	2-3	2-5	2-8	2-10	55	0-2
296-1	2-8	3-0	3-4	3-8	4-0	4-5	4-9	5-1	56	1-6
311-3	3-0	3-4	3-8	4-1	4-5	4-10	5-3	5-8	57	-4-0
280-10	2-5	2-8	3-0	3-4	3-7	3-11	4-3	4-7	58	2-11
229-0	1-7	1-10	2-0	2-2	2-5	2-8	2-10	3-1	59	2-1
302-0	2-10	3-1	3-5	3-10	4-2	4-7	4-11	5-4	60	1-1
342-0	3-7	4-0	4-5	4-11	5-5	5-10	6-4	6-10	61	1-1
322-0	3-2	3-7	3-11	4-4	4-9	5-2	5-7	6-1	62	2-0
325-3	3-3	3-7	4-0	4-5	4-10	5-4	5-9	6-2	63	-1-1
284-10	2-6	2-9	3-1	3-5	3-9	4-1	4-5	4-9	64	-1-1
207-7	1-4	1-6	1-8	1-10	2-0	2-2	2-4	2-6	65	0-2
234-2	1-8	1-10	2-1	2-4	2-6	2-9	3-0	3-2	66	1-9
159-3	0-9	0-10	1-0	1-1	1-2	1-3	1-5	1-6	67	0-11
340-10	3-7	4-0	4-5	4-10	5-4	5-10	6-4	6-9	68	-2-4
338-9	3-6	3-11	4-4	4-10	5-3	5-9	6-3	6-8	69	-1-9
305-0	2-10	3-2	3-6	3-11	4-3	4-8	5-1	5-5	70	-0-1
336-0	3-6	3-10	4-3	4-9	5-2	5-8	6-1	6-7	71	-2-5
225-9	1-7	1-9	1-11	2-2	2-4	2-7	2-9	3-0	72	0-7
238-3	1-9	1-11	2-2	2-4	2-7	2-10	3-1	3-4	72A	0-3
295-0	2-8	3-0	3-4	3-8	4-0	4-4	4-9	5-1	73	1-1

301-0	2-9	3-1	3-5	3-9	4-2	4-6	4-11	5-3	74	-0-1
293-0	2-8	2-11	3-3	3-7	3-11	4-4	4-8	5-0	75	0-6
339-9	3-7	3-11	4-5	4-10	5-4	5-9	6-3	6-9	75A	-3-0
307-9	2-11	3-3	3-7	4-0	4-4	4-9	5-2	5-6	76	4-0
352-8	3-10	4-3	4-9	5-2	5-9	6-3	6-9	7-3	77	-0-6
265-11	2-2	2-5	2-8	2-11	3-3	3-7	3-10	4-1	78	1-2
281-1	2-5	2-8	3-0	3-4	3-8	3-11	4-3	4-7	79	-0-2
252-11	2-0	2-2	2-5	2-8	2-11	3-2	3-6	3-9	80	0-10
273-4	2-4	2-7	2-10	3-1	3-5	3-9	4-1	4-4	81	-0-3
319-1	3-2	3-6	3-10	4-3	4-8	5-1	5-6	5-11	82	1-10
178-10	1-0	1-1	1-3	1-4	1-6	1-7	1-9	1-10	84	3-10
272-7	2-3	2-6	2-10	3-1	3-5	3-9	4-0	4-4	85	1-5
196-2	1-2	1-4	1-6	1-7	1-9	1-11	2-1	2-3	86	1-10

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
4846	4365	3937	3569	3249	2979	2752	2561

Stringing Chart Report

Section #95 from structure #87 to structure #89, start set #11 'OHGW AHEAD', end set #11 'OHGW BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1700#.wir', Ruling span (ft) 327.19
Sagging data: Catenary (ft) 3377, Horiz. Tension (lbs) 701.065 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
327-3	3-4	3-6	3-9	4-0	4-2	4-5	4-8	4-10	87	6-0
327-2	3-4	3-6	3-9	4-0	4-2	4-5	4-8	4-10	88	-4-2

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
844	792	745	701	663	629	598	571

Stringing Chart Report

Section #96 from structure #87 to structure #89, start set #15 'TRANSMISSION AHEAD', end set #15 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 6500#.wir', Ruling span (ft) 326.899
Sagging data: Catenary (ft) 3005, Horiz. Tension (lbs) 3587.97 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
327-0	3-5	3-9	4-1	4-5	4-10	5-2	5-6	5-11	87	7-0
326-11	3-5	3-9	4-1	4-5	4-10	5-2	5-6	5-11	88	-5-2

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
4684	4271	3908	3590	3317	3083	2882	2707

Stringing Chart Report

Section #105 from structure #89 to structure #92, start set #1 'OHGW AHEAD', end set #1 'OHGW BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1700#.wir', Ruling span (ft) 220.135
Sagging data: Catenary (ft) 4230, Horiz. Tension (lbs) 878.148 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
158-4	0-7	0-7	0-8	0-9	0-10	0-11	1-0	1-1	89	-0-7
240-2	1-4	1-5	1-7	1-8	1-10	2-0	2-3	2-5	90	-0-3
234-3	1-3	1-4	1-6	1-7	1-9	1-11	2-1	2-4	91	-6-3

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
1134	1044	958	878	803	735	673	618

Stringing Chart Report

Section #106 from structure #89 to structure #92, start set #5 'TRANSMISSION AHEAD', end set #5 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\narcissus_aac - 6500#.wir', Ruling span (ft) 219.855
Sagging data: Catenary (ft) 2883, Horiz. Tension (lbs) 3442.3 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
157-11	0-9	0-10	0-11	1-1	1-3	1-4	1-6	1-8	89	-5-7
240-1	1-9	1-11	2-3	2-6	2-10	3-2	3-6	3-10	90	5-9
233-11	1-8	1-10	2-1	2-4	2-8	3-0	3-4	3-8	91	-7-3

Horiz Tension 30 F	Horiz Tension 40 F	Horiz Tension 50 F	Horiz Tension 60 F	Horiz Tension 70 F	Horiz Tension 80 F	Horiz Tension 90 F	Horiz Tension 100 F
(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)	(lbs)
4984	4422	3895	3443	3052	2724	2462	2248

Stringing Chart Report

Section #110 from structure #92 to structure #BELLS FORK H-FRAME, start set #11 'OHGW AHEAD', end set #1 'OHGW BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1000#.wir', Ruling span (ft) 92.982
Sagging data: Catenary (ft) 1774, Horiz. Tension (lbs) 368.282 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
99-0	0-6	0-6	0-8	0-9	0-10	1-0	1-1	1-2	92	-36-3

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
582	501	428	368	318	280	250	226

Stringing Chart Report

Section #111 from structure #92 to structure #BELLS FORK H-FRAME, start set #12 'OHGW AHEAD', end set #11 'OHGW BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\7no_9_alumoweld - 1000#.wir', Ruling span (ft) 94.1267
Sagging data: Catenary (ft) 1774, Horiz. Tension (lbs) 368.282 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
99-11	0-6	0-7	0-8	0-9	0-10	1-0	1-1	1-3	92	-35-8

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
580	499	428	367	319	281	251	227

Stringing Chart Report

Section #112 from structure #92 to structure #BELLS FORK H-FRAME, start set #15 'TRANSMISSION AHEAD', end set #3 'TRANSMISSION BACK'
Cable 'e:\data\client_folders\greenville_uc\pod-3_to_bells-fork\cable\arbutus_aac - slack.wir', Ruling span (ft) 95.1269
Sagging data: Catenary (ft) 301, Horiz. Tension (lbs) 224.666 Condition I Temperature (deg F) 60
Results below for condition 'Initial RS'
Calculations done using actual span lengths and vertical projections

Span Length	Mid Span Sag 30 F	Mid Span Sag 40 F	Mid Span Sag 50 F	Mid Span Sag 60 F	Mid Span Sag 70 F	Mid Span Sag 80 F	Mid Span Sag 90 F	Mid Span Sag 100 F	Left Struct Number	Span Vertical Projection
(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)	(ft-in)		(ft-in)
98-2	3-11	4-0	4-1	4-2	4-2	4-3	4-4	4-5	92	-25-2

Horiz Tension 30 F (lbs)	Horiz Tension 40 F (lbs)	Horiz Tension 50 F (lbs)	Horiz Tension 60 F (lbs)	Horiz Tension 70 F (lbs)	Horiz Tension 80 F (lbs)	Horiz Tension 90 F (lbs)	Horiz Tension 100 F (lbs)
236	232	228	225	222	218	215	212

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS
FOR THE INSTALLATION OF
230kV POD TO BELLS FORK
115kV TRANSMISSION LINE

APPENDIX 6 – SOIL BORING LOGS

Geotechnical Engineering Report

230 South P.O.D. to Bellsfork Substation Transmission Line

Mills Rd, Charles Blvd (HWY 43), and Bells Chapel Rd

Greenville, North Carolina

April 12, 2016

Project No. 72165017

Prepared for:
Greenville Utilities Commission
Greenville, NC

Prepared by:
Terracon Consultants, Inc.
Winterville, North Carolina

April 12, 2016

Terracon

Greenville Utilities Commission
801 Mumford Road
Greenville, NC 27834

Attn: Mr. Jeff Byrd

Re: Geotechnical Engineering Report
230 South P.O.D. to Bells Fork Substation Transmission Line
Mills Rd, Charles Blvd (HWY 43), and Bells Chapel Rd
Greenville, North Carolina
Terracon Project No. 72165017

Dear Mr. Byrd:

Terracon Consultants, Inc. (Terracon) has completed the geotechnical engineering services for the above referenced project. This study was performed in general accordance with our proposal P72165017 dated February 16, 2016.

This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning the design and construction of foundations for the proposed transmission line.

We appreciate the opportunity to be of service to you on this project. Materials testing services are provided by Terracon. We would be pleased to discuss these services with you. If you have any questions concerning this report, or if we may be of further service, please contact us.

Sincerely,

Terracon Consultants, Inc.

NORTH CAROLINA PROFESSIONAL SEAL 042183 ENGINEER ANDREW J. GLINIAK

Andrew J. Gliniak, P.E.
Geotechnical Project Engineer
Registered NC 042183

Robert H. Neel
CMT Department Manager

Reviewed By: Barney C. Hale, PE

Enclosures

TABLE OF CONTENTS

EXECUTIVE SUMMARY

The following items represent a brief summary of the findings of our subsurface exploration and recommendations for the proposed transmission line to be located along Mills Rd, Charles Blvd (HWY 43), and Bells Chapel Rd in Greenville, North Carolina. A total of 13 soil borings were advanced 35 feet below the existing ground surface.

- Based on the results of the borings, subsurface conditions on the project site can be generalized as very loose to loose sand and soft to medium stiff clay.
- Design parameters for the lateral resistance, skin friction, and end bearing capacity of drilled piers are presented in Appendix C.
- We recommend Terracon be retained to observe construction materials at the site as well as the excavation for drilled piers.

This summary should be used in conjunction with the entire report for design purposes. Details were not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **GENERAL COMMENTS** should be read for an understanding of report limitations.

GEOTECHNICAL ENGINEERING REPORT
230 SOUTH P.O.D. TO BELLS FORK
SUBSTATION TRANSMISSION LINE
MILLS RD, CHARLES BLVD (HWY 43), AND BELLS CHAPEL RD
GREENVILLE, NORTH CAROLINA

Terracon Project No. 72165017
April 12, 2016

1.0 INTRODUCTION

We have completed the geotechnical engineering report for the proposed transmission line to be located along Mills Rd, Charles Blvd (HWY 43), and Bells Chapel Rd in Greenville, North Carolina. A total of 13 soil borings were advanced 35 feet below the existing ground surface. Logs of the borings along with a site location plan and a boring location plan are included in Appendix A of this report.

The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- subsurface soil conditions
- groundwater conditions
- drilled pier soil design parameters

2.0 PROJECT INFORMATION

Project information was obtained from plans and specifications on the share file setup on February 4, 2016. The plans included boring locations and foundation locations of the proposed 230 kV transmission line. The project information is shown in the following tables.

2.1 Project Description

ITEM	DESCRIPTION
Site Location	The proposed transmission line will start on the west side of the intersection of Mills Rd and Hudson's Crossroads Rd. It will extend northwest along Mills Rd about 1.6 miles to Charles Blvd (HWY 43), then about 2.9 miles to Bells Chapel Rd and then about 0.2 miles into the Bells Fork Substation. The total length is about 4.7 miles.
Site layout	See Appendix A, Exhibit A-2, Boring Location Plan
Site GPS	Start latitude: 35.5200° Longitude: -77.2951° End latitude: 35.5622° Longitude: -77.3502°

ITEM	DESCRIPTION
Structure	The project includes a new 230 kV transmission line.
Line construction	Foundations of vibratory driven piles and a few concrete drilled pier are anticipated.
Maximum Loads	4,500 ft-kips overturning (assumed).

2.2 Site Description

ITEM	DESCRIPTION
Current ground cover	Grassed at foundation locations.
Existing topography	Relatively level.
Existing Improvements	Mostly undeveloped at foundation locations. The project is adjacent to the road and nearby residences.

3.0 SUBSURFACE CONDITIONS

3.1 Typical Profile

Based on the results of the borings, subsurface conditions on the project site can be generalized as very loose to loose sand and soft to medium stiff clay.

Laboratory tests for water content, grain size, and Atterberg limits were conducted on selected soil samples. The test results are presented in Appendix B of this report.

Conditions encountered at the boring locations are indicated on the boring logs. Stratification boundaries on the boring logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Subsurface conditions can also vary between boring locations. For a comprehensive description of the conditions encountered in the borings, refer to the boring logs in Appendix A of this report.

3.2 Groundwater

Mud rotary drilling techniques were used to advance the borings which can obscure groundwater levels. Groundwater readings after about 3 days indicated groundwater depths of 2 to 6 feet in the borings.

The groundwater level can change due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

4.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION

4.1 Geotechnical Considerations

Very loose to loose sand and soft clay were the dominant subsurface conditions. Drilled piers are recommended for the ease of construction. Drilled piers should be installed with the slurry method of drilling to stabilize the open excavation. Design parameters for the lateral resistance and end bearing capacity of drilled piers are presented in Appendix C.

Existing utilities and residences are present near some of the locations which could influence the choice of foundations due to the potential for damage from ground vibrations associated with pile installation. However, vibrations can be monitored during installation. The lateral resistance parameters presented in Appendix C for drilled piers can be used for the driven piles. The axial compressive and uplift capacities of these piles can be calculated if requested.

5.0 GENERAL COMMENTS

Terracon should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. Terracon also should be retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

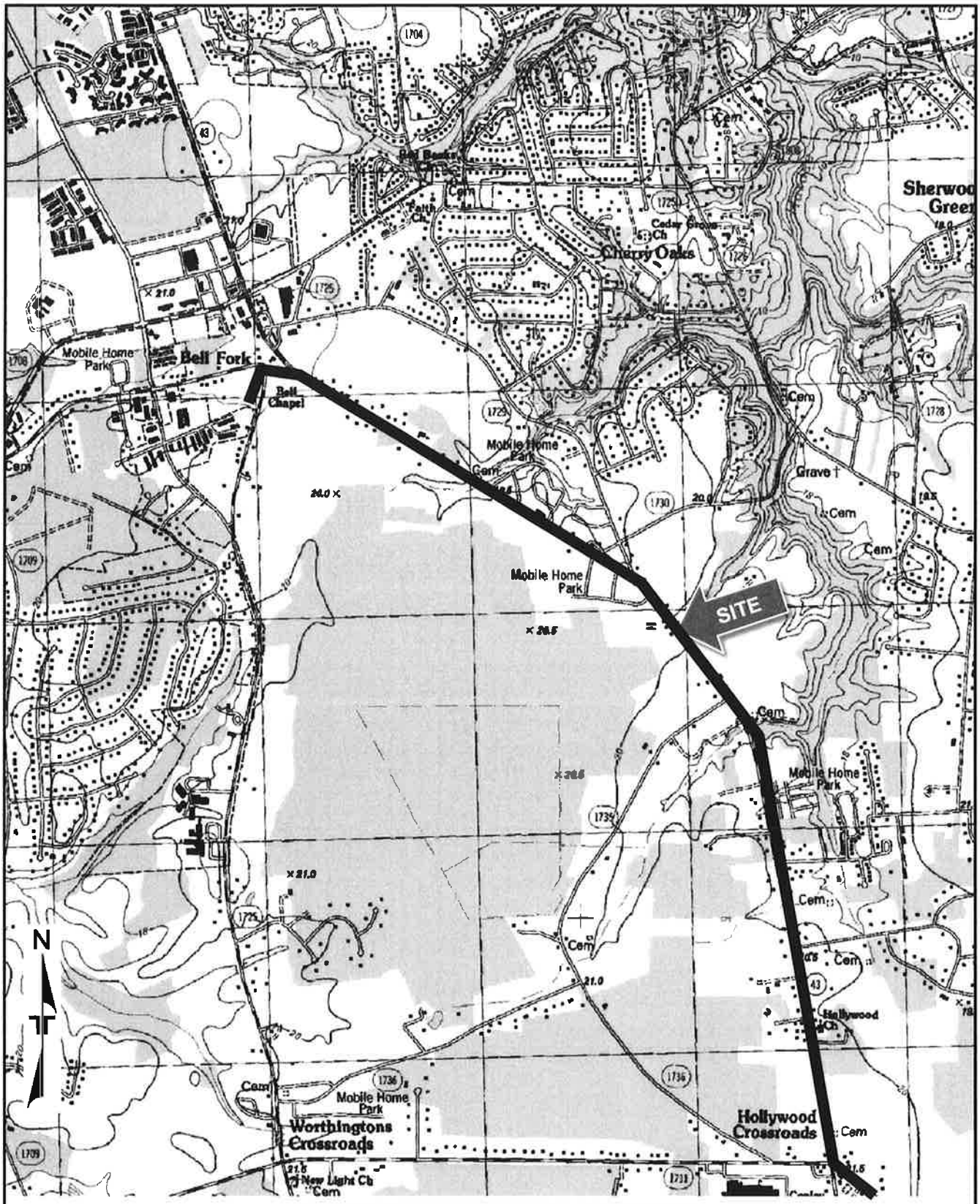
The analysis and recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

This report has been prepared for the exclusive use of our client for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site

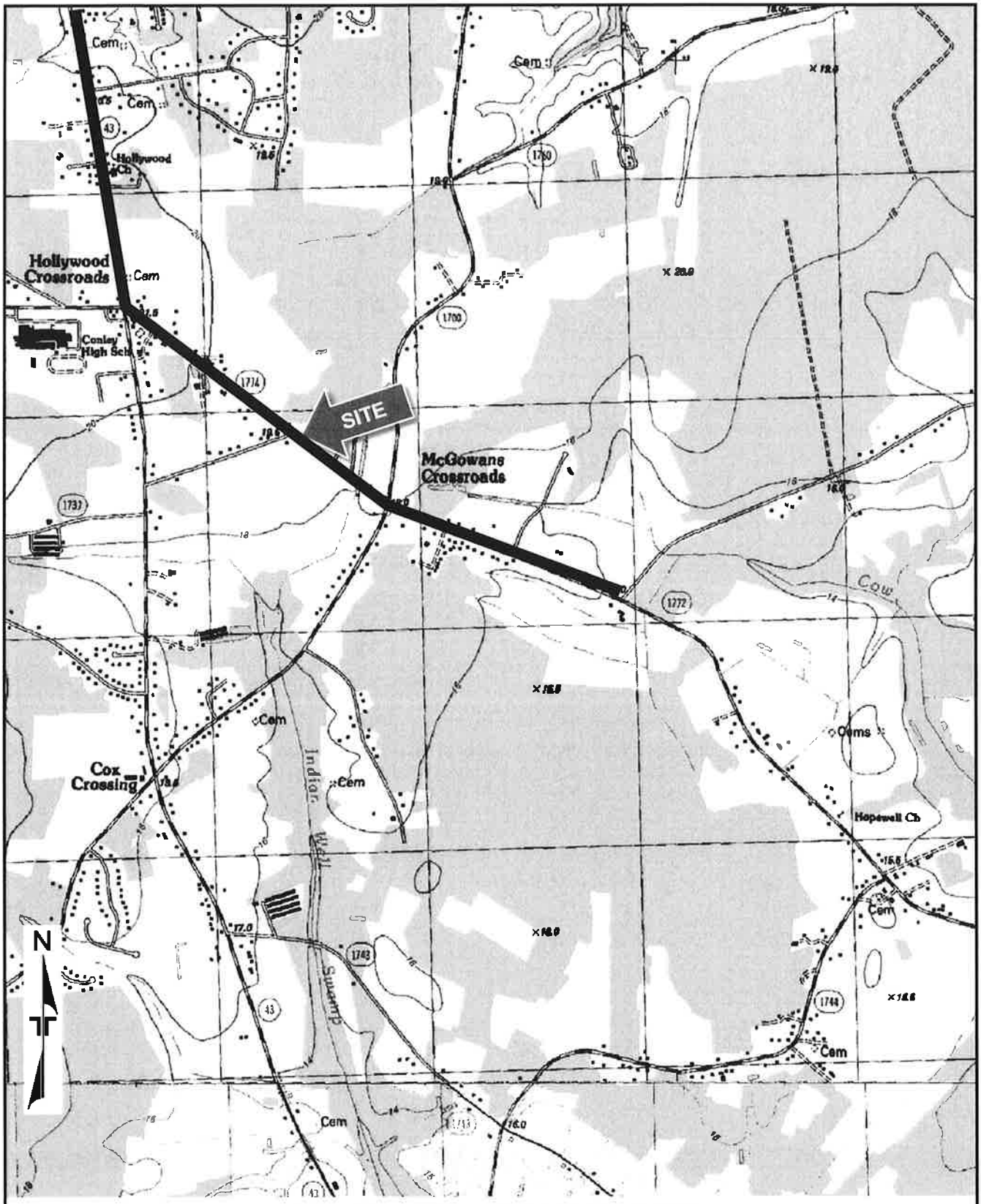
safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Terracon reviews the changes and either verifies or modifies the conclusions of this report in writing.

APPENDIX A
FIELD EXPLORATION



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: GREENVILLE SE, NC (1/1/1998).

Project Manager: AJG	Project No. 72165017	Terracon 314 Beacon Dr Winterville, NC 28590-7956	SITE LOCATION PLAN 230 S P.O.D. to Bells Fork Substation Transmission Line Mills Rd, Charles Blvd, and Bells Chapel Rd Greenville, NC	Exhibit A-1A
Drawn by: AJG	Scale: 1"=2,000'			
Checked by: BCH	File Name: 72165017 EXA			
Approved by: BCH	Date: 4/6/2016			



TOPOGRAPHIC MAP IMAGE COURTESY OF THE U.S. GEOLOGICAL SURVEY
QUADRANGLES INCLUDE: GREENVILLE SE, NC (1/1/1998) and GARDNERVILLE, NC (1/1/1983).

Project Manager: AJG	Project No. 72165017	Terracon	SITE LOCATION PLAN
Drawn by: AJG	Scale: 1"=2,000'	314 Beacon Dr Winterville, NC 28590-7956	230 S P.O.D. to Bells Fork Substation Transmission Line Mills Rd, Charles Blvd, and Bells Chapel Rd Greenville, NC
Checked by: BCH	File Name: 72165017 EXA2		
Approved by: BCH	Date: 4/6/2016		Exhibit A-1B

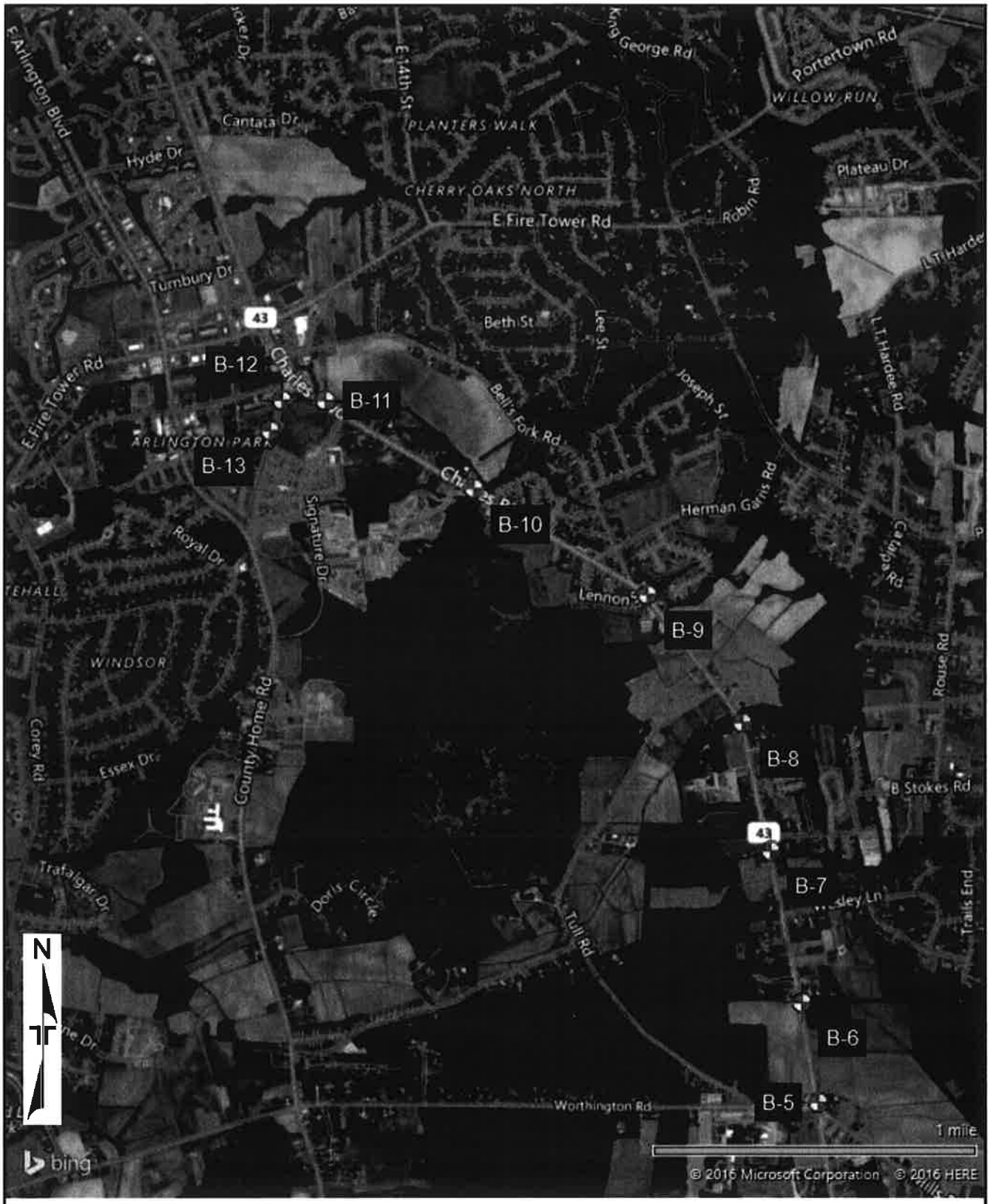


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Project Manager: AJG	Project No. 72165017	Terracon 314 Beacon Dr Winterville, NC 28590-7956	BORING LOCATION PLAN 230 S P.O.D. to Bells Fork Substation Transmission Line Mills Rd, Charles Blvd, and Bells Chapel Rd Greenville, NC	Exhibit A-2A
Drawn by: AJG	Scale: AS SHOWN			
Checked by: BCH	File Name: 72165017 EXA			
Approved by: BCH	Date: 4/6/2016			

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

AERIAL PHOTOGRAPHY PROVIDED BY MICROSOFT BING MAPS

Project Manager: AJG	Project No. 72165017	Terracon 314 Beacon Dr Winterville, NC 28590-7956	BORING LOCATION PLAN 230 S P.O.D. to Bells Fork Substation Transmission Line Mills Rd, Charles Blvd, and Bells Chapel Rd Greenville, NC	Exhibit A-2B
Drawn by: AJG	Scale: AS SHOWN			
Checked by: BCH	File Name: 72165017 EXA2			
Approved by: BCH	Date: 4/6/2016			

Field Exploration Description

The locations of Borings B-1 through B-12 were established in the field by the surveyor. Boring B-13 and GPS locations of the borings were approximated from the plans provided. Elevation information was not provided. The location of the borings should be considered accurate only to the degree implied by the means and methods used. The approximate locations of the borings are shown on the attached site plan.

The soil test borings were performed by a trailer-mounted power drilling rig utilizing mud rotary drilling procedures to advance the boreholes. Representative soil samples were obtained at 2.5 foot intervals above a depth of 10 feet and at 5 foot intervals below 10 feet using split-barrel sampling procedures. In the split barrel sampling procedure, the number of blows required to advance a standard 2 inch O.D. split barrel sampler the last 12 inches of the typical total 18 inch penetration by means of a 140 pound automatic hammer with a free fall of 30 inches, is the standard penetration resistance value (SPT-N). This value is used to estimate the in-situ relative density of cohesionless soils and consistency of cohesive soils. Soil samples were taken.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count (N) value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The samples were tagged for identification, sealed to reduce moisture loss, and taken to our laboratory for further examination, testing, and classification. Information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions.

A field log of each boring was prepared by the drill crew. These logs included visual classifications of the materials encountered during drilling as well as the driller's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent the engineer's interpretation of the field logs and include modifications based on laboratory observation and tests of the samples. Additional information provided on the boring logs attached to this report includes soil descriptions, consistency evaluations, boring depths, sampling intervals, and groundwater conditions.

BORING LOG NO. B-1

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet northeast

Latitude: 35.520087° Longitude: -77.295142°

DEPTH	Description	Sample	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1.0	**Topsoil**					
3.0	**CLAYEY SAND (SC)**, orange and light gray, loose	1	2-2-4 N=6			
6.0	**SILTY SAND (SM)**, gray, orange and red, loose	2	3-2-2 N=4			
8.0	**SANDY LEAN CLAY (CL)**, light gray and orange, very soft	3	1-1-1 N=2			
23.0	**FAT CLAY (CH)**, dark gray, very soft to soft	4	1-1-1 N=2			
		5	1-1-2 N=3			
		6	1-1-1 N=2			
28.0	**SILTY SAND (SM)**, with shell fragments, dark gray, loose	7	3-3-2 N=5			
35.0	**SANDY LEAN CLAY (CL)**, with shell fragments, bluish gray, soft to medium-stiff	8	3-2-3 N=5			
		9	2-2-2 N=4			
	Boring Terminated at 35 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *While drilling*
- *3/18/16*
- *Cave in depth on 3/18/16*

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016

Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.

Project No.: 72165017 | Exhibit: A-4

BORING LOG NO. B-2

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd Greenville, NC

LOCATION Offset 10 feet northeast

Latitude: 35.522093° Longitude: -77.301291°

GRAPHIC LOG	DEPTH	DEPTH (FL)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	1.0 **Grass/Topsoil/Rootmat**								
	CLAYEY SAND (SC), gray, loose		▽	X	2-2-2 N=4	1			
	3.0 **SILTY SAND (SM)**, gray, very loose		▽	X	1-2-1 N=3	2			
	6.0 **CLAYEY SAND (SC)**, light gray, loose	5	▨	X	2-3-3 N=6	3			
				X	1-3-2 N=5	4			
	13.0 **SANDY LEAN CLAY (CL)**, dark brownish gray, very soft	10		X	0-0-0 N=0	5			
	18.0 **SILTY SAND (SM)**, trace mica, gray to dark gray, loose to medium dense	15		X	6-6-7 N=13	6			
		20		X	4-3-2 N=5	7			
		25		X	5-6-7 N=13	8			
		30		X	4-3-5 N=8	9			
	35.0 ***Boring Terminated at 35 Feet***	35							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method: Mud Rotary

Abandonment Method: Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.

See Appendix B for description of laboratory procedures and additional data (if any).

See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

▽ *3/18/16*

▨ *Cave in depth on 3/18/16*

Terracon

314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016

Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.

Project No.: 72165017 | Exhibit: A-5

BORING LOG NO. B-3

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet northeast

Latitude: 35.523864° Longitude: -77.306957°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0		**Grass/Topsoil/Rootmat**								
3.0		**SANDY LEAN CLAY (CL)**, gray and orange, soft to medium-stiff		▽	X	1-2-2 N=4	1	28		
8.0		**CLAYEY SAND (SC)**, trace mica, orange and gray to light gray, very loose to loose	5	▽	X	2-2-2 N=4	2	14		
					X	0-0-0 N=0	3	36		
			10		X	1-2-1 N=3	4	36		
23.0		**SANDY LEAN CLAY (CL)**, trace mica, light gray and dark gray, very soft	15		X	0-0-0 N=0	5	41		
			20		X	0-0-0 N=0	6	41	36-18-18	69
28.0		**FAT CLAY (CH)**, dark gray, soft	25		X	1-1-1 N=2	7	58		
33.0		**SILTY SAND (SM)**, dark gray, loose	30		X	3-3-3 N=6	8	17		
35.0		**CLAYEY SAND (SC)**, dark gray, loose	35		X	2-3-2 N=5	9	31		
		Boring Terminated at 35 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *3/18/16*
Cave in depth on 3/18/16

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016
Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.
Project No.: 72165017 | Exhibit: A-6

BORING LOG NO. B-4

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet northeast

Latitude: 35.527052° Longitude: -77.312266°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0		**Grass/Topsoil/Rootmat**								
3.0		**SILTY SAND (SM)**, dark brownish gray, very loose		▽	X	1-2-1 N=3	1			
6.0		**CLAYEY SAND (SC)**, light gray and orange, loose	5	▽	X	2-2-3 N=5	2			
8.0		**SILTY SAND (SM)**, yellow and light tan, medium dense			X	4-7-9 N=16	3			
13.0		**CLAYEY SAND (SC)**, orange and light gray, medium dense	10		X	2-4-6 N=10	4			
23.0		**SILTY SAND (SM)**, light tan and orange, loose	15		X	6-4-5 N=9	5			
28.0		**SANDY LEAN CLAY (CL)**, trace mica, dark gray, medium stiff	20	▨	X	7-2-3 N=5	6			
35.0		**CLAYEY SAND (SC)**, dark gray, very loose to loose	25		X	2-2-4 N=6	7			
			30		X	1-2-1 N=3	8			
			35		X	2-2-2 N=4	9			
		Boring Terminated at 35 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *3/18/16*
▨ *Cave in depth on 3/18/16*

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016
Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.
Project No.: 72165017 | Exhibit: A-7

BORING LOG NO. B-5

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd Greenville, NC

LOCATION Offset 10 feet east

Latitude: 35.531984° Longitude: -77.320266°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0		**Grass/Topsoil/Rootmat**								
		SANDY LEAN CLAY (CL), tannish brown, orange and light gray, soft to medium-stiff		▽	X	2-3-2 N=5	1			
				▽	X	1-2-2 N=4	2			
6.0			5		X	2-2-3 N=5	3			
		CLAYEY SAND (SC), gray to light gray, very loose to loose			X	1-1-1 N=2	4			
13.0			10							
		SILTY SAND (SM), trace mica, light tan, orange and gray to dark gray, loose to medium dense			X	1-2-3 N=5	5			
			15							
				▨	X	3-6-9 N=15	6	25	NP	25
			20							
					X	7-9-13 N=22	7			
			25							
					X	3-4-5 N=9	8			
33.0			30							
		SANDY LEAN CLAY (CL), trace mica, dark gray, very soft			X	0-0-0 N=0	9			
35.0			35							
		Boring Terminated at 35 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *3/18/16*
▨ *Cave in depth on 3/18/16*

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016
Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.
Project No.: 72165017 | Exhibit: A-8

BORING LOG NO. B-6

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd Greenville, NC

LOCATION Offset 30 feet northeast

Latitude: 35.536484° Longitude: -77.321159°

DEPTH	GRAPHIC LOG		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0		**Grass/Topsoil/Rootmat**							
		CLAYEY SAND WITH GRAVEL (SC), gray, very loose		X	2-1-1 N=2	1			
3.0			▽						
		CLAYEY SAND (SC), light gray, orange and dark gray, loose		X	2-2-3 N=5	2			
5			▽						
				X	1-2-2 N=4	3			
				X	1-1-2 N=3	4			
10									
				X	1-1-1 N=2	5			
15									
18.0									
		FAT CLAY (CH), dark gray, very stiff		X	3-7-9 N=16	6			
20									
23.0									
		SILTY SAND (SM), orange and light tan, loose		X	2-3-4 N=7	7			
25									
28.0									
		FAT CLAY (CH), dark gray, very soft to soft		X	0-0-0 N=0	8			
30									
				X	1-1-1 N=2	9			
35.0									
		Boring Terminated at 35 Feet							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *3/18/16*
Cave in depth on 3/18/16

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016
Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.
Project No.: 72165017 | Exhibit: A-9

BORING LOG NO. B-7

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet east

Latitude: 35.543315° Longitude: -77.322879°

GRAPHIC LOG	DEPTH	DEPTH (FL)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
	1.0 **Grass/Topsoil/Rootmat**								
	SANDY LEAN CLAY (CL), light gray and orange, soft to medium-stiff		▽	X	2-3-2 N=5	1			
		5		X	1-2-1 N=3	2			
	6.0								
	SILTY SAND (SM), light gray and orange, loose			X	2-3-3 N=6	3			
	8.0		▽						
	CLAYEY SAND (SC), light gray, orange and dark gray, very loose to loose	10		X	1-2-2 N=4	4			
		15		X	0-0-0 N=0	5			
	23.0	20	▨	X	1-1-2 N=3	6			
	SANDY LEAN CLAY (CL), dark gray, soft	25		X	1-2-1 N=3	7			
	28.0								
	FAT CLAY (CH), dark gray, soft to medium-stiff	30		X	2-2-2 N=4	8			
	35.0	35		X	1-2-2 N=4	9			
	Boring Terminated at 35 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *3/18/16*
▨ *Cave in depth on 3/18/16*

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016
Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.
Project No.: 72165017 | Exhibit: A-10

BORING LOG NO. B-8

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet east

Latitude: 35.549083° Longitude: -77.324416°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0		**Grass/Topsoil/Rootmat**								
		CLAYEY SAND (SC), dark brown, light tan, orange and gray to light gray, very loose to loose			X	1-1-1 N=2	1			
					X	1-1-1 N=2	2			
			5	▽						
				▽	X	3-3-4 N=7	3			
					X	2-2-1 N=3	4			
13.0			10	Cave						
		SANDY LEAN CLAY (CL), trace mica, dark gray, very soft			X	0-0-0 N=0	5			
18.0			15							
		LEAN CLAY (CL), dark gray, very soft to medium stiff			X	1-2-2 N=4	6			
			20							
					X	1-1-1 N=2	7			
28.0			25							
		SILTY SAND (SM), light gray and dark gray, medium dense			X	3-5-6 N=11	8			
			30							
35.0					X	8-10-12 N=22	9			
		Boring Terminated at 35 Feet	35							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *3/18/16*
Cave *Cave in depth on 3/18/16*

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016
Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.
Project No.: 72165017 | Exhibit: A-11

BORING LOG NO. B-9

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet northeast

Latitude: 35.554836° Longitude: -77.329624°

DEPTH	Description	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0	**Grass/Topsoil/Rootmat**					
	SILTY SAND (SM), dark brown, loose	3-3-4 N=7	1			
3.0						
	CLAYEY SAND (SC), gray, loose	1-2-2 N=4	2			
6.0						
	FAT CLAY (CH), light gray and orange, medium stiff	1-2-3 N=5	3			
8.0						
	SANDY LEAN CLAY (CL), gray and orange, very soft	1-1-1 N=2	4			
13.0						
	SILTY SAND (SM), trace mica, dark gray, very loose to medium dense	3-4-6 N=10	5			
23.0						
	SANDY LEAN CLAY (CL), dark gray, very soft	1-1-1 N=2	7			
28.0						
	SILTY SAND (SM), dark gray, very loose to loose	1-2-1 N=3	8			
35.0		6-4-2 N=6	9			
	Boring Terminated at 35 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ 3/18/16

Cave in depth on 3/18/16

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016

Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.

Project No.: 72165017 | Exhibit: A-12

BORING LOG NO. B-10

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet northeast

Latitude: 35.559613° Longitude: -77.339125°

DEPTH	Description	Sample	Field Test Results	Water Content (%)	Atterberg Limits LL-PL-PI	Percent Fines
1.0	**Grass/Topsoil/Rootmat**					
3.0	**SANDY LEAN CLAY (CL)**, orangish brown, soft to medium-stiff	1	2-2-2 N=4	21		
6.0	**LEAN CLAY (CL)**, dark gray and orange, soft to medium-stiff	2	2-2-2 N=4	33		
8.0	**SANDY LEAN CLAY (CL)**, light gray, medium stiff	3	2-3-3 N=6	26		
13.0	**SILTY SAND (SM)**, light gray, loose	4	1-4-4 N=8	22		
23.0	**CLAYEY SAND (SC)**, light gray, very loose	5	0-0-0 N=0	26		
		6	1-1-1 N=2	28		
33.0	**SANDY SILT (ML)**, dark gray, very soft	7	1-1-1 N=2	41	28-26-2	52
		8	1-1-1 N=2	40		
35.0	**SANDY LEAN CLAY (CL)**, dark gray, soft to medium-stiff	9	1-2-2 N=4	40		
	Boring Terminated at 35 Feet					

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- *While drilling*
- *3/18/16*
- *Cave in depth on 3/18/16*

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016

Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.

Project No.: 72165017 | Exhibit: A-13

BORING LOG NO. B-11

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet northeast

Latitude: 35.56357° Longitude: -77.347255°

DEPTH	GRAPHIC LOG		DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		Grass/Topsoil/Rootmat								
1.5		**SILTY SAND (SM)**, tan to brown, very loose to loose		▽	X	2-1-2 N=3	1			
					X	1-2-2 N=4	2			
6.0		**CLAYEY SAND (SC)**, light gray, very loose to loose	5		X	1-1-1 N=2	3			
				▽	X	2-2-2 N=4	4			
13.0		**LEAN CLAY (CL)**, light gray, very soft	10		X	1-1-1 N=2	5			
18.0		**CLAYEY SAND (SC)**, dark gray, very loose to medium dense	15	▩	X	0-0-0 N=0	6			
			20		X	2-4-6 N=10	7			
28.0		**SILTY SAND (SM)**, dark gray, medium dense to dense	25		X	4-7-10 N=17	8			
35.0			30		X	13-17-19 N=36	9			
		Boring Terminated at 35 Feet	35							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *3/18/16*
▩ *Cave in depth on 3/18/16*

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016
Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.
Project No.: 72165017 | Exhibit: A-14

BORING LOG NO. B-12

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet east

Latitude: 35.563586° Longitude: -77.349617°

DEPTH	GRAPHIC LOG		WATER LEVEL OBSERVATIONS	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0		**Grass/Topsoil/Rootmat**							
		CLAYEY SAND (SC), tannish gray, orange and light gray, very loose to medium dense	▽	X	2-1-1 N=2	1			
				X	2-2-1 N=3	2			
5			▽	X	2-3-6 N=9	3			
				X	3-4-7 N=11	4			
10									
13.0		**SILTY SAND (SM)**, white, orange and light tan, very loose to medium dense		X	1-1-1 N=2	5			
15			▩						
				X	5-6-9 N=15	6			
20									
				X	2-2-5 N=7	7			
25									
				X	10-12-14 N=26	8			
30									
				X	11-12-16 N=28	9			
35.0									
35		***Boring Terminated at 35 Feet***							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*
▽ *3/18/16*
▩ *Cave in depth on 3/18/16*

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016
Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.
Project No.: 72165017 | Exhibit: A-15

BORING LOG NO. B-13

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

CLIENT: Greenville Utilities Commission
Greenville, NC

SITE: Mills Rd, HWY 43, and Bells Chapel Rd
Greenville, NC

LOCATION Offset 10 feet northwest

Latitude: 35.562219° Longitude: -77.350271"

DEPTH	Material Description	SAMPLE TYPE	FIELD TEST RESULTS	SAMPLE	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1.0	**Grass/Topsoil/Rootmat**						
3.0	**SILTY SAND (SM)**, tannish brown, loose	X	3-2-2 N=4	1			
	CLAYEY SAND (SC), light gray, orange, red and white, very loose to medium dense	X	1-1-2 N=3	2			
		X	3-5-5 N=10	3			
		X	3-3-5 N=8	4			
		X	1-2-2 N=4	5			
18.0	**SILTY SAND (SM)**, light tan and orange, loose to medium dense	X	5-6-7 N=13	6			
		X	5-6-3 N=9	7			
28.0	**SANDY LEAN CLAY (CL)**, orange, red, light tan and light gray, stiff	X	3-4-6 N=10	8			
33.0	**SILTY SAND (SM)**, light tan and orange, medium dense	X	9-11-13 N=24	9			
35.0	***Boring Terminated at 35 Feet***						

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud Rotary

Abandonment Method:
Borings backfilled with soil cuttings upon completion.

See Exhibit A-3 for description of field procedures.
See Appendix B for description of laboratory procedures and additional data (if any).
See Appendix C for explanation of symbols and abbreviations.

Notes:

WATER LEVEL OBSERVATIONS

- While drilling
- 3/18/16
- Cave in depth on 3/18/16

Terracon
314 Beacon Dr
Winterville, NC

Boring Started: 3/15/2016 | Boring Completed: 3/15/2016

Drill Rig: Trailer Rig | Driller: Carolina Drilling, Inc.

Project No.: 72165017 | Exhibit: A-16

APPENDIX B
LABORATORY TESTING

Laboratory Testing

Descriptive classifications of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. Also shown are estimated Unified Soil Classification Symbols. A brief description of this classification system is attached to this report. Soils laboratory testing was performed under the direction of a geotechnical engineer and included visual classification, moisture content, organic content, grain size analysis and Atterberg limits testing as appropriate. The results of the laboratory testing are shown on the borings logs and in Appendix B.

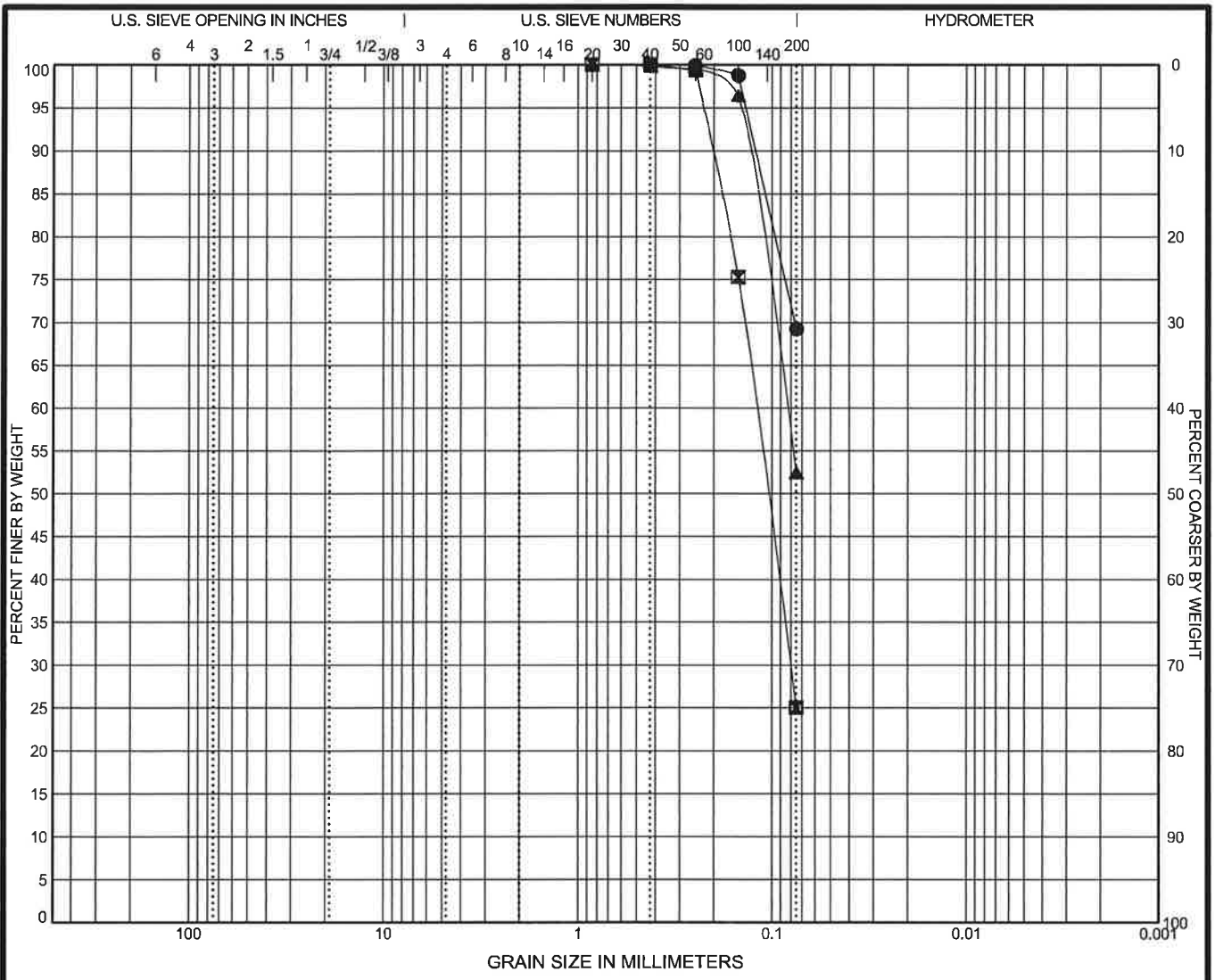
The laboratory test methods are described in the ASTM Standards listed below:

ASTM D2216 Standard Test Method of Determination of Water Content of Soil and Rock by Mass
ASTM D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)
ASTM D2488 Standard Practice of Description and Identification of Soils (Visual Manual Method)
ASTM D422 Standard Test Method for Particle Size Analysis of Soils
ASTM D1140 Standard Test Methods for Determining the Amount of Material Finer than No. 200 Sieve in Soils by Washing
ASTM D4318 Standard Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils
ASTM D2974 Standard Test Methods for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils

Procedural standards noted above are for reference to methodology in general. In some cases variations to methods are applied as a result of local practice or professional judgment.

GRAIN SIZE DISTRIBUTION

ASTM D422 / ASTM C136



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	BORING ID	DEPTH	% COBBLES	% GRAVEL	% SAND	% SILT	% FINES	% CLAY	USCS
●	**B-3**	**18.5 - 20**	**0.0**	**0.0**	**30.7**		**69.3**		**CL**
⊠	**B-5**	**18.5 - 20**	**0.0**	**0.0**	**75.0**		**25.0**		**SM**
▲	**B-10**	**23.5 - 25**	**0.0**	**0.0**	**47.6**		**52.4**		**ML**

	GRAIN SIZE		
	●	⊠	▲
D_{60}		0.121	0.084
D_{30}		0.08	
D_{10}			
	COEFFICIENTS		
C_C			
C_U			

SIEVE (size)	PERCENT FINER		
	●	⊠	▲
1 1/2"			
1"			
3/4"			
1/2"			
3/8"			
#4			
#10			
#20		100.0	100.0
#40	100.0	99.98	99.79
#60	99.9	99.33	99.53
#100	98.75	75.3	96.41
#200	69.27	25.05	52.44

SOIL DESCRIPTION

● DARK GRAY SANDY LEAN CLAY (CL)

⊠ GRAY TO DARK GRAY SILTY SAND (SM)

▲ DARK GRAY SANDY SILT (ML)

REMARKS

●

⊠

▲

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

SITE: Mills Rd, HWY 43, and Bells Chapel Rd Greenville, NC

Terracon

314 Beacon Dr
Winterville, NC

PROJECT NUMBER: 72165017

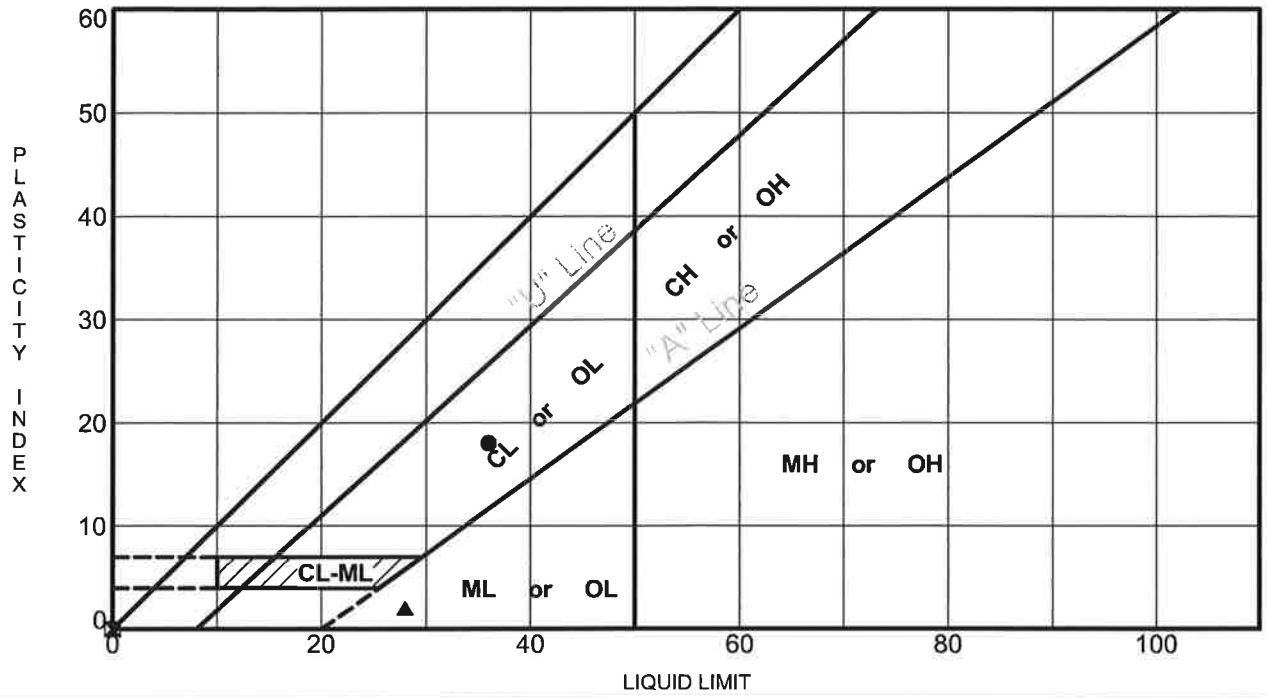
CLIENT: Greenville Utilities Commission Greenville, NC

EXHIBIT: B-2

LABORATORY TESTS ARE NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GRAIN SIZE: USCS 1 72165017 230 SOUTH POD TO BELLS FORK SUBSTATION TRANSMISSION LINE; GREENVILLE, NC.GPJ 35159097 - ATTERBERG ISSUE.GPJ 4/11/16

ATTERBERG LIMITS RESULTS

ASTM D4318



	Boring ID	Depth	LL	PL	PI	Fines	USCS	Description
●	B-3	18.5 - 20	36	18	18	69	CL	DARK GRAY SANDY LEAN CLAY
⊠	B-5	18.5 - 20	NP	NP	NP	25	SM	GRAY TO DARK GRAY SILTY SAND
▲	B-10	23.5 - 25	28	26	2	52	ML	DARK GRAY SANDY SILT

PROJECT: 230 South POD to Bells Fork Substation Transmission Line

SITE: Mills Rd, HWY 43, and Bells Chapel Rd Greenville, NC

Terracon

314 Beacon Dr
Winterville, NC

PROJECT NUMBER: 72165017

CLIENT: Greenville Utilities Commission Greenville, NC

EXHIBIT: B-3

APPENDIX C
SUPPORTING DOCUMENTS

GENERAL NOTES

DESCRIPTION OF SYMBOLS AND ABBREVIATIONS

SAMPLING


Auger


Split Spoon


Shelby Tube


Macro Core


Ring Sampler


Rock Core


Grab Sample


No Recovery

WATER LEVEL


Water Initially Encountered


Water Level After a Specified Period of Time


Water Level After a Specified Period of Time

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

FIELD TESTS

(HP)	Hand Penetrometer
(T)	Torvane
(b/f)	Standard Penetration Test (blows per foot)
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

DESCRIPTIVE SOIL CLASSIFICATION

Soil classification is based on the Unified Soil Classification System. Coarse Grained Soils have more than 50% of their dry weight retained on a #200 sieve; their principal descriptors are: boulders, cobbles, gravel or sand. Fine Grained Soils have less than 50% of their dry weight retained on a #200 sieve; they are principally described as clays if they are plastic, and silts if they are slightly plastic or non-plastic. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size. In addition to gradation, coarse-grained soils are defined on the basis of their in-place relative density and fine-grained soils on the basis of their consistency.

LOCATION AND ELEVATION NOTES

Unless otherwise noted, Latitude and Longitude are approximately determined using a hand-held GPS device. The accuracy of such devices is variable. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

STRENGTH TERMS

RELATIVE DENSITY OF COARSE-GRAINED SOILS (More than 50% retained on No. 200 sieve.) Density determined by Standard Penetration Resistance Includes gravels, sands and silts.			CONSISTENCY OF FINE-GRAINED SOILS (50% or more passing the No. 200 sieve.) Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance			
Descriptive Term (Density)	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**	**Descriptive Term (Consistency)**	**Unconfined Compressive Strength, Qu, psf**	**Standard Penetration or N-Value Blows/Ft.**	**Ring Sampler Blows/Ft.**
Very Loose	0 - 3	0 - 6	Very Soft	less than 500	0 - 1	< 3
Loose	4 - 9	7 - 18	Soft	500 to 1,000	2 - 4	3 - 4
Medium Dense	10 - 29	19 - 58	Medium-Stiff	1,000 to 2,000	4 - 8	5 - 9
Dense	30 - 50	59 - 98	Stiff	2,000 to 4,000	8 - 15	10 - 18
Very Dense	> 50	≥ 99	Very Stiff	4,000 to 8,000	15 - 30	19 - 42
			Hard	> 8,000	> 30	> 42

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 15
With	15 - 29
Modifier	> 30

GRAIN SIZE TERMINOLOGY

Major Component of Sample	Particle Size
Boulders	Over 12 in. (300 mm)
Cobbles	12 in. to 3 in. (300mm to 75mm)
Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Sand	#4 to #200 sieve (4.75mm to 0.075mm
Silt or Clay	Passing #200 sieve (0.075mm)

RELATIVE PROPORTIONS OF FINES

Descriptive Term(s) of other constituents	Percent of Dry Weight
Trace	< 5
With	5 - 12
Modifier	> 12

PLASTICITY DESCRIPTION

Term	Plasticity Index
Non-plastic	0
Low	1 - 10
Medium	11 - 30
High	> 30

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UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or $1 > Cc > 3$ [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F,G,H]
			Fines classify as CL or CH		GC	Clayey gravel [F,G,H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or $1 > Cc > 3$ [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G,H,I]
			Fines classify as CL or CH		SC	Clayey sand [G,H,I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A" line [J]		CL	Lean clay [K,L,M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OL	Organic clay [K,L,M,N]
			Liquid limit - not dried			Organic silt [K,L,M,O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K,L,M]
			PI plots below "A" line		MH	Elastic Silt [K,L,M]
		Organic:	Liquid limit - oven dried	< 0.75	OH	Organic clay [K,L,M,P]
			Liquid limit - not dried			Organic silt [K,L,M,Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

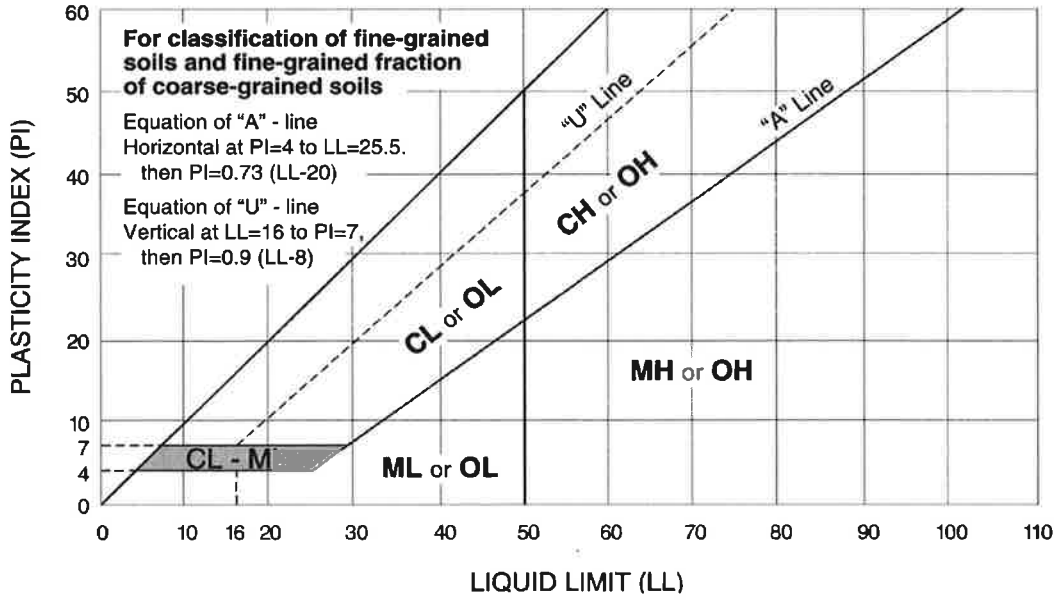
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.



Terracon

Exhibit C-2

Terracon

Design Soil Parameters for Drilled Piers

Test Boring B-1

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	3.5	110	---	---	---	---	---	28	25	25	300	6000
2	Sand	6	47	---	---	---	---	---	28	20	25	100	700
3	Sand	23	59	250	0.55	7	20	0.025	---	---	---	100	700
4	Sand	28	47	---	---	---	---	---	28	25	20	700	7200
5	Sand	35 [1]	60	600	0.55	7	80	0.018	---	---	---	300	1600

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 3.5 feet after drilling.

Test Boring B-2

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	3	110	---	---	---	---	---	28	25	25	300	4800
2	Sand	6	47	---	---	---	---	---	28	20	25	300	4800
3	Sand	13	50	---	---	---	---	---	29	35	28	500	8400
4	Clay	18	57	100	0.55	7	10	0.03	---	---	---	50	300
5	Sand	23	57	---	---	---	---	---	32	75	75	900	17000
6	Sand	28	50	---	---	---	---	---	29	35	28	700	7200
7	Sand	3	55	---	---	---	---	---	31	60	37	1100	16800

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 3 feet after drilling.

Test Boring B-3

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Clay	2.5	123	500	0.55	7	75	0.020	---	---	---	250	1400
2	Sand	6	47	---	---	---	---	---	28	20	25	350	6000
3	Sand	8	37	---	---	---	---	---	26	10	15	200	1200
4	Clay	13	59	250	0.55	7	20	0.025	---	---	---	100	700
5	Clay	23	57	100	0.55	7	10	0.03	---	---	---	50	250
6	Clay	28	59	250	0.55	7	20	0.025	---	---	---	100	700
7	Sand	35	50	---	---	---	---	---	29	35	28	900	8000

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 2.5 feet after drilling.

Test Boring B-4

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	2.5	113	---	---	---	---	---	29	50	28	300	7000
2	Sand	6	50	---	---	---	---	---	29	35	28	300	7000
3	Sand	18	55	---	---	---	---	---	31	60	37	700	14000
4	Sand	23	50	---	---	---	---	---	29	35	28	650	7000
5	Clay	28	61	750	0.55	7	100	0.015	---	---	---	400	2000
6	Sand	35	47	---	---	---	---	---	28	20	25	700	4500

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 2.5 feet after drilling.

Test Boring B-5

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Clay	3	123	600	0.55	7	80	0.018	---	---	---	300	1600
2	Clay	6	60	600	0.55	7	80	0.018	---	---	---	300	1600
3	Sand	8	50	---	---	---	---	---	29	35	28	450	7000
4	Sand	13	45	---	---	---	---	---	28	15	20	400	3600
5	Sand	18	50	---	---	---	---	---	29	35	28	600	7200
6	Sand	28	60	---	---	---	---	---	33	80	52	1000	20000
7	Sand	33	52	---	---	---	---	---	30	50	32	1000	12000
8	Sand	35	37	100	0.55	7	10	0.3	---	---	---	50	250

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 3 feet after drilling.

Test Boring B-6

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	3.3	108	---	---	---	---	---	28	20	20	150	3600
2	Sand	8	47	---	---	---	---	---	28	20	25	350	7200
3	Sand	18	45	---	---	---	---	---	28	15	20	450	4800
4	Clay	23	65	2000	0.55	7	650	0.008	---	---	---	1100	5600
5	Sand	28	50	---	---	---	---	---	29	35	28	800	9600
6	Clay	35	57	100	0.55	7	10	0.03	---	---	---	50	300

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 3.3 feet after drilling.

Test Boring B-7

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Clay	3	123	500	0.55	7	75	0.02	---	---	---	250	1400
2	Clay	6	60	500	0.55	7	75	0.02	---	---	---	250	1400
3	Sand	13	50	---	---	---	---	---	29	35	28	500	8400
4	Sand	18	37	---	---	---	---	---	26	10	15	300	1200
5	Sand	23	45	---	---	---	---	---	28	15	20	550	4800
6	Clay	35	60	500	0.55	7	75	0.02	---	---	---	250	1400

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 3 feet after drilling.

Test Boring B-8

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	5	108	---	---	---	---	---	28	20	20	200	3600
2	Sand	8	50	---	---	---	---	---	29	35	28	500	9600
3	Sand	13	45	---	---	---	---	---	28	15	20	450	4800
4	Clay	18	57	100	0.55	7	10	0.03	---	---	---	50	300
5	Clay	28	60	500	0.55	7	75	0.02	---	---	---	275	1400
6	Sand	35	55	---	---	---	---	---	31	60	37	1200	18000

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 5 feet after drilling.

Test Boring B-9

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	2.5	110	---	---	---	---	---	28	25	25	300	6000
2	Sand	6	47	---	---	---	---	---	28	20	25	300	6000
3	Clay	8	61	750	0.55	7	100	0.015	---	---	---	400	2100
4	Clay	13	59	250	0.55	7	20	0.025	---	---	---	125	700
5	Sand	18	55	---	---	---	---	---	31	60	37	800	15600
6	Sand	23	45	---	---	---	---	---	28	15	20	550	4800
7	Clay	28	59	250	0.55	7	20	0.025	---	---	---	125	700
8	Sand	35	47	---	---	---	---	---	28	20	25	750	6000

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 2.5 feet after drilling.

Test Boring B-10

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Clay	6	123	600	0.55	7	80	0.018	---	---	---	300	1600
2	Clay	8	60	600	0.55	7	80	0.018	---	---	---	300	1600
3	Sand	13	52	---	---	---	---	---	30	50	32	700	10800
4	Sand	23	37	---	---	---	---	---	26	10	15	375	1200
5	Clay	35	59	250	0.55	7	20	0.025	---	---	---	125	700

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 6 feet after drilling.

Test Boring B-11

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	2	108	---	---	---	---	---	28	20	20	300	3600
2	Sand	13	45	---	---	---	---	---	28	15	20	300	3600
3	Sand	18	59	250	0.55	7	20	0.025	---	---	---	125	700
4	Sand	23	37	---	---	---	---	---	26	10	15	350	1200
5	Sand	28	55	---	---	---	---	---	31	60	37	900	15600
6	Sand	35	60	---	---	---	---	---	33	80	52	1200	24000

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 2 feet after drilling.

Test Boring B-12

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	3	108	---	---	---	---	---	28	20	20	250	4800
2	Sand	6	45	---	---	---	---	---	28	15	20	250	4800
3	Sand	13	55	---	---	---	---	---	31	60	37	600	14400
4	Sand	18	45	---	---	---	---	---	28	15	20	450	3600
5	Sand	23	57	---	---	---	---	---	32	75	42	950	19200
6	Sand	28	52	---	---	---	---	---	30	50	32	800	9600
7	Sand	35	67	---	---	---	---	---	36	135	102	1500	36000

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 3 feet after drilling.

Test Boring B-13

Layer Number	Material Type	Approx. Depth to Bottom of Layer (feet)	Effective Unit Weight [2, 4] (pcf)	Undrained Shear Strength [2] (psf)	Adhesion Factor [2]	Bearing Capacity Factor N_c	LPile k-Value (pci) for Cohesive material	L-Pile Parameter ε_{50} (for clay)	Friction Angle [2] (degrees)	LPile k-value (pci) for Sand [2]	Bearing Capacity Factor N_q	Allowable Skin Friction[3] (psf)	Allowable End Bearing Pressure[3] (psf)
1	Sand	4	108	---	---	---	---	---	28	20	20	275	4800
2	Sand	6	45	---	---	---	---	---	28	15	20	275	4800
3	Sand	13	52	---	---	---	---	---	30	50	32	675	15600
4	Sand	18	47	---	---	---	---	---	28	20	25	550	6000
5	Sand	23	57	---	---	---	---	---	32	75	42	950	18000
6	Sand	28	52	---	---	---	---	---	30	50	32	900	12000
7	Sand	35	55	---	---	---	---	---	31	60	37	1200	18000

1. Undetermined – test boring terminated at an approximate depth of 35 feet.
2. Soil parameters are ultimate values, appropriate safety factors should be applied by the designer.
3. Only allowable design values have been provided, they include a factor of safety of 2.5 for skin friction and 2.75 for allowable bearing pressure.
4. Groundwater encountered at 4 feet after drilling.

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS
FOR THE INSTALLATION OF
230kV POD TO BELLS FORK
115kV TRANSMISSION LINE

APPENDIX 7 – PLAN AND PROFILE DRAWINGS

GREENVILLE UTILITES COMMISSION
GREENVILLE, NORTH CAROLINA
115kV TRANSMISSION LINE
P.O.D. #3 TO BELLS FORK SUBSTATION

NOTES:

1. TRANSMISSION – 115kV INSULATION / 115kV OPERATION (UNLESS OTHERWISE NOTED)
   PHASE CONDUCTOR – THREE (3) 1272 kcmil AAC, 61/0 STRANDING (NARCISSUS)
   LOADING DISTRICT – MEDIUM (DESIGN) / MEDIUM (ACTUAL)
   O.H.G.W – 7#9 ALUMOWELD
   MAXIMUM CONDUCTOR DESIGN TEMPERATURE – 167°F FINAL

   TRANSMISSION – 230kV INSULATION / 230kV OPERATION
   PHASE CONDUCTOR – THREE (3) 795 kcmil AAC, 37/0 STRANDING (ARBUTUS)
   LOADING DISTRICT – MEDIUM (DESIGN) / MEDIUM (ACTUAL)
   O.H.G.W – N.A.
   MAXIMUM CONDUCTOR DESIGN TEMPERATURE – 212° FINAL

   SEE "STRINGING SAG SUMMARY" FOR RULING SPAN & NESC MEDIUM CONDUCTOR DESIGN TENSION BY SECTION. THE STRINGING SAG TABLES ARE LOCATED IN THE CONTRACT BOOK IN APPENDICE No. 5

2. DISTRIBUTION UNDERBUILD – 12.47kV INSULATION / 12.47kV OPERATION
   PHASE CONDUCTOR – SINGLE AND DUAL CIRCUIT UNDERBUILD
   THREE (3) OR SIX (6) 795 kcmil AAC, 37/0 STRANDING (ARBUTUS)
   MAXIMUM CONDUCTOR DESIGN TEMPERATURE 167°F FINAL

   DISTRIBUTION UNDERBUILD – 34.5kV INSULATION / 34.5kV OPERATION
   PHASE CONDUCTOR – SINGLE CIRCUIT UNDERBUILD
   THREE (3) 795 kcmil AAC, 37/0 STRANDING (ARBUTUS)
   MAXIMUM CONDUCTOR DESIGN TEMPERATURE 167°F FINAL

   NEUTRAL CONDUCTOR – SINGLE AND DUAL CIRCUIT (1) 336.4 kcmil ACSR, 18/1 STRANDING (MERLIN)
   LOADING DISTRICT – MEDIUM (DESIGN) / MEDIUM (ACTUAL)
   MAXIMUM CONDUCTOR DESIGN TEMPERATURE 167°F FINAL.

   SEE "STRINGING SAG SUMMARY" FOR RULING SPAN & NESC MEDIUM CONDUCTOR DESIGN TENSION BY SECTION. THE STRINGING SAG TABLES ARE LOCATED IN THE CONTRACT BOOK IN APPENDICE No. 5.

3. FIBER OPTIC UNDERBUILD FIBER OPTIC CONDUCTOR – ONE (1) 144 FIBER
   LOADING DISTRICT – MEDIUM (DESIGN) / MEDIUM (ACTUAL) MAXIMUM CONDUCTOR DESIGN TEMPERATURE 120°F FINAL

   SEE "STRINGING SAG SUMMARY" FOR RULING SPAN AND NESC MEDIUM CONDUCTOR DESIGN TENSION BY SECTION. THE STRINGING SAG TABLES ARE LOCATED IN THE CONTRACT BOOK IN APPENDICE No. 5.

4. FOR CONDUCTOR SPACING SEE STANDARD CONSTRUCTION DRAWINGS, AND TYPICAL CONDUCTOR SEPARATION DRAWINGS.

5. DISTRIBUTION DESIGN, STAKING SHEETS, REMOVAL, INSTALLATION AND TRANSFERS BY GREENVILLE UTILITIES COMMISSION.

6. DANGER ALL LINES ARE TO BE CONSIDERED ENERGIZED UNLESS PHYSICALLY CHECKED AND CLEARLY GROUNDED IN ACCORDANCE WITH OWNER'S OR CONTRACTOR'S SAFETY REGULATIONS AND PROCEDURES, WHICHEVER IS MORE STRINGENT.

7. PROPERTY LINES SHOWN ARE PLOTTED FROM REFERENCES AND ARE NOT BASED ON AN ACTUAL SURVEY.

8. ALL NEW TRANSMISSION POLES ARE VIBRATORY POLE BASE UNLESS NOTED OTHERWISE.

9. TRANSMISSION POLES ARE SPECIFIED BY HEIGHT AND RUS STANDARD CLASS STEEL TRANSMISSION POLE DESIGNATION (ie: 80/S–06.2 IS 80–foot, S–06.2 RUS STEEL POLE DESIGNATION). SEE RUS BULLETIN 1724E–214.

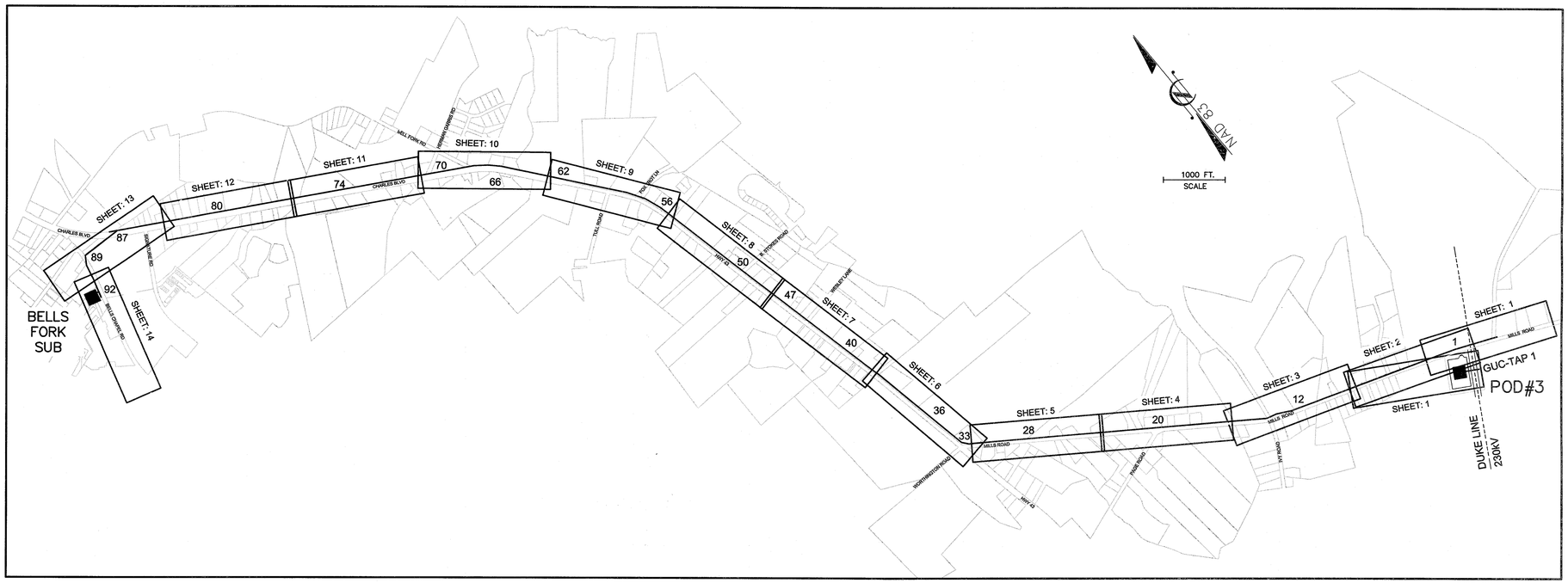
10. STRUCTURES ARE NOT INTENDED TO BE CLIMBABLE UNDER ENERGIZED CONDITIONS.

11. POLES WHERE CONDUCTOR POSITIONS ARE STANDARD ARE INDICATED BY STANDARD CONDUCTOR SEPARATION DRAWING NUMBERS, SHOWN IN THE TRANSMISSION CONSTRUCTION ASSEMBLY UNITS IN THE PROFILE VIEW (ie S–1A). SEE NOTE No. 12 FOR NON–STANDARD SEPARATION CONDITIONS.

12. POLES FOR WHICH CONDUCTOR POSITIONS ARE OTHER THAN THAT SHOWN ON THE TYPICAL CONSTRUCTION UNIT DRAWINGS HAVE DIMENSIONS INDICATED ON THE PROFILE VIEW. POSITIONS INDICATED ARE FOR CONDUCTOR LOCATIONS MEASURED IN FEET FROM THE TOP OF THE POLE. OFFSETS TO ACCOUNT FOR CROSSARM/INSULATOR MUST BE ACCOUNTED FOR WHEN DRILLING CROSSARM/INSULATOR ATTACHMENT LOCATIONS.

13. DANGER!! VERIFY AND LABEL ALL TWO–WAY CIRCUIT FEEDS.

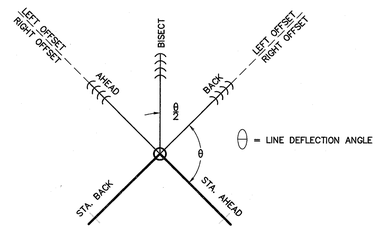
14. CLEARLY IDENTIFY NEUTRAL CONDUCTOR IN THE FIELD.



ROUTE MAP

LEGEND

- PROPOSED POLE LOCATION
- EXISTING FOREIGN POLE LOCATION – TO BE RETAINED
- EXISTING POLE LOCATION – TO BE REMOVED
- EXISTING POLE LOCATION – TO BE RETAINED
- PROPOSED TRANSMISSION LINE
- PROPOSED TRANSMISSION LINE WITH DISTRIBUTION UNDERBUILD (PHASES & NEUTRAL INDICATED)
- PROPOSED PRIMARY DISTRIBUTION LINE (PHASES & NEUTRAL INDICATED, BY GUC)
- EXISTING PRIMARY LINE TO BE RETAINED, TRANSFERRED, OR REMOVED (BY GUC)
- EXISTING SECONDARY DISTRIBUTION TO BE RETAINED OR TRANSFERRED
- GROUND CLEARANCE LINE (TRANSMISSION)
- GROUND CLEARANCE LINE (DISTRIBUTION)
- PROPOSED UTILITY EASEMENT
- EXISTING UTILITY EASEMENT
- PROPERTY LINE (APPROXIMATE)
- PROPOSED GUY AND ANCHOR COMBINATION
- N.C.D.O.T. RIGHT–OF–WAY
- UNDERGROUND DISTRIBUTION LINE
- UNDERGROUND FIBER OPTIC LINE
- WOODLINE
- DITCH/STREAM CENTERLINE
- FENCE
- GAS CENTERLINE
- GRAVEL DRIVE



TYPICAL GUY/ANCHOR ORIENTATION

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-25-2016

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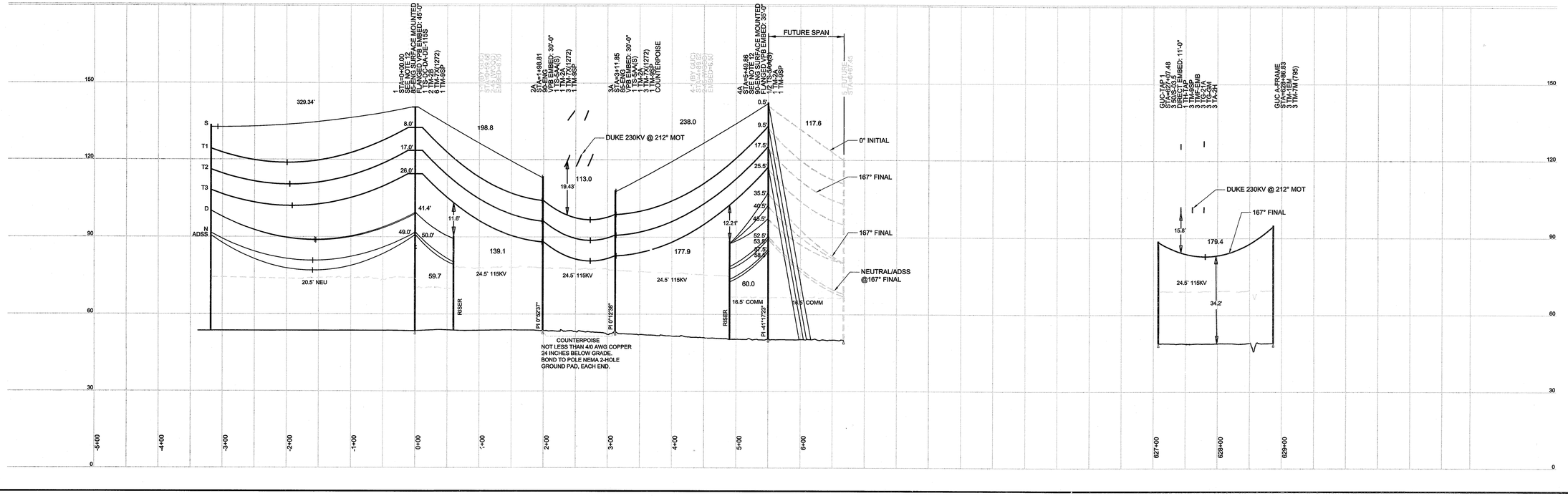
GREENVILLE UTILITES COMMISSION
GREENVILLE, NORTH CAROLINA

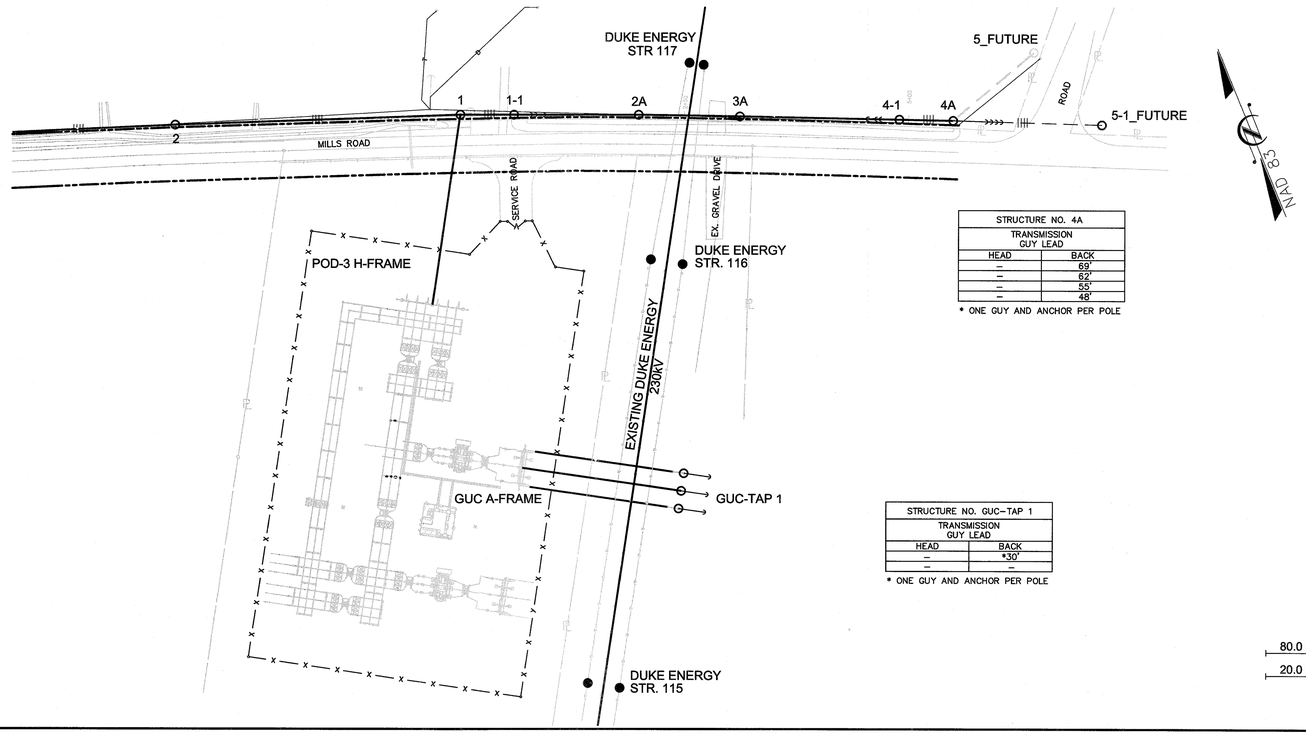
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

Booth&Associates, LLC
2821 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERING NO P-0521

DWN: GSB/AVS	DATE: 10/25/2016	SHEET:
CKD: TKB/RSY	APPD: WPJ	COVER
CAD FILE: 1407798PP1		

POD–3_TO_BELLS–FORK.BAK





STRUCTURE NO. 4A	
TRANSMISSION GUY LEAD	
HEAD	BACK
–	69'
–	62'
–	55'
–	48'

* ONE GUY AND ANCHOR PER POLE

STRUCTURE NO. GUC–TAP 1	
TRANSMISSION GUY LEAD	
HEAD	BACK
–	*30'
–	–

* ONE GUY AND ANCHOR PER POLE

80.0 FT. HORIZ. SCALE

20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN
10-25-2016

NO	REVISIONS	DATE
0	ICF	10/27/16

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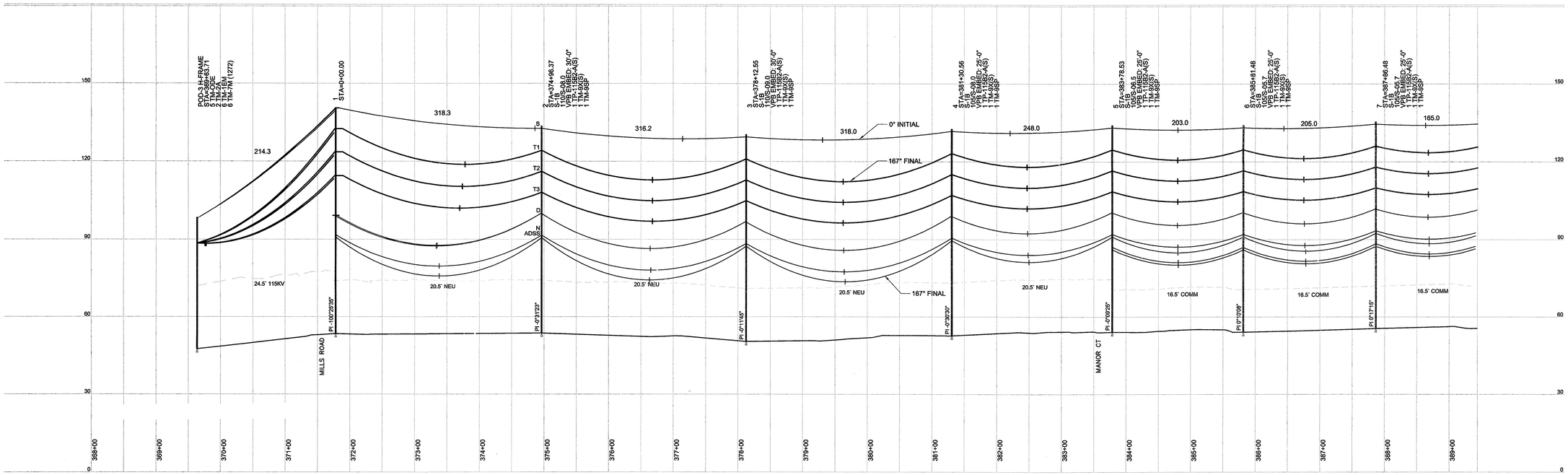
GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

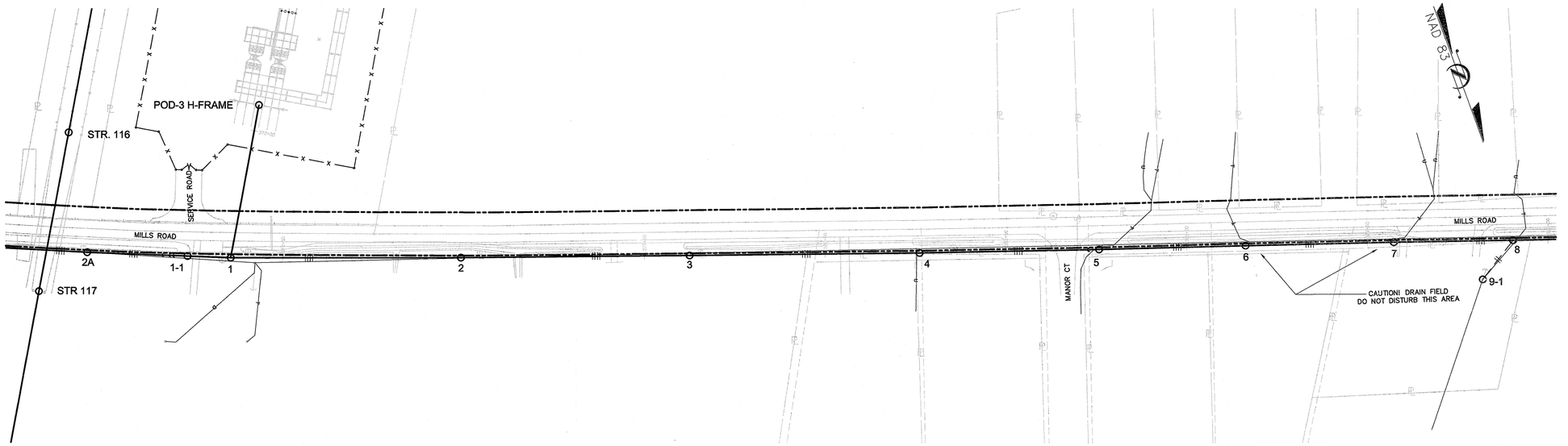
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

Booth&Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERING NO P-0221

DWN: GSB/AVS | DATE: 10/25/2016 | SHEET: 1 OF 14
CKD: TKB/RSY | APPD: WPJ
CAD FILE: 1407798PP1

POD-3_TO_BELLS-FORK.BAK





80.0 FT. HORIZ. SCALE

20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 036029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
0	IFC	10/27/16

GREENVILLE UTILITES COMMISSION
GREENVILLE, NORTH CAROLINA

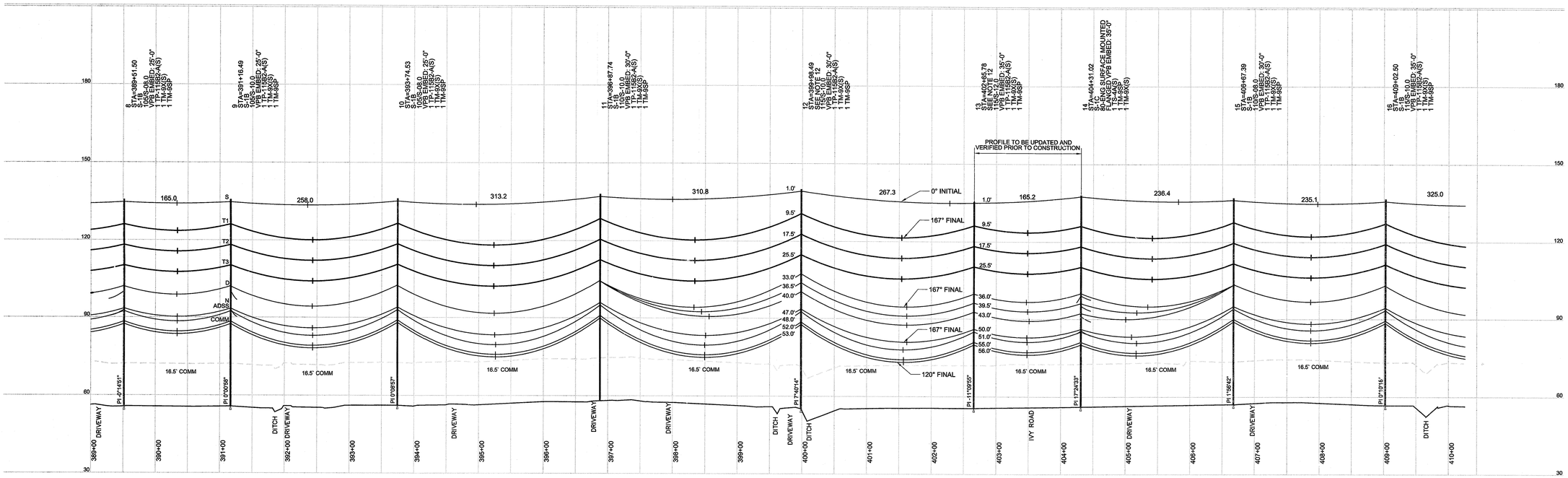
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

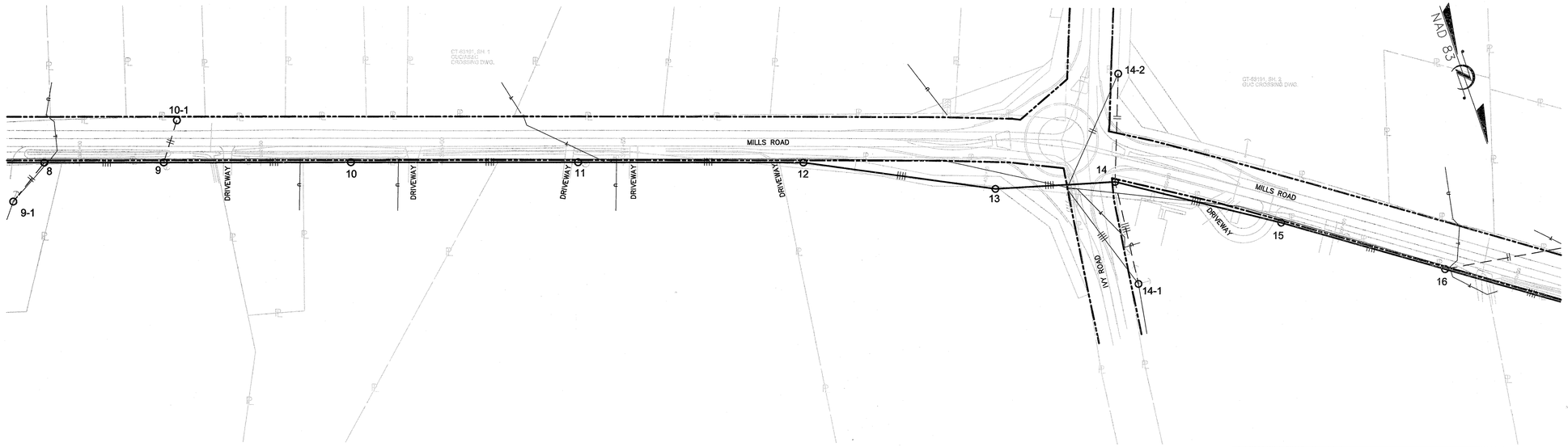
Booth&Associates, LLC
2803 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC P-0221

DWN: GSB/AVS | DATE: 10/25/2016
CKD: TKB/RSY | APPD: WPJ
CAD FILE: 1407798PP1

SHEET: 2 OF 14

POD-3_TO_BELLS-FORK.BAK





80.0 FT. HORIZ. SCALE
20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
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GREENVILLE, NORTH CAROLINA

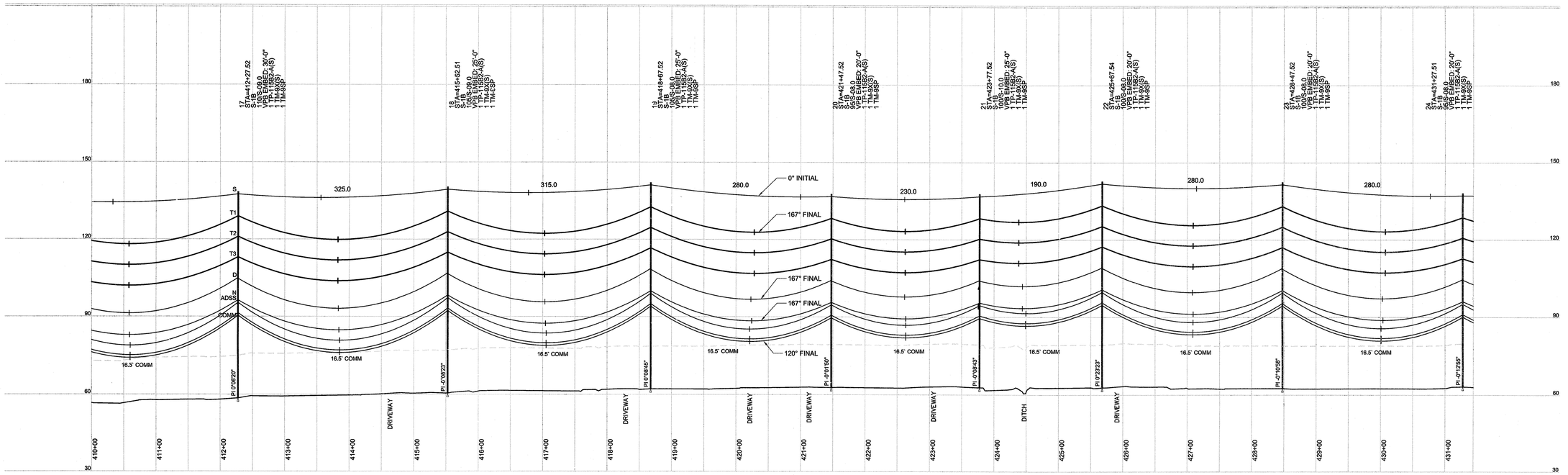
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

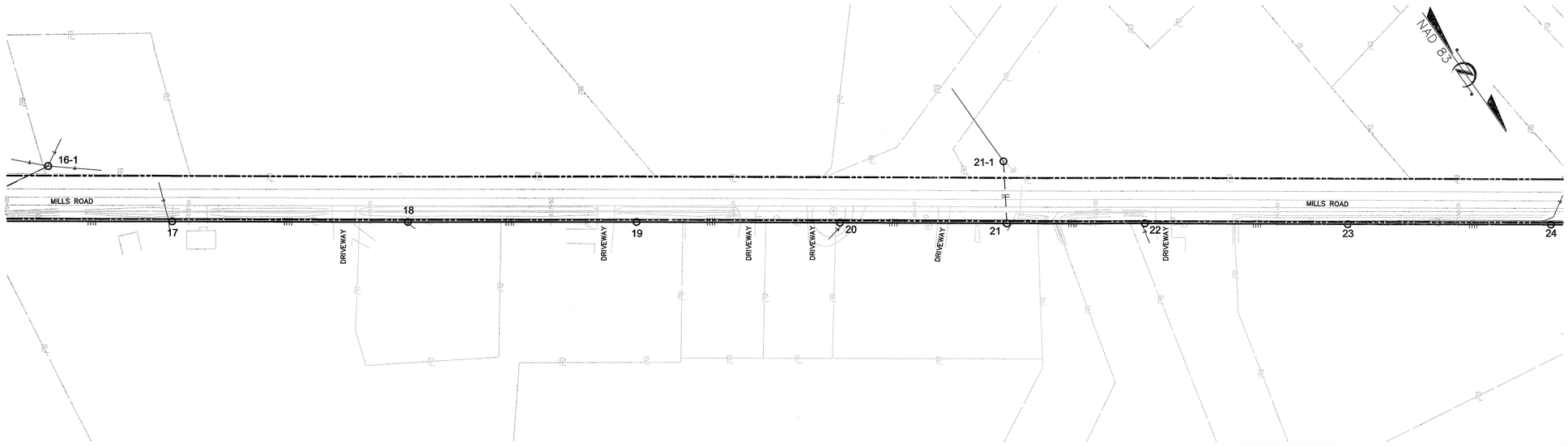
Booth&Associates, LLC
8811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERING NC P-0822 |

DWN: GSB/AVS | DATE: 10/25/2016
CKD: TKB/RSY | APPD: WPJ
CAD FILE: 1407798PP1

SHEET: 3 OF 14

POD--3_TO_BELLS--FORK.BAK





80.0 FT. HORIZ. SCALE

20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
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GREENVILLE UTILITES COMMISSION
GREENVILLE, NORTH CAROLINA

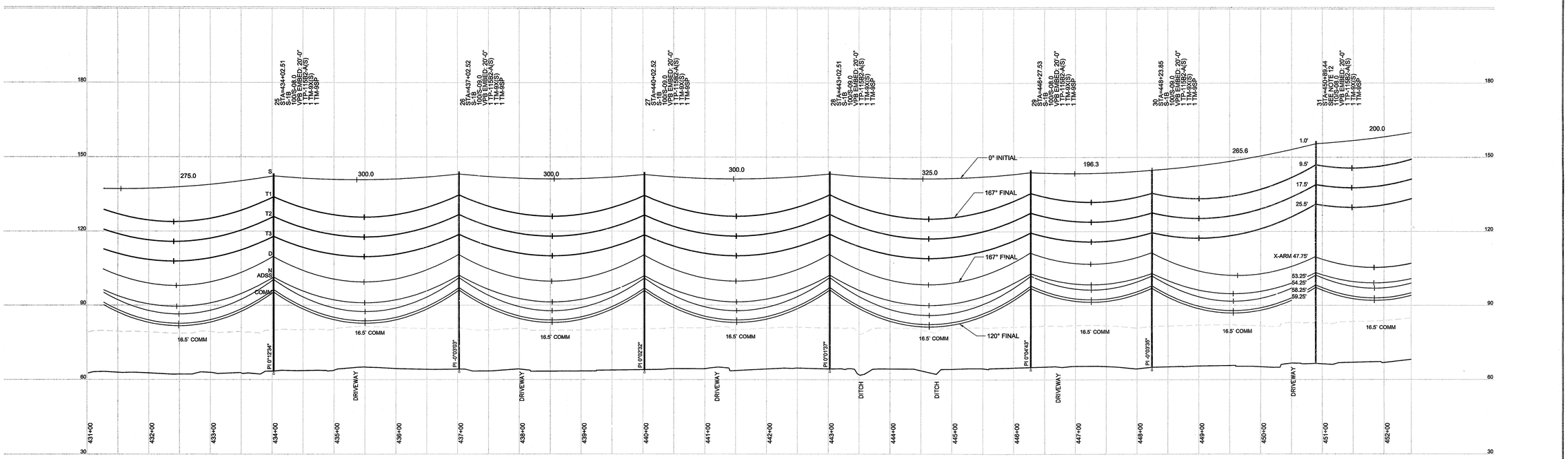
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

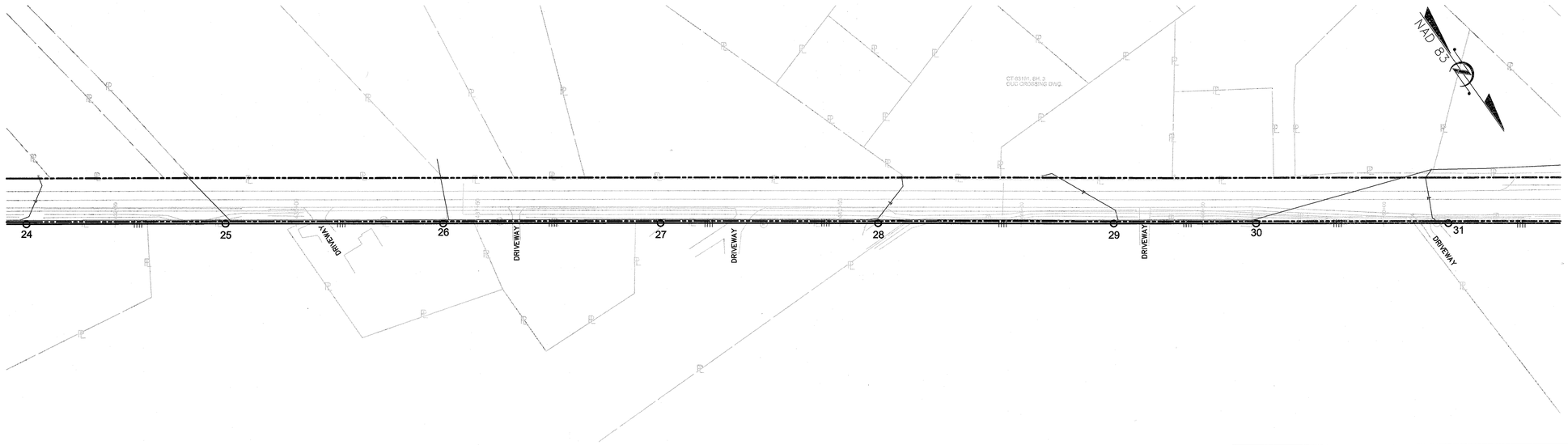
Booth&Associates, LLC
201 Glenwood Avenue | Raleigh, NC 27603 CONSULTING ENGINEERING NO P-0221

DWN: GSB/AVS | DATE: 10/25/2016
CKD: TKB/RSY | APPD: WPJ
CAD FILE: 1407798PP1

SHEET:
4 OF 14

P:\0D-3_TO_BELLS-FORK.BAK





80.0 FT. HORIZ. SCALE

20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
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GREENVILLE, NORTH CAROLINA

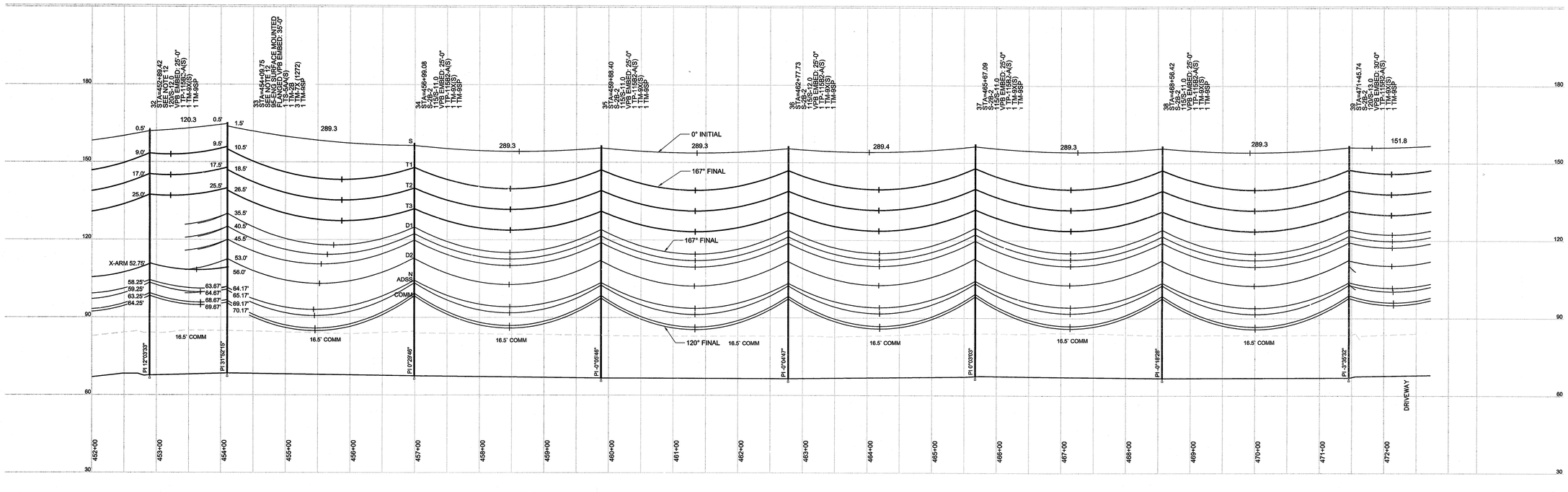
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

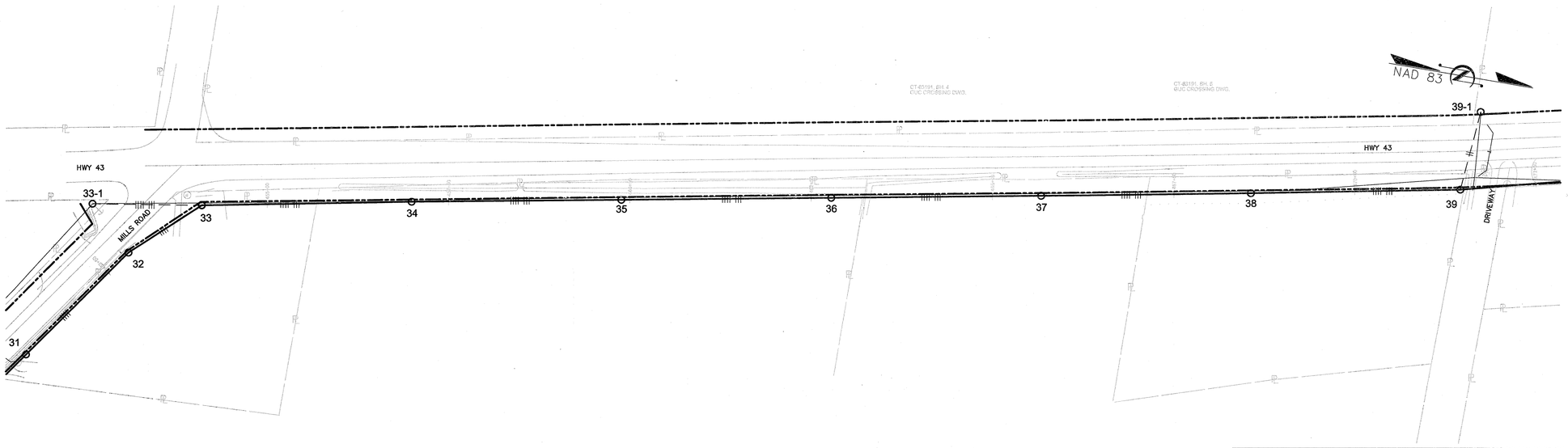
Booth&Associates, LLC
8011 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NO P-0221

DWN: GSB/AVS DATE: 10/25/2016
CKD: TKB/RSY APPD: WPJ
CAD FILE: 1407798PP1

SHEET:
5 OF 14

POD-3_TO_BELLS-FORK.BAK





80.0 FT. HORIZ. SCALE

20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
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GREENVILLE, NORTH CAROLINA

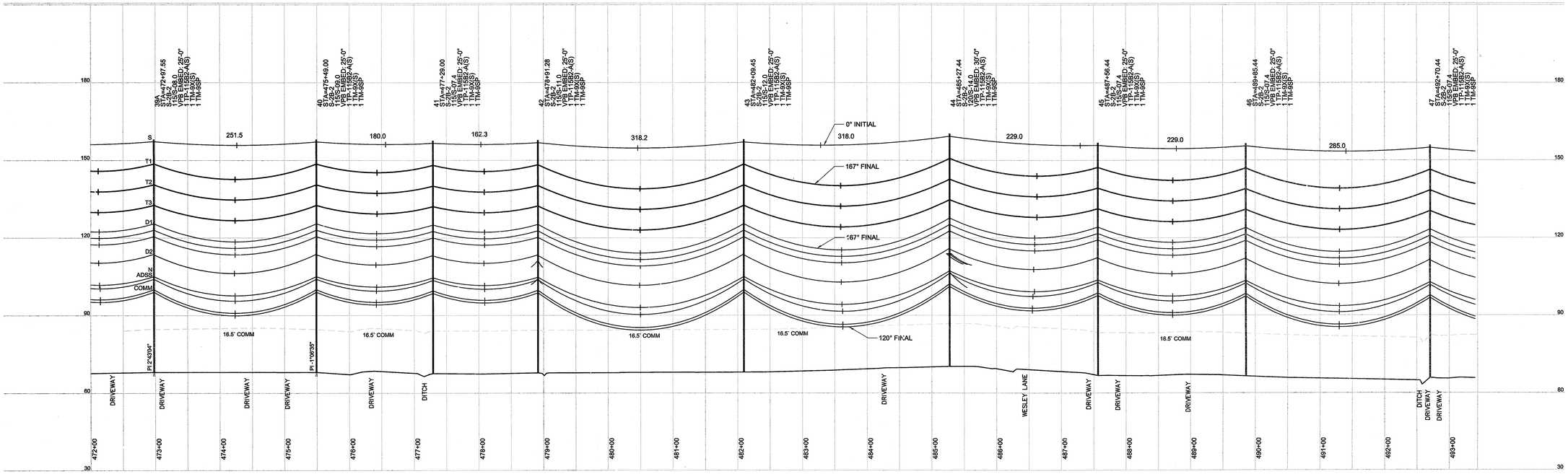
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

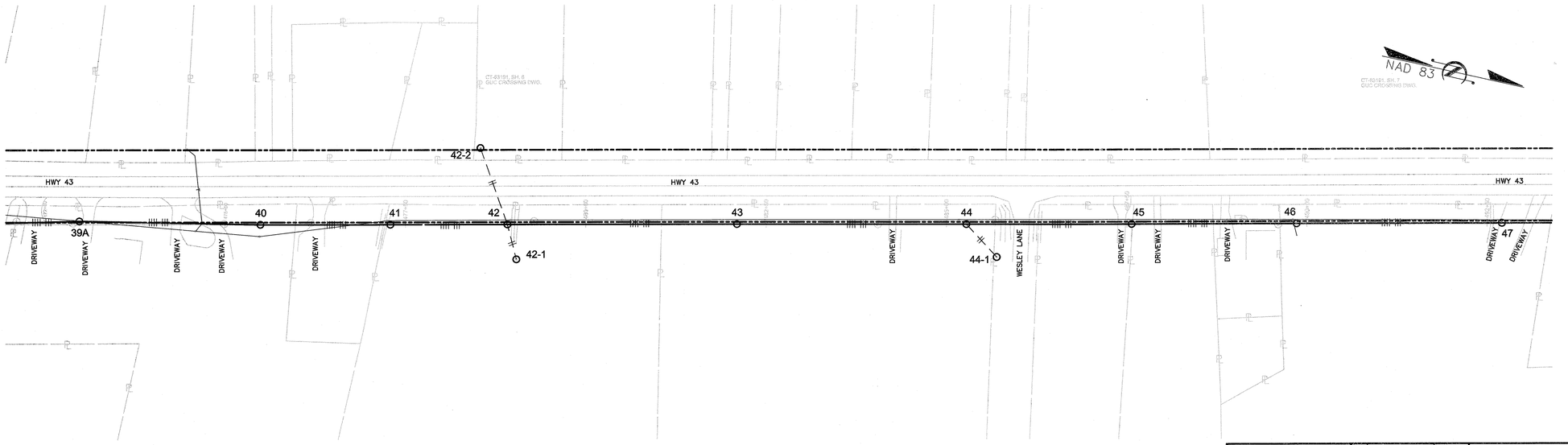
Booth&Associates, LLC
3811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC P-0221

DWN: GSB/AVS DATE: 10/25/2016
CKD: TKB/RSY APPD: WPJ
CAD FILE: 1407798PP1

SHEET: 6 OF 14

POD-3_TO_BELLS-FORK.BAK





80.0 FT. HORIZ. SCALE
20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN
10-31-2016

NO	REVISIONS	DATE
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GREENVILLE UTILITES COMMISSION
GREENVILLE, NORTH CAROLINA

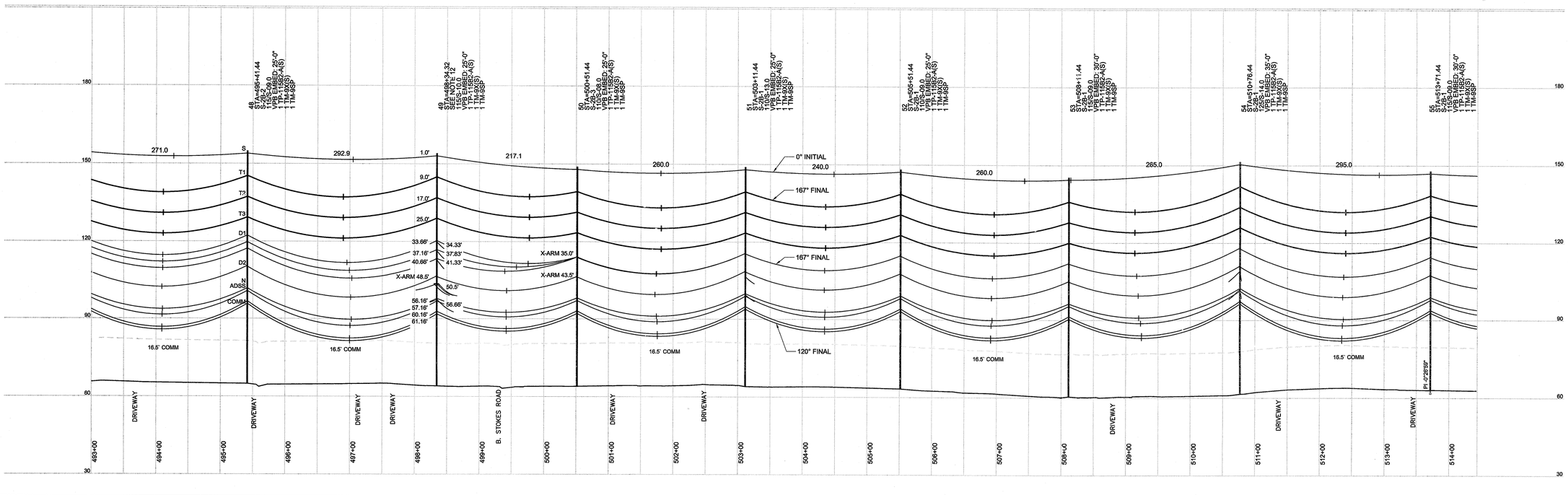
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

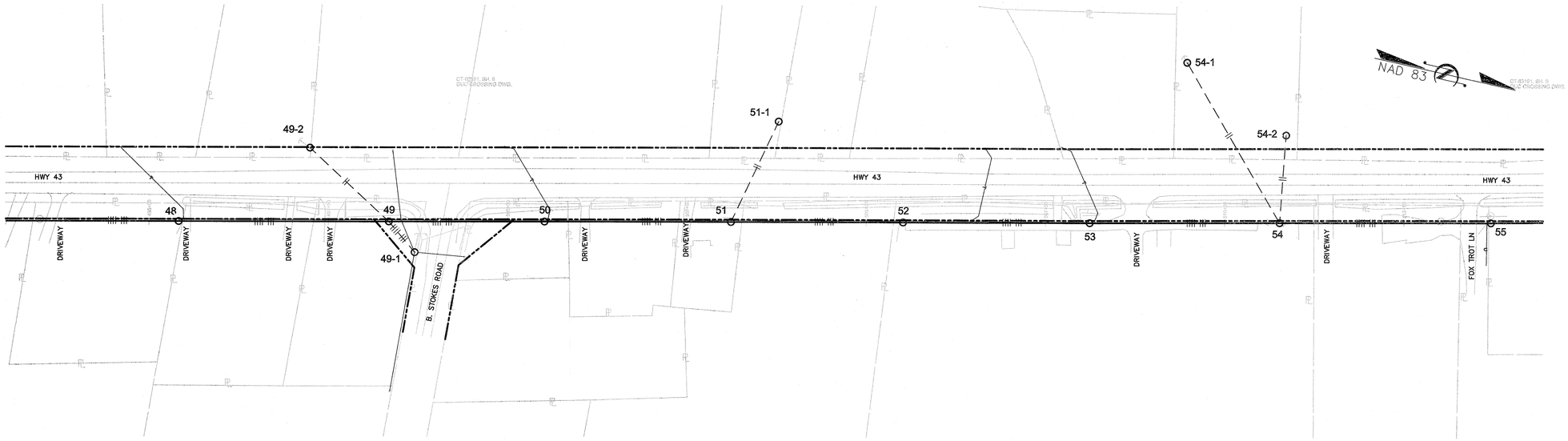
Booth&Associates, LLC
5851 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC P-0321

DWN: GSB/AVS DATE: 10/25/2016
CKD: TKB/RSY APPD: WPJ
CAD FILE: 1407798PP1

SHEET: 7 OF 14

POD-3_TO_BELLS-FORK.BAK





80.0 FT. HORIZ. SCALE

20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
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GREENVILLE, NORTH CAROLINA

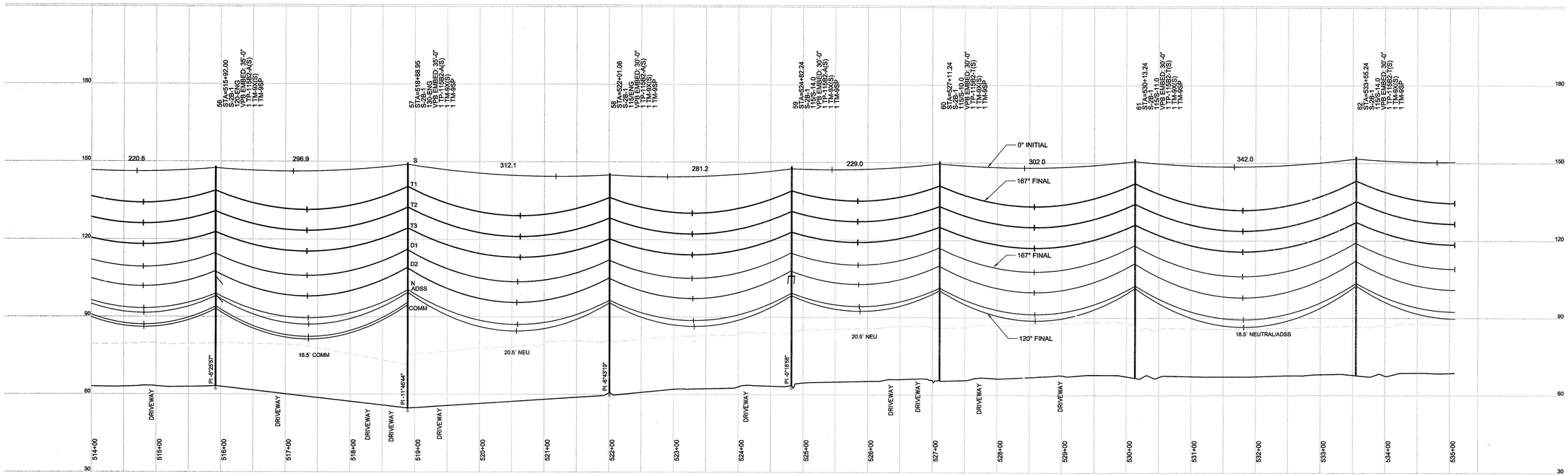
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

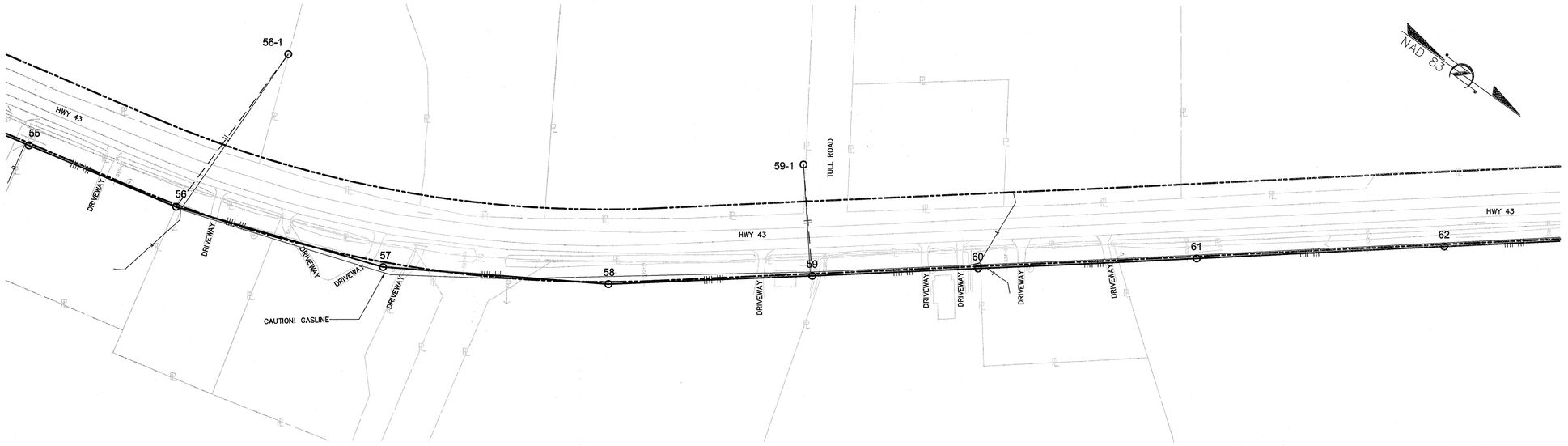
Booth&Associates, LLC
8601 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NO P-0331

DWN: GSB/AVS DATE: 10/25/2016
CKD: TKB/RSY APPD: WPJ
CAD FILE: 1407798PP1

SHEET:
8 OF 14

PCD--3_TO_BELLS-FORK.BAK





80.0 FT. HORIZ. SCALE

20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
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GREENVILLE, NORTH CAROLINA

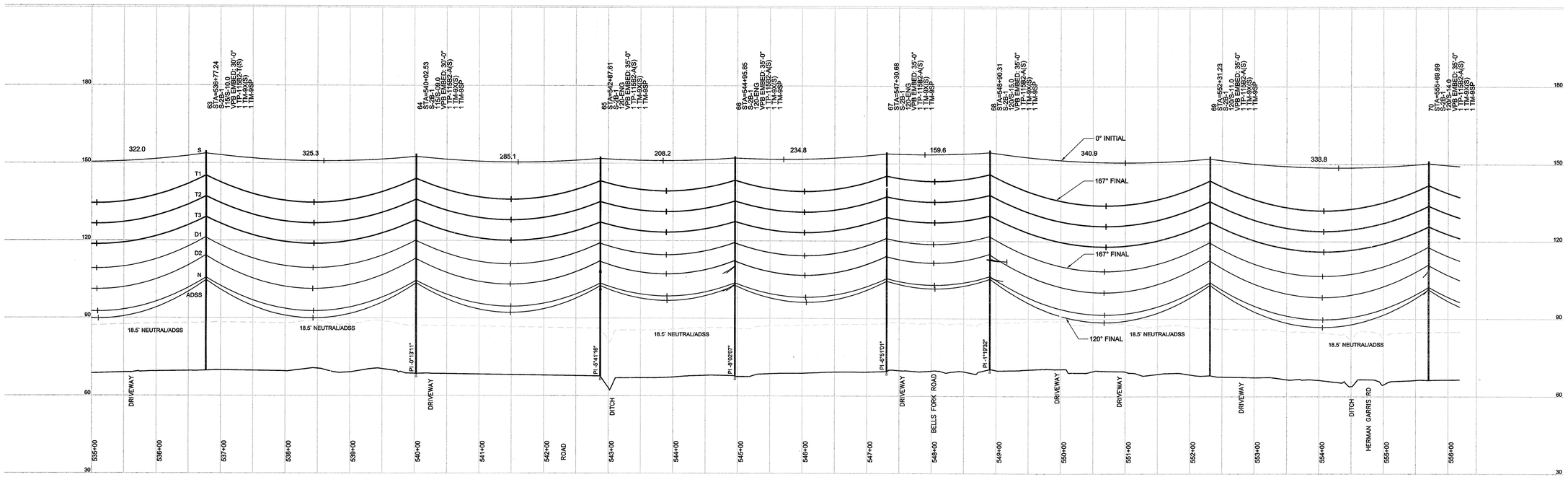
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

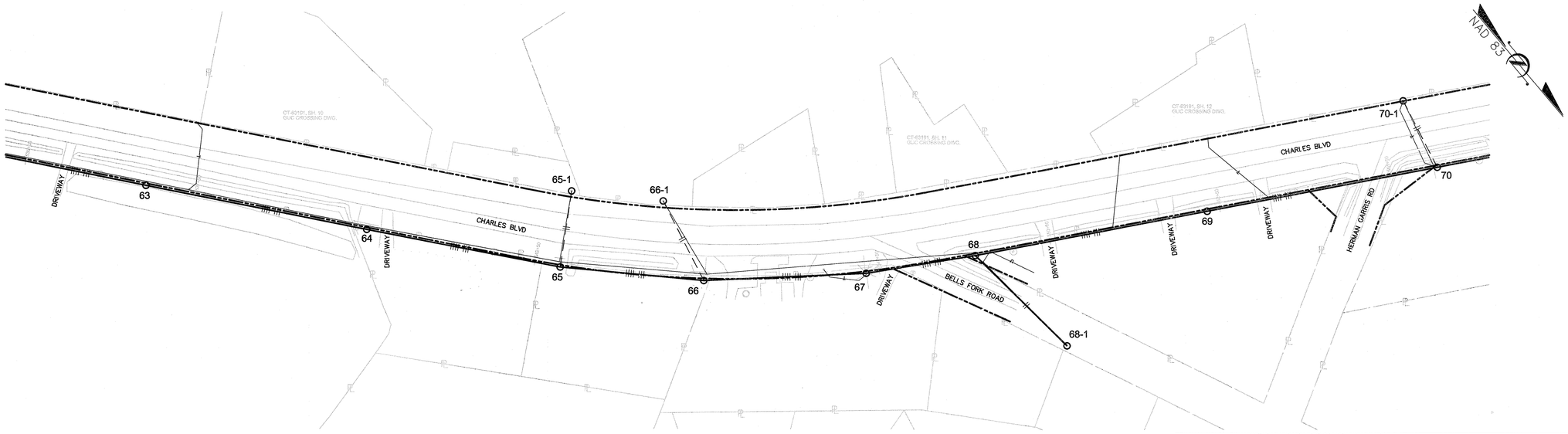
Booth & Associates, LLC
3801 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERS NC P-0251

DWN: GSB/AVS | DATE: 10/25/2016
CKD: TKB/RSY | APPD: WPJ
CAD FILE: 140779BPP1

SHEET: 9 OF 14

POD-3_TO_BELLS-FORK.BAK





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20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
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GREENVILLE UTILITES COMMISSION
GREENVILLE, NORTH CAROLINA

115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

Booth&Associates,LLC
5851 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERING NC P-0281

DWN: GSB/AVS DATE: 10/25/2016
CKD: TKB/RSY APPD: WPJ
CAD FILE: 1407798PP1

SHEET:
10 OF 14

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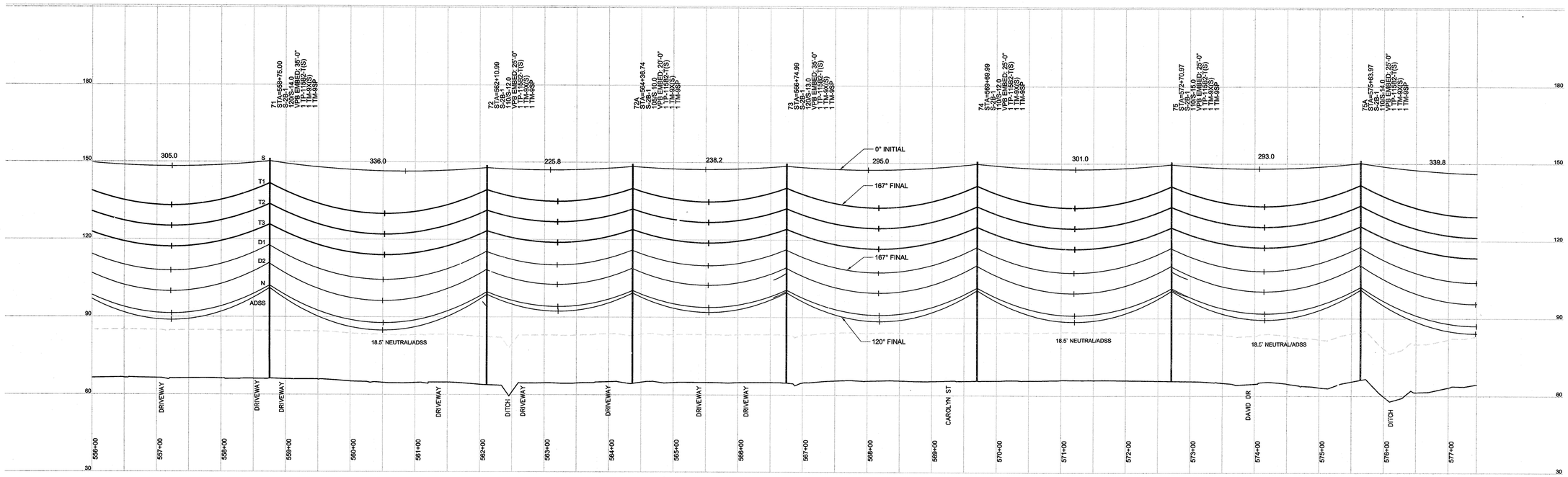

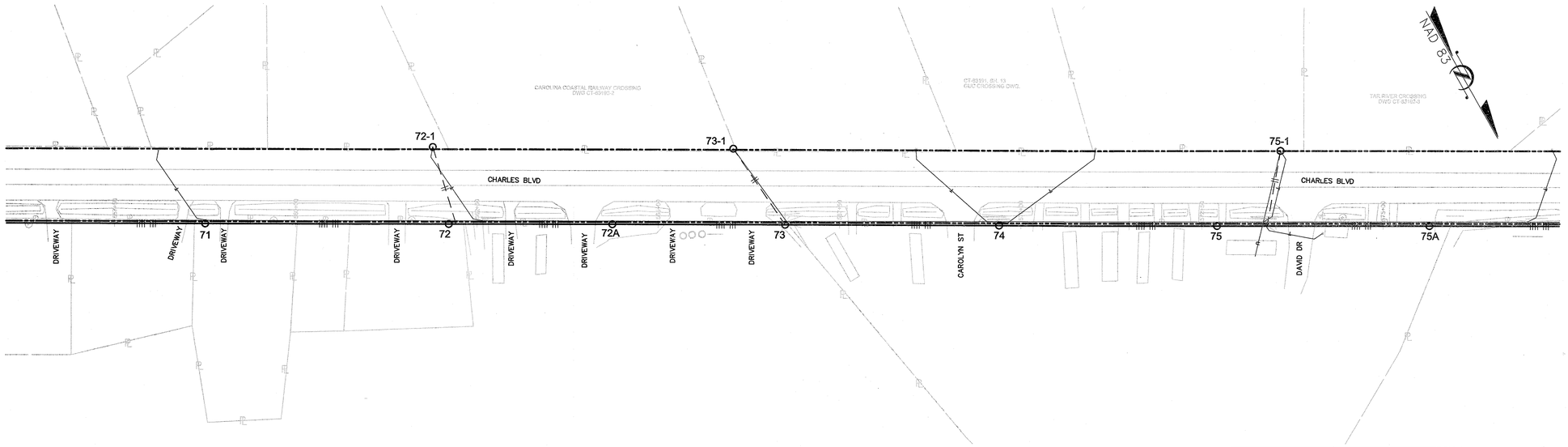

80.0 FT. — HORIZ. SCALE

20.0 FT. — VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN
10-31-2016

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GREENVILLE, NORTH CAROLINA

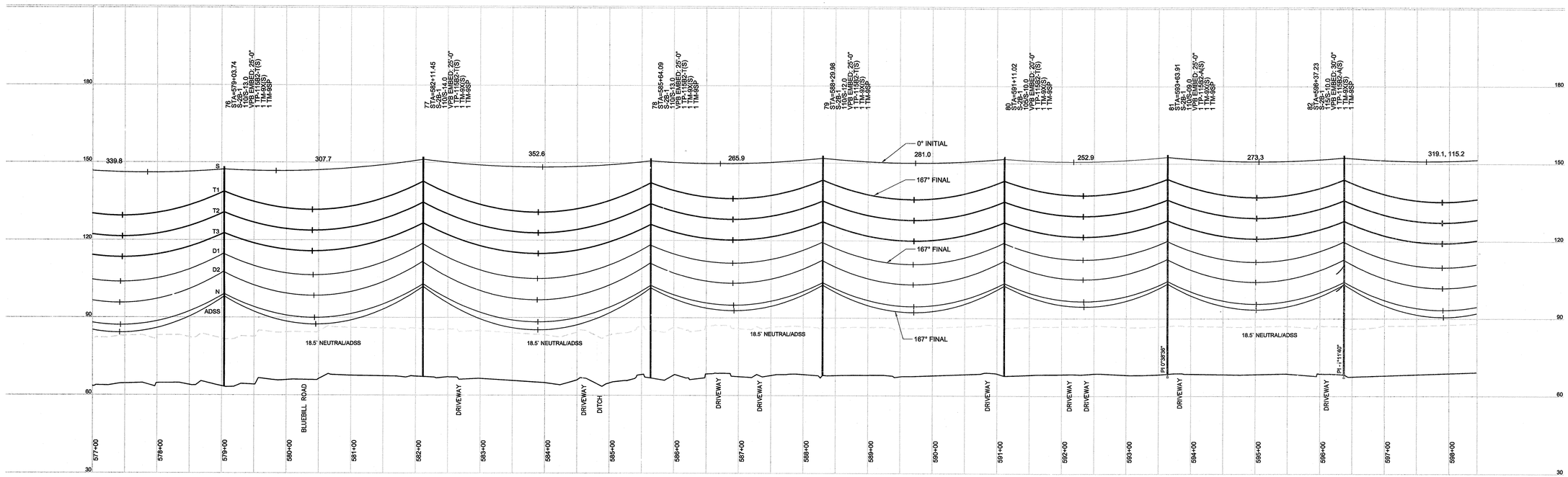
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

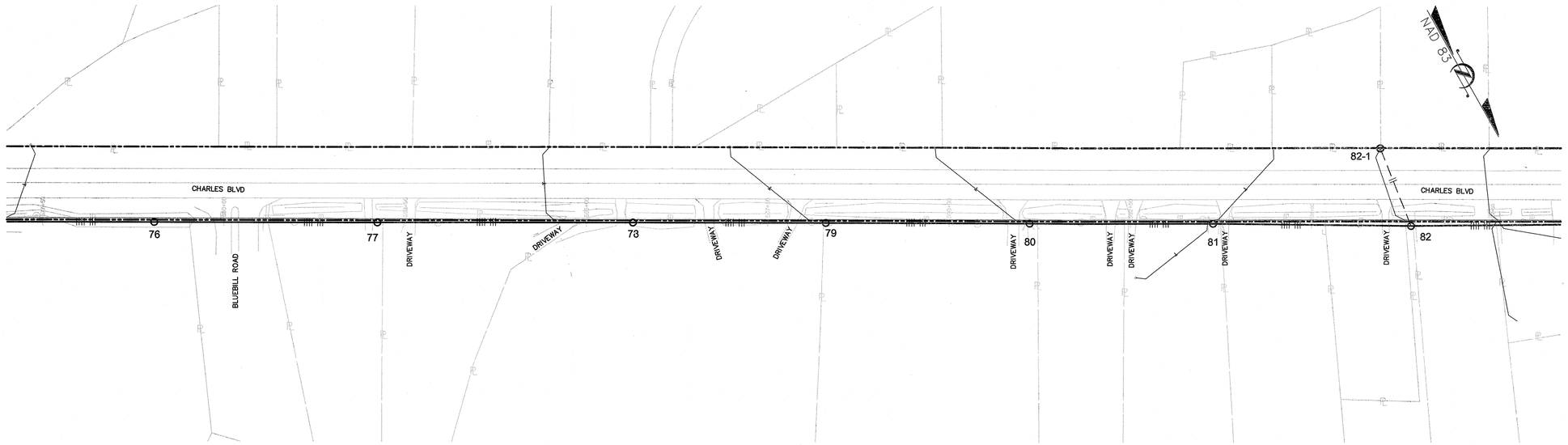
Booth&Associates, LLC
1051 Greenwood Avenue | Raleigh, NC 27603 CIVIL/UTILITIES ENGINEERING FIRM P-0221

DWN: GSB/AVS | DATE: 10/25/2016 | CKD: TKB/RSY | APPD: WPJ | CAD FILE: 1407798PP1

SHEET: 11 OF 14

P:\OD-3_TO_BELLS-FORK.BAK





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20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
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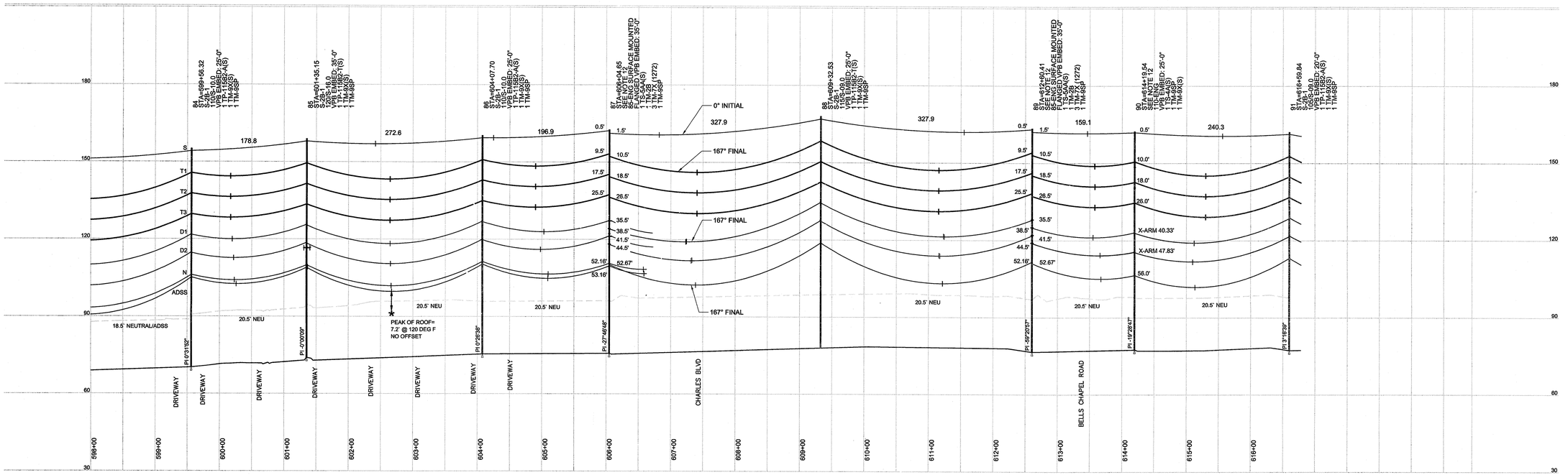
GREENVILLE, NORTH CAROLINA

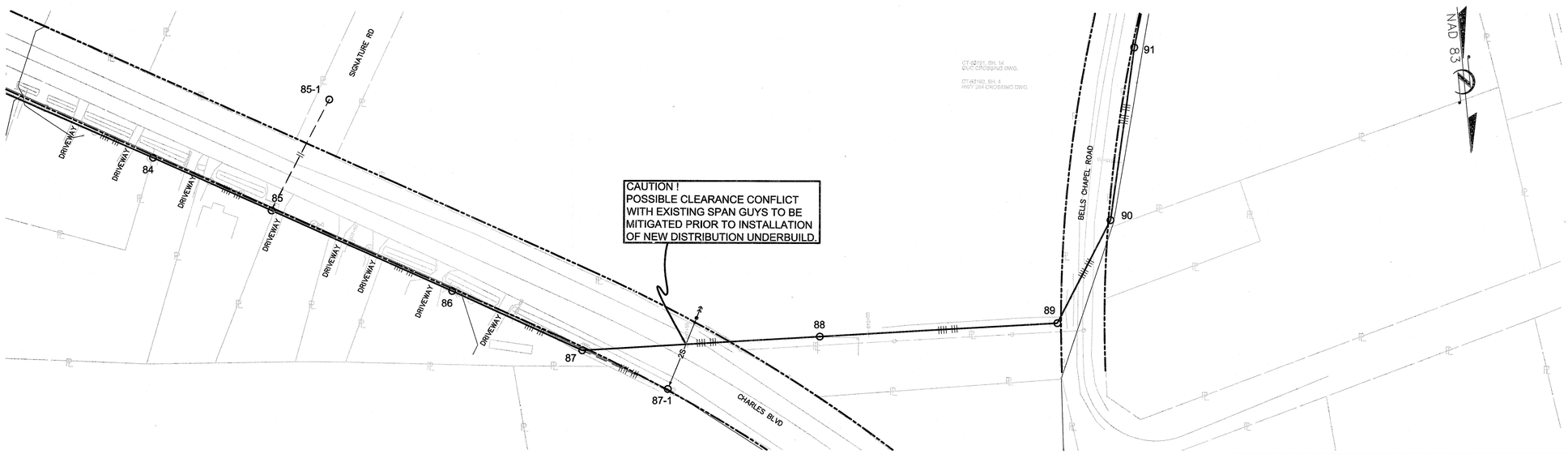
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

Booth&Associates, LLC
3803 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERING NO P-0231

DWN: GSB/AVS | DATE: 10/25/2016 | SHEET: 12 OF 14
CKD: TKB/RSY | APPD: WPJ
CAD FILE: 1407798PP1

POD-3_TO_BELLS-FORK.BAK





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20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
0	IFC	10/27/16

GREENVILLE UTILITES COMMISSION
GREENVILLE, NORTH CAROLINA

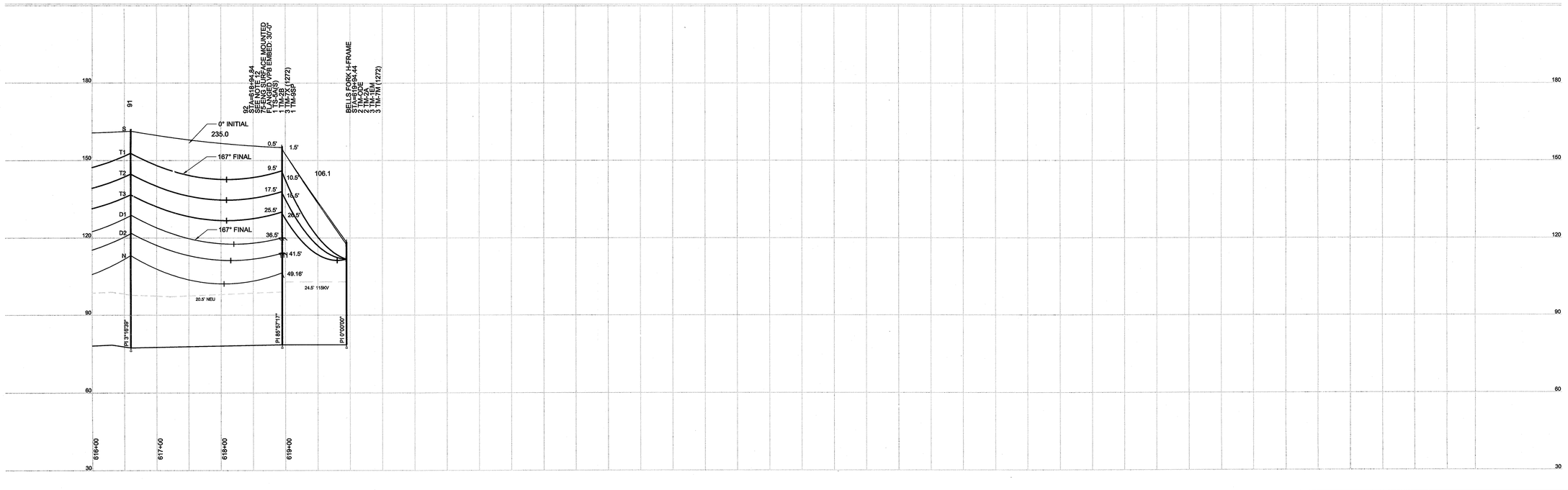
115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

Booth&Associates, LLC
3801 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERING NO. P-0251

DWN: GSB/AVS DATE: 10/25/2016
CKD: TKB/RSY APPD: WPJ
CAD FILE: 1407798PP1

SHEET: 13 OF 14

POD-3_TO_BELLS-FORK.BAK



80.0 FT. HORIZ. SCALE

20.0 FT. VERT. SCALE

NORTH CAROLINA PROFESSIONAL SEAL 035029 ENGINEER WILLIAM P. JORDAN 10-31-2016

NO	REVISIONS	DATE
0	IFC	10/27/16

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GREENVILLE UTILITES COMMISSION
GREENVILLE, NORTH CAROLINA

115 KV TRANSMISSION LINE
P.O.D. #3 TO
BELLS FORK SUBSTATION

Booth&Associates, LLC
5811 Glenwood Avenue | Raleigh, NC 27612 CONSULTING ENGINEERING NC P-0231

DWN: GSB/AVS | DATE: 10/25/2016
CKD: TKB/RSY | APPD: WPJ
CAD FILE: 1407798PP1

SHEET:
14 OF 14

POD-3_TO_BELLS-FORK.BAK

GREENVILLE UTILITIES COMMISSION
GREENVILLE, NORTH CAROLINA

SPECIFICATIONS AND BID DOCUMENTS
FOR THE INSTALLATION OF
230kV POD TO BELLS FORK
115kV TRANSMISSION LINE

APPENDIX 8 – FORMS

CHANGE ORDER NO._____

OWNER: _____
CONTRACTOR: _____
PROJECT NAME: _____
PROJECT NO.: _____
DATE: _____

Description of Work Performed:

Reason for Change:

Changes Authorized By:

Owner:	Date:
Contractor:	Date:
Booth & Associates, Inc.:	Date:

Itemized Cost for Above Order:

UNIT COSTS				
Description	**Quantity**	**Unit**	**Unit Cost**	**Extended Cost**
				$0.00
				$0.00
TOTAL UNIT COSTS:				**$0.00**
LABOR COSTS				
Classification	**Name**	**Base Rate**	**Total Hours worked Straight/Overtime**	**Extended Cost**
				$0.00
				$0.00
TOTAL LABOR COSTS:				**$0.00**
MATERIAL COSTS				
Description				**Material Cost**
TOTAL MATERIAL COSTS				**$0.00**
EQUIPMENT COSTS				
Unit No.	**Description**	**Base Rate**	**Total Hours**	**Extended Cost**
				$0.00
				$0.00
TOTAL EQUIPMENT COSTS:				**$0.00**
TOTAL COST:				**$0.00**

Booth & Associates