Kings Bluff Raw Water Transmission Main

CFPUA Contract No: 20-C0103

CFPUA Capital Project No: 17W261

235 Government Center Drive
Wilmington, NC 28403
Tel: 910-332-6573
Fax: 910-799-6066
www.cfpua.org

Kings Bluff Raw Water Transmission Main

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DRAWINGS

Included with these Contract documents is a set of drawings entitled, “KINGS BLUFF 54” RAW WATER TRANSMISSION MAIN”.

ADVERTISEMENT FOR BIDS

Sealed bids will be received by the CAPE FEAR PUBLIC UTILITY AUTHORITY addressed to the Procurement Manager, 235 Government Center Drive, Wilmington, NC 28403 and marked **Kings Bluff Raw Water Transmission Main**. Bids will be received from pre-qualified bidders until **Tuesday, August 27, 2019 at 11:00 AM** in the Engineering Conference Room of 235 Government Center Drive at which time they will be publicly opened and read.

This is a single prime contract.

Pre-Bid Conference: A pre-bid conference will be held, and **IS MANDATORY**. The Conference will be located in the IT Conference Room of 235 Government Center Drive on the 24th day of July 2019 at 3:00 PM.

Pre-Qualified Contractors: The following Contractors have successfully met the requirements of the pre-qualification process and are the only Contractors that bids will be accepted from:

1. Garney Construction
2. State Utility Contractors, Inc.
3. Oscar Renda Contracting, Inc.
4. Ruby-Collins, Inc.
5. Thalle Construction Co., Inc.
6. S. J. Louis Construction of Texas, Ltd.
7. Reynolds Construction, LLC.

Bid Opening: Bids must be in by **Tuesday, August 27, 2019 at 11:00 AM** in the Engineering Conference Room of 235 Government Center Drive. Bids must be received by Julia Faircloth, Procurement Manager or designee in the Engineering Conference Room. The official time will be by the clock in the Engineering Conference Room at 235 Government Center Drive and no late bids will be accepted. The Bidders are responsible for allowing time for traffic and parking prior to delivering the bids to the Engineering Conference Room. It is the bidder's responsibility to ensure that the bids are received on time.

Contract Documents: Plans and specifications relevant to the bid may be viewed at the following locations listed below. Cape Fear Public Utility Authority cannot guarantee the accuracy of documents and information at the plan rooms. Official sets only available from Cape Fear Public Utility Authority.

1. iSqft + bidclerk Plan Rooms: View online at: www.isqft.com or www.bidclerk.com
2. Dodge Data & Analytics/Dodge Plan Room: View online at: www.dodgeprojects.construction.com
3. Construction Journal: View online at: www.ConstructionJournal.com

4. Carolina AGC and Hispanic Contractors Association of the Carolinas: View online at: www.isqft.com

5. The Blue Book Building & Construction Network: View online at www.thebluebook.com

Pre-qualified bidders must register and obtain an official set of the relevant contract documents from Teresa McPherson (Bid Manager). To register, pre-qualified bidders will be required to email Bid Manager at bids@cfpua.org and provide contact information. An official set of relevant bid documents will then be provided to pre-qualified bidder on an USB flash drive. If you send an email to bids@cfpua.org and do not receive a response with two (2) business days, please call 910-332-6472 or 910-332-6589. Bids received from pre-qualified bidders who cannot prove registration at Bid Opening will not be opened or considered.

USB flash drive containing bid documents can be picked up from 235 Government Center Dr. Monday-Thursday 9:00 AM-3:00 PM. Please email bids@cfpua.org in advance to arrange pick up. No payment is required if USB is picked up. USB flash drive can be mailed if a FedEx or UPS account number is provided. Shipping costs are the responsibility of the bidder.

Bid Bond: A deposit is required with the submission of the bid. When a deposit is required, the bidder must submit with the bid cash or a certified check, drawn on a bank or trust company authorized to do business in the State of North Carolina, payable to Cape Fear Public Utility Authority, in an amount at least equal to five percent (5%) of the total amount of the bid, as a guarantee that a contract will be entered into and that satisfactory performance and payment bonds will be executed. In lieu of making the cash deposit above described, a satisfactory bid bond in the amount of five percent (5%) of the total bid, executed by a corporate surety licensed under the laws of the State of North Carolina to execute such bonds, shall be submitted with each bid, 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. This deposit shall be retained if the successful bidder fails to execute the contract within ten (10) days after the award of the bid or fails to give satisfactory surety as required in North Carolina General Statutes Section 143-129.

Affidavit and Certification of Non-Collusion, Non-Suspension and Non-Conviction: The Affidavit and Certificate of Non-Collusion, Non-Suspension and Non-Conviction provided with bid documents must be completely executed and submitted with bid.

Each bidder must show evidence that it is licensed as a contractor under Chapter 87 of the North Carolina General Statutes. The bidder must have the following NC General Contractor's license to be qualified to perform the work associated with this bid:

Limitation: Unlimited
Classification(s): Public Utility or Unclassified

No bid may be withdrawn after bids have been opened, except as provided in the North Carolina General Statutes.

The successful bidder will be required to furnish a construction performance bond and a construction payment bond as security in the amount of one hundred percent (100%) of the contract amount for the faithful performance and the payment of all bills and obligations arising from the performance of the Contract.

If the bidder fails to complete and submit all requirements stated in this Advertisement for Bids and those further requirements stated in the Instruction to Bidders included with the relevant contract documents, the Cape Fear Public Utility Authority may deem such failure nonresponsive and therefore a forfeiture of the bid.

Cape Fear Public Utility Authority reserves the right to reject any and all bids.

All inquiries concerning this bid shall be directed to CFPUA Purchasing Division by e-mail to bids@cfpua.org.

1. DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. Issuing Office: The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

2. COPIES OF BIDDING DOCUMENTS

2.01 Complete sets of the Bidding Documents in the number and for the deposit sum, if any, stated in the Advertisement for Bids may be obtained from the Issuing Office.

2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

2.03 Owner and Engineer in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

3. QUALIFICATIONS OF BIDDERS

3.01 Bidder must hold a North Carolina General Contractor's License with the specific classification and limitation stated on the bid form. Additional qualifications may be required and will be stated on the bid form. Failure to properly submit requested qualification documentation, including subcontractor's qualification, shall be treated as a non-responsive bid, and may result in the Bid being rejected.

4. EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 The Contractor is responsible for examining and carefully studying the Contract Documents, Drawings, Site, and all reports pertaining to supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, underground facilities, and hazards), and Bids shall include all considerations noted in these documents and found on Site.

4.02 On request, the Owner will provide the Bidder access to the Site to conduct such examinations, investigations, explorations, tests, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies. Bidder shall comply with all applicable Laws and Regulations relative to excavation and utility locates.

4.03 Any supplementary reports ordered and obtained for supplementary conditions related to this project, including examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, underground facilities, and hazards) shall be included in these Bidding Documents.

4.04 The Bidder shall notify the Owner and Engineer if it believes more examinations, investigations, explorations, tests, studies, or data concerning conditions (surface, subsurface, underground facilities, and hazards) are necessary for determination of its Bid for performance of the Work.

4.05 In some cases other work is being performed on the Site by Owner as a separate contract. On request, the Owner will provide to each Bidder for examination access to or copies of Contract Documents (other than portions related to the price) for such other work.

4.06 It is the responsibility of each Bidder before submitting a Bid to:

A. Examine and carefully study the Bidding Documents, the other related data identified in the Bidding Documents, and any Addenda;

B. Visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, or performance of the Work;

C. Become familiar and satisfy Bidder as to all Federal, State and local Laws and Regulations that may affect cost, progress, or performance of the Work;

D. Carefully study all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been included in the Contract Documents, and (2) reports and drawings of

Hazardous Environmental Conditions at the Site which have been included in the Contract Documents;

E. Carefully study all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;

F. Agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of its Bid for performance of the Work at the price(s) bid and within the times in accordance with the other terms and conditions of the Bidding Documents;

G. Become aware of the general nature of the work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;

I. Promptly give Owner and Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by Engineer is acceptable to Bidder; and

J. Determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions of the performance of the Work.

K. Environmental Management: The Cape Fear Public Utility Authority has developed and implemented an ISO 14001 Environmental Management System (EMS), and is third party certified. Per the certification the

Authority must ensure all persons doing work on their behalf is made aware of our Environmental Policy. The Environmental Policy can be found on the CFPUA website www.cfpua.org, click on the Departments tab, Environmental Management, and then choose Environmental Management. Contractor/Vendor certifies by signing this agreement that they have reviewed the Environmental Policy and understand their work contributes to the effectiveness of the EMS and may have a positive or negative impact on the Environment.

4.07 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement listed in this Section 4 of the Instruction to Bidders, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents.

5. PRE-BID CONFERENCE

5.01 Details and requirements for a pre-bid conference, if required, will be stated in the Advertisement for Bids.

6. INTERPRETATION OF ADDENDA

6.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to Purchasing in writing as detailed in the Advertisement for Bid. Interpretations or clarifications considered necessary by the Engineer in response to such questions will be issued by Addenda to all parties recorded by the Owner as having received the Bidding Documents. Questions received less than five (5) days prior to the date for opening Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

7. BID SECURITY

7.01 Details and requirements for a Bid security, if required, will be stated in the Advertisement for Bids.

7.02 Bid Bond shall be executed by surety company legally authorized to do business in the State of North Carolina. The attorney-in-fact who executes the bid bond

on behalf of the surety shall attach a certified current copy of his or her power of attorney indicating his or her authority to execute the bond. Bid Bond Form and Affidavit must have original signatures and seals, otherwise; the Bid will be considered non-responsive.

7.03 The Bid security of the lowest, responsive, responsible Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Contract, whereupon the Bid security will be returned. If the lowest, responsive, responsible Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 10 days after the Award, Owner may annul the Award and the Bid security of that Bidder will be forfeited. The Bid security of other Bidders whom the Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Agreement or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

7.04 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be returned within 7 days after the Bid opening.

8. CONTRACT TIMES

8.01 The number of days within which, or dates by which, the Work is to be substantially complete and ready for final payment are set forth in the Agreement.

9. PREPARATION OF BID

9.01 The Bid shall be submitted on the Bid Form provided by CFPUA.

9.02 All blanks on the Bid Form shall be completed in ink and the Bid Form signed and sealed in ink. Alterations to the Bid shall be initialed in ink by the person signing the Bid Form. A Bid price shall be indicated for each Bid Item listed therein, or the words “No Bid” or “Not Applicable” entered.

9.03 Bidder/Company Name shall be listed on Bid Form as it appears on the North Carolina General Contractors Certificate of License.

9.04 Bid submitted by a North Carolina General Contractor engaging in business under an assumed name or under any designation, name or style other than; the real name of the owner or owners of the individual or partnership thereof; other than the name set out in the Certificate filed with the Office of the Secretary of State for a limited partnership or limited liability company; other than the corporate name set out in the articles of organization filed with the Office of the Secretary of State for a corporation, must be accompanied by Certificate of Assumed Name as filed with the Register of Deeds in the County of North Carolina in which the bidder is conducting business, pursuant to G.S. 66-68.

9.05 A Bid by a corporation shall be executed in the corporate name as it appears on the North Carolina General Contractors Certificate of License. If corporation is conducting business under an assumed name please also provide the corporate name as it is filed with the North Carolina Secretary of State, as per 9.04. Bid shall be signed by an Officer as registered with the North Carolina Secretary of State, or signed by person duly authorized, accompanied by evidence of authority to sign. The corporation's business address and state of incorporation shall be provided on the Bid Form.

9.06 A Bid by a partnership shall be executed in the partnership name as it appears on the North Carolina General Contractors Certificate of License. If partnership is conducting business under an assumed name please also provide the partnership name as it is filed with the North Carolina Secretary of State, as per 9.04. Bid shall be signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The business address of the partnership shall be provided on the Bid Form.

9.07 A Bid by a limited liability company shall be executed in the name of the limited liability company (LLC) as it appears on the North Carolina General Contractors Certificate of License. If LLC is conducting business under an assumed name please also provide the LLC name as it is filed with the North Carolina Secretary of State, as per 9.04. Bid shall be signed by a Manager-Member and accompanied by evidence of authority to sign. The state of formation of the limited liability company and the business address shall be provided on the Bid Form.

9.08 A Bid by an individual shall show the Bidder's name and business address.

9.09 A Bid by a joint venture shall be executed by each joint venturer in the manner indicated on the Bid Form. The business address of the joint venture shall be provided on the Bid Form.

9.10 All names shall be typed or printed in ink below the signatures.

9.11 The Bid shall contain an acknowledgement of receipt of all Addenda, the numbers and dates of which shall be filled in on the Bid Form.

9.12 The Bid shall contain evidence of the Bidder's authority and qualification to do business in the State of North Carolina prior to the award of the Contract.

9.13 The Bidder shall completely execute the Affidavit and Certificate of Non-Collusion, Non-Suspension and Non-Conviction, and submit it with the Bid Form; otherwise, the Bid will be considered non-responsive.

9.14 Upon request by the Owner or Engineer, the Bidder shall provide evidence of previous work performed of similar nature and qualification to perform the Work in this Contract. Please see section 3.01 of the Instruction to Bidders.

9.15 Subcontractor's shall be identified on the bid form on Table 6.02 Subcontractor Summary Table. Bidders shall list subcontractors as detailed in section 6.01 of the Bid Form. Failure to list the requested subcontractors shall result in the bid being ruled non-responsive and rejected.

10. BASIS OF BID; COMPARISON OF BIDS

10.01 When Unit Price is required on the Bid Form:

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the Bid Schedule.

B. The total of all bid prices will be the sum of the products of the estimated quantity of each item and the corresponding unit price. The final quantities and Contract Price will be determined in accordance with the General and Supplementary Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the

indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

10.02 Both Unit and Lump Sum price(s): Discrepancies between the words and figures will be resolved in favor of the words.

11. SUBMITTAL OF BID

11.01 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bids and shall be enclosed in an opaque sealed envelope plainly marked with the Project title (and, if applicable, the designated portion of the Project for which the Bid is submitted), the name and address of Bidder, the Bidders North Carolina General Contractors License Number, and shall be accompanied by the Bid security (if applicable) and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate opaque envelope plainly marked on the outside with the notation "BID ENCLOSED." When using the mail or other delivery system, the Bidder is totally responsible for the mail or other delivery system delivering the Bid at the place and prior to the time indicated in the Advertisement for Bids. A mailed Bid shall be addressed as stated in the Advertisement for Bids.

12. MODIFICATION OR WITHDRAWAL OF BID

12.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids.

12.02 Pursuant to North Carolina General Statutes Section 143-129.1, Owner shall allow a Bidder to withdraw its Bid from consideration without forfeiture of its Bid security if the Bidder can clearly show to the Owner by objective evidence drawn from inspection of the original work papers, documents, or materials used in the preparation of the Bid that: (i) the price bid was based upon a mistake that constituted a substantial error, (ii) the Bid was submitted in good faith, (iii) the mistake was clerical in nature and not a judgment error, and (iv) the price bid was actually due to an unintentional and substantial arithmetic error or an unintentional omission of a substantial quantity of work, labor, apparatus, supplies, materials, equipment, or services made directly in the compilation of the Bid. To be considered valid, a request to withdraw a Bid must be made in writing and received by Owner within 72 hours of the Bid opening or prior to the

award of the Contract, whichever occurs first. Thereafter, if the Work is rebid or negotiated, the withdrawn Bidder, its partners, and affiliates shall be disqualified from further bidding on the Work. Furthermore, the withdrawn Bidder shall be disqualified from supplying any material or labor to, or perform any subcontract on, the Work without prior written approval of the Owner.

13. OPENING OF BIDS

13.01 Bids will be opened at the time and place indicated in the Advertisement for Bids and read aloud publicly, unless obviously non-responsive or is an informal bid, as stated on the Advertisement for Bids. An abstract of the amounts of the Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

14. BIDS TO REMAIN SUBJECT TO ACCEPTANCE

14.01 All Bids will remain valid and subject to acceptance for the period ninety (90) calendar days after the Bid opening.

15. EVALUATION OF BIDS AND AWARD OF CONTRACT

15.01 The Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner further reserves the right to reject the Bid of any Bidder whom it finds, after reasonable inquiry and evaluation, to be non-responsible. Owner also reserves the right to waive all informalities not involving price, time, or changes in the Work and to negotiate contract terms with the Successful Bidder.

15.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that any Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.

15.03 In evaluating Bidders, Owner will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.

15.04 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.

16. CONTRACT SECURITY AND INSURANCE

16.01 Details and requirements for payment bonds and insurance are stated in the General and Supplementary Conditions.

17. SIGNING OF AGREEMENT

17.01 The Owner will give Notice to the apparent lowest, responsive, responsible Bidder. This Notice shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents with which are identified in the Agreement as attached thereto. Within ten (10) calendar days thereafter, the apparent lowest, responsive, responsible Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to Owner.

17.02 When the apparent lowest, responsive, responsible bid is $300,000 or more, this Notice is contingent upon approval by the CFPUA Board of Directors and is not legally binding until executed by the Executive Director.

17.03 When the apparent lowest, responsive, responsible bid is $300,000 or less, this Notice is contingent upon approval by the CFPUA Executive Director and is not legally binding until executed by the Executive Director.

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

Bidder's Checklist

Bidder/Company Name: _____
(As it appears on NC General Contractor's License)

The following checklist shall be signed and submitted with the bid to indicate that all required documents have been completed in full and included with the bid.

- ☐ Read and Understand:
  - All special notices
  - All addenda
  - Bid Form
  - Instructions to Bidders
  - General & Supplementary Conditions
- ☐ Complete and Submit Bid Form
  - Acknowledge the acceptance of all addenda (Section 2.01)
  - Complete bid tabulation and Sign (Section 5)
  - Complete Subcontractor Summary Table and Sign (Section 6.02)
  - Complete bidding Contractor's License number, expiration date, and include copy of Contractor's License (Section 7.01)
  - Provide Bidder Contact (Section 9)
  - Complete appropriate signature blocks (Section 9)
- ☐ Enclose properly executed original Bid Bond. *Please refer to Instructions to Bidders, Section 7*
- ☐ Execute and Submit Affidavit and Certificate of Non-Collusion, Non-Suspension and Non-Conviction
- ☐ Enclose entire Bid package in opaque envelope plainly marked with the Project title, NC General Contractors License Number, and seal.
  - If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid shall be enclosed in a separate opaque envelope plainly marked on the outside with the notation "BID ENCLOSED".

Bidder's Signature: _____

By signing, I acknowledge I have completed and enclosed all items indicated above.

- Welded Steel Pipe supplier must meet requirements stated in Special Provisions Section 5 – Steel Pipe and Fittings, 1.4 A. The deadline for prime contractor to request approval of suppliers **NOT** listed in 2.2 B. is **Friday, August 16, 2019 at 3:00 PM**. All requests must be submitted to bids@cfpua.org by prime contractor.
- Bidder must **submit requests for substitutions and "or-equals" to** bids@cfpua.org **by Friday, August 16, 2019 at 3:00 PM.** All requests for substitutions and "or-equals" must be submitted by prime contractor per the requirements of Article 6.05 of the General & Supplementary Conditions of the Construction Contract.
- Registered Bidders will be notified of approved substitutions and or-equals by addenda prior to bid opening.
- Inquiries concerning the bid shall be directed to the CFPUA Purchasing Division by email to bids@cfpua.org. **Deadline for questions is Tuesday, August 20, 2019 at 3:00 PM.**

BID FORM

CFPUA Project Name:	Kings Bluff Raw Water Transmission Main
Bid Opening Date/Time:	Tuesday, August 27, 2019 t 11:00 AM
Bid Opening Location:	Engineering Conference Room
Bids may be submitted and received prior to the Bid opening at this location:	Cape Fear Public Utility Authority 235 Government Center Drive Wilmington, NC 28403

1. GENERAL

1.01 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to complete all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the Bidding Documents.

1.02 Terms contained in the Bidding Documents, including this Bid Form, have the same meaning as defined in the general and supplementary conditions made part of the Bidding Documents.

1.03 Bidder accepts all the terms and conditions of the Advertisement for Bid and Instruction to Bidders, including without limitation those dealing with the disposition of Bid Security. This bid will remain open and valid for ninety (90) calendar days after the day of the Bid opening. Bidder will sign the Agreement and submit insurance, bonding and other documents required by the Contract Documents within ten (10) calendar days from the date Owner gives notice to apparent lowest, responsive responsible Bidder.

2. PROJECT EXPECTATIONS

2.01 In submitting this Bid, Bidder represents, as fully set forth in the Agreement, that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of all which is hereby acknowledged.

No. _____ Dated _____

No. _____ Dated _____

No. _____ Dated _____

No. _____ Dated _____

B. The undersigned Bidder agrees that Bidder has carefully examined and become familiar with the expectations of the Work described in the Bidding Documents, and agrees that he/she has met the bidding responsibilities stated in Section 4 of the Instructions to Bidders.

3. NON-COLLUSION, NON-SUSPENSION, AND NON-CONVICTION

3.01 Bidder represents that this Bid is genuine and is non-collusive.

3.02 Bidder further represents that he/she is not suspended or debarred from bidding on this Work, and that Bidder has not been convicted of any charges or engaged in any unlawful act of trade in Federal or any state jurisdiction.

3.03 Bidder is fully aware that Bid is not considered responsive, if CFPUA's Affidavit and Certificate of Non-Collusion, Non-Suspension and Non-Conviction is not properly executed and submitted with Bid Form.

4. CONTRACT TIMES

4.01 Bidder agrees to the contract times and liquidated damages stated in the Agreement made part of the Bidding Documents.

5. BID AMOUNT

5.01 Bidder agrees to perform all the work described in the Bidding Documents for the unit and/or lump sum prices found in the Bid tabulation. *(Bid tabulation to be completed by Bidder can be found on next page. If Bid tabulation intentionally excluded by Owner and Owner is requesting one lump sum price for the complete Work, Bidder shall write out the lump sum amount in both word format and number format at the bottom of this page. Ex: one hundred twenty-five and 12/100 dollars; $125.12)*

KINGS BLUFF RAW WATER TRANSMISSION MAIN BID FORM

SCHEDULE I

Item No.	Description	Unit	Estimated Quantity	Unit Cost		Total Cost
1	**Mobilization (3% Maximium)**	LS	1	$_____	/LS	$_____
2	**Construction Surveying and Staking**	LS	1	$_____	/LS	$_____
3	**Revised After Construction Surveying and Record Drawings**	LS	1	$_____	/LS	$_____
4	**Clearing and Grubbing**	LS	1	$_____	/LS	$_____
5	**54-inch Diameter Raw Water Main Pipe**					
a	STA 100+03+/- to STA 393+00+/- (Excludes Bore & Jack Installations)	LF	29,300	$_____	/LF	$_____
b	STA 393+00+/- to STA 488+43+/- International Paper Property (Excludes Bore & Jack Installation)	LF	9,600	$_____	/LF	$_____
c	STA 490+07+/- to STA 833+71+/- (Excludes Bore & Jack Installations & Livingston Creek Aerial Crossing)	LF	34,400	$_____	/LF	$_____
6	**Bore & Jack 72-inch Steel Encasement Pipe**					
a	Sheet C-54 NC Highway 11 (Min. 0.625-inch Wall Thick.)	LF	160	$_____	/LF	$_____
b	Sheet C-54 SR 1817 John Reigel Road (Min. 0.625-inch Wall Thick.)	LF	90	$_____	/LF	$_____
c	Sheet C-56 SR 1426 Mt. Misery Road (Min. 0.625-inch Wall Thick.)	LF	145	$_____	/LF	$_____
d	Sheet C-57 International Paper Rail Yard (Min 1.0" Wall Thick.)	LF	300	$_____	/LF	$_____
7	**Sheet C-27 Livingston Creek Aerial Crossing**	LS	1	$_____	/LS	$_____
8	**Raw Water Main Fittings (Ductile Iron Pipe ONLY)**	LBS	280,000	$_____	/LB	$_____
9	**Pigging Facilities**					
a	Pig Launcher (Sheet C-1)	LS	1	$_____	/LS	$_____
b	Pig Retriever (Sheet C-50)	LS	1	$_____	/LS	$_____
10	**48-inch Raw Water Main Valves**	EA	22	$_____	/EA	$_____
11	**Raw Water Main Connections**					
a	Sheet C-1 Connection to Existing Raw Water Main Stub-Out at STA 100+03	LS	1	$_____	/LS	$_____
b	Sheet C-50 Connections (Two Total) to Existing 48-Inch Raw Water Main	LS	1	$_____	/LS	$_____
12	**48-inch Diameter Raw Water Main Pipe**	LF	300	$_____	/LF	$_____
13	**Combination Air Vaccum/ Air Release Valve and Vault**	EA	25	$_____	/EA	$_____
14	**Blow-Off / Drain Assembly**	EA	8	$_____	/EA	$_____
15	**30-inch Raw Water Main Pipe Replacement (Sheet C-2)**	LS	1	$_____	/LS	$_____
16	**Roadway Repair & Restoration**					
a	Ashpalt Roadway Trench Repair	LF	250	$_____	/LF	$_____
b	Asphalt Overlay	SY	2,400	$_____	/SY	$_____
c	Temporary Access Road (Reference Sheets C-51, C-52, C-53)	EA	5	$_____	/EA	$_____
17	**Cathodic Protection Installation and Testing (Complete)**	LS	1	$_____	/LS	$_____
18	**Utility Marker**	EA	13	$_____	/EA	$_____
19	**Subgrade Stabilization Stone As Required (Per LF Per 6-Inch Lift)**	LF	125,000	$_____	/LF	$_____
20	**Modify/Relocate 12" Raw Water Main Stub-Out & Valve (Sheet C-2)**	LS	1	$_____	/LS	$_____
21	**Sheeting/Shoring at Duke Energy Transmission Structure (Sheet C-44)**	LS	1	$_____	/LS	$_____
22	**Restore Tennis Court (Sheet C-41)**	LS	1	$_____	/LS	$_____
23	**Erosion and Sedimentation Control**					
a	Temorpary Silt Fence	LF	86,000	$_____	/LF	$_____
b	Check Dam	EA	50	$_____	/EA	$_____
c	Silt Curtains	EA	25	$_____	/EA	$_____
d	Seeding and Restoration	LF	75,000	$_____	/LF	$_____
24	**Replacement/Restoration of Driveways**					
a	Asphalt Driveway	EA	1	$_____	/EA	$_____
b	Concrete Driveway	EA	2	$_____	/EA	$_____
c	Gravel Driveway	EA	5	$_____	/EA	$_____
d	Compacted Soil Driveway	EA	30	$_____	/EA	$_____
25	**Geotechnical Instrumentation and Monitoring**					
a	Existing Structure	EA	15	$_____	/EA	$_____
b	IP Rail Yard Crossing	LS	1	$_____	/EA	$_____
	TOTAL BASE BID AMOUNT SCHEDULE I (ITEMS 1 THROUGH 25)					$_____

KINGS BLUFF RAW WATER TRANSMISSION MAIN BID FORM

SCHEDULE II						
Item No.	**Description**	**Unit**	**Estimated Quantity**	**Unit Cost**		**Total Cost**
26	**Sheet C-60 Connection to Brunswick Service Main and Meter to include Meter Installation, Valves Vault, Electrical, Controls, Bypass Piping, Fencing, and all Miscellaneous Appurtenances for a Complete Installation (STA. 809+50)**	LS	1	$_____	/LS	$_____
27	**Pressure Reducing Valve Assemblies**					
a	Sheet C-59 30" Pressure Reducing Valve on Existing 48" PCCP Raw Water Main	EA	1	$_____	/EA	$_____
b	Sheet C-59 24" Pressure Reducing Valve on Existing 48" PCCP Raw Water Main	EA	1	$_____	/EA	$_____
28	**Raw Water Main Connections**					
a	Sheet C-10 Connection to Existing 48-inch Raw Water Main at STA 243+25	LS	1	$_____	/LS	$_____
b	Sheet C-22 Connection to Existing 48-inch Raw Water Main at STA 416+35	LS	1	$_____	/LS	$_____
c	Sheet C-36 Connection to Existing 48-inch Raw Water Main at STA 636+65	LS	1	$_____	/LS	$_____
29	**New Fences at Interconnections**					
a	6' Chain link Fence	LF	600	$_____	/LF	$_____
b	Double Hinge Access Gate	EA	3	$_____	/EA	$_____
c	6" Stone and Geofabric inside fenced area	SY	900	$_____	/SY	$_____
30	**Bollards**	EA	12	$_____	/EA	$_____
	TOTAL BASE BID AMOUNT SCHEDULE II (ITEMS 26 THROUGH 30)					$_____
	TOTAL BASE BID AMOUNT SCHEDULE I AND SCHEDULE II (ITEMS 1 THROUGH 30)					$_____

Raw Water Main Pipeline Material (Circle One) : **Ductile** **Steel**

Pipe Supplier: _____

Gate Valve Supplier: _____

6. SUBCONTRACTS

6.01 Bidder shall list all the subcontractors they have selected to perform the following subdivisions of work: Jack & Bore, Cathodic Protection, Welding, Welded Steel Pipe Supplier. Bidder shall also list the Work/Service to performed, amount the subcontractor shall be paid, the percent of the total bid amount the subcontractor shall perform and the subcontractor's NC license permitting them to perform this type of work (if applicable). Bidders shall only list one subcontractor for each work/service to be performed.

6.02 Subcontractor Summary Table

Subcontractor Name or indicate self-performing	Work/Service to be Performed	Amount to be Paid	Percentage of Total Bid	License Number (If applicable)
	Jack & Bore			
	Cathodic Protection			
	Welding			
	Welded Steel Pipe Supplier			

Bidder acknowledges by signing below that all subcontractors performing the subdivisions of work as described in 6.01 are listed above in 6.02 the Subcontractor Summary Table. A contractor whose bid is accepted shall not substitute any person as a subcontractor in the place of the subcontractor listed in the original bid unless approved by CFPUA with justification from the contractor. Failure to comply with these terms may result in the bid being rejected based on non-responsiveness.

BIDDER SIGNATURE: _____

7. BIDDER LICENSE

7.01 The bidder must have the following North Carolina General Contractor's License to be qualified to perform the work associated with this bid. Bidder must list License number below and provide copy of North Carolina General Contractors Certificate.

Limitation: Unlimited

Classification(s): Public Utilities or Unclassified

NC License Number: _____ License Expiration Date: _____

8. BIDDER QUALIFICATIONS

8.01 Other Qualifications: None

9. BIDDER CONTACT

9.01 Communications concerning this Bid shall be sent to the Bidder at the following:

Name: _____

Address: _____

Phone: _____ Email: _____

BIDDER SIGNATURE

Please see Section 9 of the Instruction to Bidder for additional information.

If a Corporation:

Bidder Name: _____
(As it appears on NC General Contractor's License)

By: _____ Date: _____
(Officer as registered with the NC Secretary of State, or authorized person and provide evidence of authority to sign)

Printed Name: _____ Title: _____

Business Address: _____

Phone: _____ Email: _____

Bidder is conducting Business under an Assumed Name (DBA) ____Yes _____No

If the above answer is Yes, please provide the Corporate Name as filed with the NC Secretary of State, and Provide Certificate of Assumed Name:

_____
(Corporate Name as filed with NC Secretary of State)

If a Limited Liability Company

Bidder Name: _____
(As it appears on NC General Contractor's License)

By: _____ Date: _____
(Member-Manager)

Printed Name: _____ Title: _____

Business Address: _____

Phone: _____ Email: _____

Bidder is conducting Business under an Assumed Name (DBA) ____Yes _____No

If the above answer is Yes, please provide the Company Name as filed with the NC Secretary of State, and Provide Certificate of Assumed Name:

_____
(Name as filed with NC Secretary of State)

If a Partnership

Bidder Name: _____
(As it appears on NC General Contractor's License)

By: _____ Date: _____
(Partner)

Printed Name: _____ Title: _____

Business Address: _____

Phone: _____ Email: _____

Bidder is conducting Business under an Assumed Name (DBA) ____Yes _____No

If the above answer is Yes, please provide the Partnership Name as filed with the NC Secretary of State, and Provide Certificate of Assumed Name:

_____
(Name as filed with NC Secretary of State)

BID BOND

This Bond is executed on _____, 20____.

CONTRACTOR (as PRINCIPAL)	SURETY
NAME: _____	NAME: _____
ADDRESS:	ADDRESS:
_____	_____
_____	_____
OWNER (as CONTRACTING BODY)	BOND
CAPE FEAR PUBLIC UTILITY AUTHORITY	AMOUNT: $_____
ADDRESS:	_____
235 Government Center Drive Wilmington, North Carolina 28403	_____Dollars

KNOW ALL MEN BY THESE PRESENTS THAT we, the above named PRINCIPAL and above named SURETY, who is duly licensed to act as surety in North Carolina, are held and firmly bound unto the Cape Fear Public Utility Authority, as CONTRACTING BODY, in the penal sum of the above stated dollar amount, 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 presents.

WHEREAS, the said PRINCIPAL is herewith submitting proposal for _____ project, and the PRINCIPAL desires to file this bid bond in lieu of making the cash deposit as required by North Carolina G.S. 143-129.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such, that if the PRINCIPAL shall be awarded the contract for which the bid is submitted and shall execute the contract and give bond for the faithful performance thereof within ten days after the award of same to the PRINCIPAL, then this obligation shall be null and void; but if the PRINCIPAL fails to so execute such contract and give performance bond as required by North Carolina G.S. 143-129, the SURETY shall, upon demand, forthwith pay to the CONTRACTING BODY the amount set forth above as BOND. Provided further, that the bid may be withdrawn as provided by North Carolina G.S. 143-129.1.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their 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.

If additional signature required:

CONTRACTOR (as PRINCIPAL)

_____

BY: _____

PRINTED: _____

TITLE: _____

DATE: _____

CONTRACTOR (as PRINCIPAL)

_____

BY: _____

PRINTED: _____

TITLE: _____

DATE: _____

WITNESS TO PRINCIPAL

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

CONTRACTOR'S SEAL:

SURETY

_____

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

PHONE #: _____

SURETY'S SEAL:

WITNESS TO SURETY

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

This Bid Bond is not official without a completed affidavit validating the surety agent's authority and a Power of Attorney attached.

AFFIDAVIT

STATE OF:

COUNTY OF:

_____being first duly sworn on oath deposes and says that s/he is
(Name of agent-in-fact or agent)

_____(agent-in-fact or agent) of _____

(bonding company) surety on the attached Agreement on _____(Date)

executed by _____(Contractor).

Affiant further deposes and says that no officer, official, or employee of the Owner has any interest directly or indirectly, or is receiving any premium, commission fee, or other thing of value on account of the same or furnishing of the Bond, undertaking or Contract of Indemnity, Guaranty, Suretyship in connection with the above mentioned Agreement.

Signed _____

(agent-in-fact or agent)

Subscribed and sworn to before me this ____day of _____, 20____.

_____

Notary Public

My Commission Expires: _____

STATE OF _____

COUNTY OF _____

AFFIDAVIT AND CERTIFICATE OF
NON-COLLUSION, NON-SUSPENSION AND NON-CONVICTION

The undersigned, being first duly sworn, deposes and says:

1. I understand that for the purposes of this affidavit, the term "bidder" shall include the person(s), firm(s), or corporation(s) signing this affidavit, the undersigned's subcontractor(s), subsidiary(ies) and affiliate(s) and any officer, director, employee or agent of the bidder; and the term "conviction" shall include guilty pleas, pleadings of nolo contendere and similar pleas.

2. This Affidavit and Certificate is made in accordance with Article 3 of Chapter 133 of the North Carolina General Statutes; I certify that this proposal is made without prior understanding, agreement, or connection with any person(s), firm(s), or corporation(s) making bids or proposals; I further certify that the bidder has not entered into any agreement with any other bidder or prospective bidder or with any other person(s), firm(s) or corporation(s) relating to the price named in said proposal, nor any agreement or arrangement under which any person(s), firm(s) or corporation(s) is to refrain from bidding, nor any agreement or arrangement for any act or omission in restraint of free competition among bidders; I understand collusive bidding is a violation of state and federal law and can result in fines, prison sentences, and civil damage awards; and I further certify that the bidder will abide by all terms of this bid or proposal.

3. The bidder is not presently suspended, debarred or proposed for debarment from bidding by any federal or state governmental agency.

4. The bidder is not presently charged in an indictment or information with engaging in any conspiracy, combination, or other unlawful act in restraint of trade or any similar charges in any federal court or a court of this or any other state.

5. The bidder, within three years immediately preceding the date of this affidavit, has not been convicted of charges or engaging in any conspiracy, combination, or other act in restraint of trade or commerce declared to be unlawful by the provisions of G.S. 75-1 and 75-2 in any federal court or a court of this or any other state.

6. If, during the time of this proposal, from the date advertised to the date bids are opened, the bidder is indicted or convicted of bid-rigging, I understand this proposal shall be rejected and not considered for award.

7. I hereby affirm that all information contained in this affidavit is true, correct, accurate and complete, and any untrue, incorrect, inaccurate or incomplete statements will result in the disqualification and rejection of this proposal. I certify that I am authorized to sign this bid and to make the representations set forth herein on behalf of myself and the bidder.

8. The Bidder shall completely execute this Affidavit and Certificate of Non-Collusion, Non-Suspension and Non-Conviction, and submit it with the Bid Form; otherwise, the Bid will be considered non-responsive.

This the _____ day of _____, 20___

CONTRACTOR'S SEAL:

COMPANY NAME: _____

BY: _____
(Owner, Partner, or Corporate President, Vice President or Assistant Vice President Only)

PRINTED: _____

TITLE: _____

ATTEST:

BY: _____
(Secretary, Assistant Secretary, or Trust Officer Only)

PRINTED: _____

TITLE: _____

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public, certify that the corporation's Secretary,
[Notary-(Print)]
Assistant Secretary, or Trust Officer, Mr./Mrs./Ms. _____
(Name)-Secretary, Asst. Secretary, Trust Officer]
personally came before me this day and acknowledged that s/he is the _____ of _____, a corporation,
[(Title)-Secretary, Asst. Secretary, Trust Officer] *[Corporation Name]*
and that by authority duly given and as act of the corporation, the foregoing instrument was signed in its name by its President, Vice President, or Assistant Vice President, Mr./Mrs./Ms. _____, sealed with its Corporate Seal, and attested by
[(Name) - President, Vice President, Asst. Vice President]
its Secretary, Assistant Secretary, or Trust Officer.

WITNESS my hand and official seal this the _____ day of _____, 20 ____.

_____
Notary Public
My commission expires: _____

AGREEMENT FOR CONSTRUCTION SERVICES

New Hanover County, State of North Carolina

20-C0103

THIS AGREEMENT FOR CONSTRUCTION SERVICES ("Agreement"), made this the day of_____, 2019, (the "Effective Date") is an agreement by and between CAPE FEAR PUBLIC UTILITY AUTHORITY, a body politic and corporate organized under North Carolina General Statutes Chapter 162A and located in New Hanover County, North Carolina (hereinafter called OWNER) and , licensed as a contractor in the State of North Carolina (herein called CONTRACTOR).

1. PURPOSE

The OWNER hereby employs the CONTRACTOR to furnish all labor, materials, and equipment to perform all work (the "Work") in a manner and form as specified by the attached plans, specifications, and/or documents consisting of, but not limited to: Advertisement, Instructions to Bidders, General and Supplementary Conditions, Technical Specifications, Proposal, Agreement, and Performance and Payment Bonds (collectively, the "Contract Documents"), which are incorporated as if fully set out, for the following:

Kings Bluff Raw Water Transmission Main

2. ENGINEER

The Project has been designed by McKim & Creed, Inc., who is referred to in the Contract Documents as ENGINEER. Engineer and its duly authorized agents are to act as OWNER'S representatives, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with completion of the Work in accordance with the Contract Documents.

3. CONTRACT TIMES

The CONTRACTOR shall commence Work to be performed under this Agreement within ten (10) consecutive calendar days of the issuance of a Notice to Proceed by the OWNER. The Work included in Schedule 1 shall achieve Substantial Completion within 790 consecutive calendar days of the Notice to Proceed. The Work included in Schedule 2 shall achieve Substantial Completion within 910 consecutive calendar days of the

Notice to Proceed. Final Completion of all Work within 1000 consecutive calendar days of the Notice to Proceed. Time is of the essence.

Substantial and final completions occur when the Engineer's requirements are met as defined in Special Project Conditions and Division 1 – General Requirements of the Technical Specification.

4. LIQUIDATED DAMAGES

The OWNER and CONTRACTOR agree that time is of the essence of this Agreement. The CONTRACTOR agrees to pay, as liquidated damages, to the OWNER Three Thousand 00/100 Dollars ($3,000) for each consecutive calendar day the Work extends beyond the total time allotted for Substantial Completion of all Work and One Thousand 00/100 Dollars ($1,000) for each consecutive calendar day the Work extends beyond the total time allotted for Final Completion of all Work, not as a penalty, but as liquidated damages. CONTRACTOR and OWNER agree to liquidated damages because of the impractablility and extreme difficulty of fixing and ascertaining the actual damages the OWNER would sustain in the event CONTRACTOR fails to achieve Substantial and Final Completion within the Contract Time, as may be adjusted.

OWNER shall have the right to deduct the liquidated damages from any payments, otherwise due, or to become due, to the CONTRACTOR, and to initiate applicable dispute resolution procedures to recover such liquidated damages to the extent they exceed amounts owed to the CONTRACTOR.

5. CONTRACT PRICE & PAYMENT PROCEDURES

The OWNER agrees to pay the CONTRACTOR for the faithful performance of this Agreement, subject to any additions or deductions as provided for in the Contract Documents as set forth in the Proposal, the total cost of Dollars ($).

CONTRACTOR shall submit an Application for Payment for partial payment to the ENGINEER no later than the 30th day of every month, and shall expect a periodic payment for such Application for Payment from the OWNER by the last day of the following month, assuming the Application for Payment is complete and has been accepted by both the ENGINEER and OWNER. The Application for Payment may include the value of materials on the jobsite, but not installed.

Until the Work is fifty percent (50%) complete based on gross invoices, five percent (5%) of each periodic payment due to CONTRACTOR shall be retained by OWNER. When the Work is fifty percent (50%) complete, OWNER shall, with written consent of the surety,

not retain any further retainage from periodic payments due to the CONTRACTOR provided CONTRACTOR continues to satisfactorily perform the Work and any nonconforming Work identified as provided herein has been corrected by CONTRACTOR and accepted by OWNER. In the event the OWNER determines that CONTRACTOR'S performance of the Work is unsatisfactory, the OWNER may reinstate retainage from each subsequent periodic payment. The value of stored on-site materials shall not exceed twenty percent (20%) of the gross project invoices for the purposes of determining whether the Work is fifty percent (50%) complete.

Upon Substantial Completion, OWNER may release a portion of the retainage to CONTRACTOR, retaining at all times an amount sufficient to cover the cost of the Work remaining to be completed. Consent of the Surety shall be obtained before any retainage is paid by the OWNER. Consent of the Surety signed by an agent, must be accompanied by a certified copy of such agent's authority to act for the Surety.

Upon completion and acceptance of the Work and under the condition that there are no outstanding items preventing final payment as defined in the General and Supplementary Conditions, the OWNER shall pay the CONTRACTOR the final payment in accordance with North Carolina General Statutes Section 143-134.1.

6. INTEREST

Pursuant to North Carolina General Statutes Section 143-134.1, i**nterest on amounts due but not paid shall bear interest at the rate of one percent (1%) per month.**

7. PERFORMANCE BOND

It is agreed that if, at any time after the execution of this Agreement and the Performance Bond, the OWNER shall deem the surety or sureties upon such bond to be unsatisfactory, or if for any reason such bond ceases to be adequate to cover the performance of the Work, the CONTRACTOR shall, at its expense, within five (5) days after receipt of notice from the OWNER to do so, furnish an additional bond or bonds in such form and amount, and with such surety, or sureties, as shall be satisfactory to the OWNER.

8. INSURANCE

The CONTRACTOR shall take out and maintain, during the term of this Agreement, all insurance required by the General and Supplementary Conditions, and shall, at the execution of this Agreement, attach to each of the counterparts thereof documentary proof of compliance in the form of a certificate from its insurer, stating the amount,

policy numbers, and kinds of insurance carried. The contractor shall provide that the insurance contributing to satisfaction of insurance requirements in the Supplementary Conditions, Section SC-5. Minimum Scope and Insurance Requirements shall not be canceled, terminated or modified by the contractor without prior written approval of CFPUA; Contractor shall provide immediate notice to CFPUA (by letter) if any policy required by this contract is canceled or non-renewed.

9. WARRANTY

A. The CONTRACTOR shall unconditionally guarantee materials and workmanship against patent defects arising from faulty materials, faulty workmanship, or negligence for a period of twelve (12) months following the date of final acceptance of the Work or beneficial occupancy and shall replace such defective materials or workmanship without cost to OWNER.

B. Where items of equipment or material carry a manufacturer's warranty for any period in excess of twelve (12) months, then the manufacturer's warranty shall apply for that particular piece of equipment or material. The CONTRACTOR shall replace such defective equipment or materials, without cost to OWNER, within the manufacturer's warranty period.

C. Additionally, OWNER may bring an action for latent defects caused by the CONTRACTOR, which are hidden or not readily apparent to OWNER at the time of beneficial occupancy or final acceptance, whichever occurred first, in accordance with applicable law.

10. RESERVED

11. CONTRACTOR'S REPRESENTATIONS

The CONTRACTOR acknowledges, represents, and warrants the following:

A. CONTRACTOR has examined and carefully studied the Contract Documents and other related data identified in the Bidding Documents.

B. CONTRACTOR has visited the Site and become familiar with and is satisfied as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. CONTRACTOR is familiar with and is satisfied as to all Federal, State, and Local laws and regulations that may affect cost, progress, and performance of Work.

D. CONTRACTOR has carefully studied all provided reports on supplementary (surface, subsurface, underground facilities, and hazards).

E. CONTRACTOR does not consider that any further examinations, investigations, explorations, tests, studies, and data are necessary for the performance of the Work at the Contract Price and within the Contract Time, and in accordance with the terms and conditions of the Contract Documents.

F. CONTRACTOR has given written notice to the ENGINEER of all conflicts, errors, ambiguities, or discrepancies that the CONTRACTOR has discovered in the Contract Documents and the written resolution thereof by ENGINEER is acceptable to CONTRACTOR.

G. The Bid, for which this Agreement is based, is genuine and not made in the interest of or on the behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization, or corporation. Also, CONTRACTOR has not sought by collusion any advantage over any other Bidder or over OWNER.

12. E-VERIFY

CONTRACTOR shall comply with E-VERIFY requirements of Article 2 of Chapter 64 of the General Statutes. Further, if CONTRACTOR utilizes a subcontractor, CONTRACTOR shall require the subcontractor to comply with the requirements of Article 2 of Chapter 64 of the General Statutes.

13. IRAN DIVESTMENT ACT CERTIFICATION

CONTRACTOR certifies by signing this agreement that they are in compliance with the Iran Divestment Act, N.C.G.S. Chapter 147 Article 6E, and as of the date listed below, the Contractor named in this agreement is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C.G.S. Article 6E, §147-86.58. Contractor shall not utilize any subcontractor found on the State www.nctreasurer.com/Iran.

14. ASSIGNMENT OF AGREEMENT

It is mutually agreed by the parties hereto that this Agreement may not be assigned by CONTRACTOR without the prior written consent of the OWNER.

15. SUBCONTRACTS

The CONTRACTOR shall utilize no subcontracts for carrying out the services to be performed under this Agreement without written approval from the OWNER and as otherwise provided in the General and Supplemental Conditions.

16. BINDING EFFECT & CONTINUING OBLIGATION

This Agreement shall be binding upon the heirs, successors, assigns, agents, officials, employees, independent contractors, and subcontractors of the parties.

The parties will make and execute all further instruments and documents required to carry out the purposes and intent of the Agreement.

17. AMENDMENTS

This Agreement shall not be modified or otherwise amended except in writing signed by both parties to this Agreement.

18. CONTRACT DOCUMENTS

The following are included in the Contract Documents as part of this Agreement:

A. This Agreement

B. Performance and Payment Bonds

C. EJCDC Standard General Conditions of the Construction Contract copyrighted 2007, as revised.

D. Cape Fear Public Utility Authority Supplementary Conditions

E. Technical Specifications as indicated in the Table of Contents and included with the bid documents.

F. Drawings as indicated in the Table of Contents and included with the bid documents.

G. Total project addenda distributed before Bid Opening:

H. Exhibits to this Agreement:

1. Bid form with CONTRACTOR'S bid

2. Notice to Proceed

3. Documentation submitted by CONTRACTOR prior to Notice of Award *(list)*

I. Documents established after the Effective Date of this Agreement, which are not attached hereto:

1. Written Amendments

2. Work Change Directives

3. Change Orders

There are no Contract Documents other than those listed above in this section. The Contract Documents represent the entire and integrated agreement between the parties hereto and supersede prior negotiations, representations or agreements, either written or oral. The Contract Documents may only be amended, modified, or supplemented as stated in the General and Supplementary Conditions.

To the extent the terms of this Agreement conflict with any terms or conditions of any other Contract Document, the terms and conditions contained herein shall control.

IN WITNESS WHEREOF, the OWNER has caused this Agreement to be duly executed in its name and behalf and the CONTRACTOR has caused this Agreement to be duly executed in its name and behalf and its corporate seal to be hereunto affixed, and attested to.

This Agreement will be effective on _____,2019.

CONTRACTOR

CONTRACTOR'S SEAL:

_____

ADDRESS:

_____

_____

ATTEST:

BY: _____

[President, Vice President, Asst. Vice President]

BY: _____

[Secretary, Asst. Secretary, Trust Officer]

PRINTED: _____

PRINTED: _____

TITLE: _____

TITLE: _____

CONTRACTOR'S LICENSE NO.: _____

EXPIRATION DATE: _____

STATE OF _____

COUNTY OF _____

I, _____, a Notary Public, certify that the corporation's Secretary,
[Notary-(Print)]

Assistant Secretary, or Trust Officer, Mr./Mrs./Ms. _____
[(Name)-Secretary, Asst. Secretary, Trust Officer]

personally came before me this day and acknowledged that s/he is the _____ of _____, a corporation,
[(Title)-Secretary, Asst. Secretary, Trust Officer] *[Corporation Name]*

and that by authority duly given and as act of the corporation, the foregoing instrument was signed in its name by its President, Vice President, or Assistant Vice President, Mr./Mrs./Ms. _____, sealed with its Corporate Seal, and attested by
[(Name) - President, Vice President, Asst. Vice President]

its Secretary, Assistant Secretary, or Trust Officer.

WITNESS my hand and official seal this the _____ day of _____, 20 ____.

_____

Notary Public

My commission expires: _____

OWNER

CAPE FEAR PUBLIC UTILITY AUTHORITY SEAL:

235 Government Center Drive
Wilmington, North Carolina 28403

BY: _____ ATTEST: _____

James R. Flechtner
Executive Director

Donna S. Pope
Clerk to the Board

NORTH CAROLINA
NEW HANOVER COUNTY

I, _____ the undersigned Notary Public do hereby certify that Donna S. Pope personally came before me this date and acknowledged that she is the Clerk to the Board of Cape Fear Public Utility Authority, Wilmington, North Carolina, and that, by authority duly given and the act of the Board, the foregoing document was signed in its name by its Executive Director, sealed with its corporate seal, and attested by herself as its Clerk.

WITNESS my hand and official seal this the _____ day of _____, 20 ____.

_____
Notary Public

My commission expires: _____

AUTHORITY ATTORNEY'S CERTIFICATION

This instrument has been reviewed and is approved as to form this the _____ day of _____, 20____.

_____
Linda Miles
Consulting Attorney to the Board

AUTHORITY ACCOUNTANT'S CERTIFICATION

This instrument has been pre-audited in the manner required by the Local Government Budget and Fiscal Control Act this the _____ day of _____, 20____.

_____
John McLean
Chief Financial Officer

PERFORMANCE BOND

This Bond is executed on _____, 2019.

CONTRACTOR (as PRINCIPAL)

NAME: _____

ADDRESS:

_____

_____

SURETY

NAME: _____

ADDRESS:

_____

_____

OWNER (as CONTRACTING BODY)

CAPE FEAR PUBLIC UTILITY AUTHORITY

ADDRESS:

235 Government Center Drive
Wilmington, North Carolina 28403

BOND

AMOUNT: $_____

_____

_____Dollars

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above named CONTRACTING BODY in the penal sum of the amount stated above in the lawful money of the United States, for 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 Agreement with the CONTRACTING BODY, dated _____, 2019 for work described by Plans and Specifications prepared by McKim & Creed, Inc. herein called and referred to as the ENGINEER, a copy of said Agreement is hereto attached and made a part hereof for the construction of Project: Kings Bluff Raw Water Transmission Main

NOW THEREFORE, if the PRINCIPAL shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of said Agreement during the original term of said Agreement and any extensions thereof 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 Agreement, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions, and agreements of any and all duly authorized modifications to the SURETY being hereby waived, then this obligation is to be void; otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their 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.

CONTRACTOR (as PRINCIPAL)

_____

BY: _____

PRINTED: _____

TITLE: _____

DATE: _____

If additional signature required:

CONTRACTOR (as PRINCIPAL)

_____

BY: _____

PRINTED: _____

TITLE: _____

DATE: _____

WITNESS TO PRINCIPAL

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

CONTRACTOR'S SEAL:

SURETY

_____

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

PHONE #: _____

SURETY'S SEAL:

WITNESS TO SURETY

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

This Performance Bond is not official without a completed affidavit validating the surety agent's authority and a Power of Attorney attached.

NOTE: Date of Bond must not be prior to date of Agreement

AFFIDAVIT

STATE OF:

COUNTY OF:

_____being first duly sworn on oath deposes and says that s/he is
(Name of agent-in-fact or agent)
_____(agent-in-fact or agent) of _____

(bonding company) surety on the attached Agreement on _____,2019(Date of Agreement)

executed by _____ (Contractor).

Affiant further deposes and says that no officer, official, or employee of the Owner has any interest directly or indirectly, or is receiving any premium, commission fee, or other thing of value on account of the same or furnishing of the Bond, undertaking or Contract of Indemnity, Guaranty, Suretyship in connection with the above mentioned Agreement.

Signed _____
(agent-in-fact or agent)

Subscribed and sworn to before me this ____day of _____, 20____.

_____
Notary Public

My Commission Expires: _____

PAYMENT BOND

This Bond is executed on _____, 2019.

CONTRACTOR (as PRINCIPAL)

NAME: _____

ADDRESS:

_____

_____

SURETY

NAME: _____

ADDRESS:

_____

_____

OWNER (as CONTRACTING BODY)

CAPE FEAR PUBLIC UTILITY AUTHORITY

ADDRESS:

235 Government Center Drive
Wilmington, North Carolina 28403

BOND

AMOUNT: $_____

_____

_____Dollars

KNOW ALL MEN BY THESE PRESENTS, that we, the PRINCIPAL and SURETY above named, are held and firmly bound unto the above named CONTRACTING BODY in the penal sum of the amount stated above in the lawful money of the United States, for 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 Agreement with the CONTRACTING BODY, dated _____, 2019 for work described by Plans and Specifications prepared by McKim & Creed, Inc. herein called and referred to as the ENGINEER, a copy of said Agreement is hereto attached and made a part hereof for the construction of Project: Kings Bluff Raw Water Transmission Main

NOW THEREFORE, if the PRINCIPAL shall promptly make payment to all persons supplying labor and material in the prosecution of the work provided for in said Agreement, and any and all duly authorized modifications of said Agreement that may hereafter be made, notice of which modifications to the SURETY being hereby waived, then this obligation is to be void; otherwise, it shall remain in full force and virtue.

IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their 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.

CONTRACTOR (as PRINCIPAL)

_____

BY: _____

PRINTED: _____

TITLE: _____

DATE: _____

If additional signature required:

CONTRACTOR (as PRINCIPAL)

_____

BY: _____

PRINTED: _____

TITLE: _____

DATE: _____

WITNESS TO PRINCIPAL

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

CONTRACTOR'S SEAL:

SURETY

_____

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

PHONE #: _____

SURETY'S SEAL:

WITNESS TO SURETY

BY: _____

PRINTED: _____

ADDRESS:

_____

_____

This Payment Bond is not official without a completed affidavit validating the surety agent's authority and a Power of Attorney attached.

NOTE: Date of Bond must not be prior to date of Agreement

AFFIDAVIT

STATE OF:

COUNTY OF:

_____being first duly sworn on oath deposes and says that s/he is
(Name of agent-in-fact or agent)
_____(agent-in-fact or agent) of _____

(bonding company) surety on the attached Agreement on _____,2019(Date of Agreement)

executed by _____ (Contractor).

Affiant further deposes and says that no officer, official, or employee of the Owner has any interest directly or indirectly, or is receiving any premium, commission fee, or other thing of value on account of the same or furnishing of the Bond, undertaking or Contract of Indemnity, Guaranty, Suretyship in connection with the above mentioned Agreement.

Signed _____
(agent-in-fact or agent)

Subscribed and sworn to before me this____day of_____, 20____.

_____
Notary Public

My Commission Expires: _____

Attach Required Insurance Documents Here
(Including Endorsements)

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

TO: Participating Consultants and Contractors
Associated with Cape Fear Public Utility Authority Related Projects

FROM: Jamie Grimes, Fiscal Contract Account Manager

RE: Required Documents for Monthly Estimates and Project Close Outs

---

The following items are required for monthly payment requests on contracts:

- Two (2) copies of Estimate/Invoice; One original, One copy
- Two (2) copies of Sales Tax Report (Attachment "A")
- Two (2) copies of Material Inventory Statement, when applicable (Attachment "B")
- Two (2) copies of Paid Invoices for all materials for which payment is being requested
- Two (2) copies of Certified Payrolls (when federal monies are involved)

The following items are required prior to a project close out and from an administrative standpoint.*

- One (1) copy of Certificate of Substantial Completion (Attachment "C")
- One (1) copy of Contractor's Affidavit of Payment of Debts and Claims and release or Waiver of liens form (Attachment "D")
- One (1) copy of Subcontractors' Release or Waiver of Liens form (Attachment "E")
- One (1) copy of Contractor's Assignment of all Warranties and Guarantees form (Attachment "F")
- One (1) copy of Consent of Surety Company to Final Payment form (Attachment "G")

* **The Project Engineer, and Consultant may require additional items to be submitted and finalized prior to release of final payment.**

235 Government Center Drive, Wilmington, NC 28403

t: 910-332-6560 f: 910-332-6353 www.cfpua.org

WILMINGTON, NORTH CAROLINA

SALES TAX REPORT

CAPE FEAR PUBLIC UTILITY AUTHORITY

I HEREBY CERTIFY TAXES LISTED WERE PAID AS SALES TAX OR WILL BE PAID AS USE TAX ON THE PURCHASES LISTED.

PROJECT:

CONTRACTOR:

FOR PERIOD: TO

ITEM	VENDOR	CITY	INVOICE	DATE	TAXABLE AMOUNT	NC TAX (4.75%)	NHC TAX (2.25%)	*OTHER COUNTIES	COUNTY

	TAXABLE AMOUNT	NC TAX (4.75%)	NHC TAX (2.25%)	*OTHER COUNTIES
SHEET TOTALS:				
(This sheet plus previous sheets being submitted) **GRAND TOTALS**				

** Tax amount if being paid to a county different from New Hanover and the tax rate is different. You must note the tax percentage being paid next to the county in the COUNTY column.*

AND THESE PURCHASES WERE FOR THE COST OF BUILDING MATERIALS, SUPPLIES, FIXTURES, AND/OR EQUIPMENT THAT BECAME PART OF, OR ANNEXED TO ANY BUILDING OR STRUCTURE BEING ERECTED, ALTERED, OR REPAIRED, UNDER THE ABOVE REFERENCED CONTRACT WITH THE CAPE FEAR PUBLIC UTILITY AUTHORITY.

SIGNED: ______________________ DATE: __________ PRINT: ______________________ TITLE: ______________________

CFPUA MATERIAL INVENTORY STATEMENT

PROJECT: _____ DATE: _____

CONTRACTOR: _____

DESCRIPTION	ON HAND PREVIOUS ESTIMATE	DELIVERED THIS MONTH	INCORP. IN WORK	ON HAND THIS ESTIMATE	UNIT PRICE	TOTAL DUE
TOTAL						

Cape Fear Public Utility Authority

Certificate of Substantial Completion

Project:	CFPUA Contract #:
Owner: Cape Fear Public Utility Authority	Date of Contract:
Contractor:	Date of Substantial Completion:

This Certificate of Substantial Completion applies to:

- ☐ All Work under the Contract Documents
- ☐ The following items, as specified in the Contract Documents:

_____

_____

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete.

This Certificate declares the date of Substantial Completion for the Contract stated above, and this is the date that applicable warranties commence on the substantially complete Work made part of this Certificate, except as stated below.

A list of items to be completed or corrected, henceforth referred to as punchlist, is attached hereto. This list may not be all-inclusive, and this list does not dismiss or alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

The responsibilities between the Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties shall be as provided in the Contract Documents, except as amended as follows.

- ☐ Not Amended
- ☐ Amended as follows:

Owner's Amended Responsibilities:

_____

Contractor's Amended Responsibilities:

_____

Documents made part of this Certificate:

- ☐ Punchlist
- ☐ Other: _____

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Accepted by:

_____	_____	_____
Engineer of Record *(signature)*	Printed Name	Date
_____	_____	_____
Contractor Project Manager *(signature)*	Printed Name	Date
_____	_____	_____
Owner Project Manager *(signature)*	Printed Name	Date

CONTRACTOR'S AFFIDAVIT
OF PAYMENT OF DEBTS AND
CLAIMS AND RELEASE OF LIENS

-D-

To: Cape Fear Public Utility Authority
235 Government Center Drive
Wilmington, N.C. 28403

Project of Contract No. : _____

Contract Date: _____

Attn: _____

Project *(Name and Address)*: _____

STATE OF: _____

COUNTY OF: _____

The undersigned, pursuant to the General and Supplementary Conditions, Articles 14.07 and SC-14.07of the Contract for construction of _____, hereby certifies that, he has paid in full or otherwise has satisfied or will satisfy all obligations for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the contractor for damages arising in any manner in connection with the performance of the contract referenced above for which the owner or his property might in any way be held responsible.

In addition, the undersigned further certifies that to the best his knowledge, information and belief, the Releases or Waivers of Liens attached hereto include the contractor, all subcontractors, all suppliers of materials and equipment, and all performers of work, labor or services who have or may have any claims against the owner arising in any manner out of the performance of the contract referenced above.

IN WITNESS WHEREOF, the undersigned has hereto set his hand and seal this ____day of _____, 20____.

CONTRACTOR: _____ SEAL:

Address: _____
_____ ATTEST:

By: _____ By: _____
Printed: _____ Printed: _____
Title: _____ Title: _____

Sworn and subscribed to before me this ____day of _____, 20____.

_____
Notary Public

(Seal) My Commission Expires_____

SUBCONTRACTOR'S RELEASE OR WAIVER OF LIENS -E-

To: _____(Contractor) AND Cape Fear Public Utility Authority
_____ 235 Government Center Drive
_____ Wilmington, N.C. 28403
Attn: _____

Project of Contract No. : _____ Contract Date: _____
Project *(Name and Address)*: _____

STATE OF: _____

COUNTY OF: _____

The undersigned subcontractor, hereby acknowledges and certifies that he has received full payment for all work, labor, skill and material furnished, delivered, supplied or performed in connection with the contract referenced above to and for _____*(contractor's name)*, the general contractor, or anyone in any manner in connection with the contract referenced above; and for value received hereby waives all rights and liens which the undersigned may now or hereafter claim or assert for all or any work, labor, skill or materials furnished, delivered or performed in connection with the contract referenced above, against said contractor, the city, or any natural person or against said improvement, land or buildings thereof and appurtenances thereof.

The undersigned, in consideration of the payment acknowledged herein, affirms that all work, labor and material, furnished, delivered or performed to or for said contract referenced above was furnished, or performed to or for said contract referenced above was furnished, delivered or performed by the undersigned, or his agent, employees and servants or by and through the undersigned by the following subcontractor(s) or material men or their agent(s), employee(s) and servant(s), to wit:_____; and further affirms that the attached receipts and releases represent payment in full, and release in full of all and any hitherto existing or possible future mechanics liens or rights in connection with the above referenced contract.

IN WITNESS WHEREOF, the undersigned has hereto set his hand and seal this ____day of _____, 20____.

SUBCONTRACTOR: _____ SEAL:

Address: _____
_____ ATTEST:

By: _____ By: _____
Printed: _____ Printed: _____
Title: _____ Title: _____

Sworn and subscribed to before me this ____day of _____, 20____.

_____
Notary Public

(Seal) My Commission Expires_____

CONTRACTOR'S ASSIGNMENT OF -F-
ALL WARRANTIES AND GUARANTEES

To: Cape Fear Public Utility Authority
235 Government Center Drive
Wilmington, N.C. 28403

Project of Contract No. : _____

Contract Date: _____

Attn: _____

Project *(Name and Address)*: _____

STATE OF: _____

COUNTY OF: _____

The undersigned, pursuant to the General and Supplementary Conditions, Articles 6.19 and SC-6.19 of the Contract for the construction of _____and in consideration for the sums stated therein, the receipt of which is hereby acknowledged, do hereby assign, transfer, bargain and convey unto the Cape Fear Public Utility Authority all its rights, title and interest in and to all warranties, express or implied, covering warranting, applying or pertaining to all goods, equipment, and materials of whatsoever kind, furnished, delivered or used for or in said contract referenced above.

Also, the undersigned does hereby certify that to the best of his knowledge, information and belief that the warranties attached hereto include all warranties of the contractors, and all subcontractors. And all suppliers of materials and equipment furnished, delivered or used for or in said contract referenced above.

IN TESTIMONY WHEREOF, said contractor or subcontractor has hereunto set his hand and seal this ____day of _____, 20____.

CONTRACTOR: _____ SEAL:

Address: _____
_____ ATTEST:

By: _____ By: _____
Printed: _____ Printed: _____
Title: _____ Title: _____

Sworn and subscribed to before me this ____day of _____, 20____.

_____
Notary Public

(Seal) My Commission Expires_____

CONSENT OF SURETY COMPANY -G-
TO FINAL PAYMENT

To: Cape Fear Public Utility Authority
235 Government Center Drive
Wilmington, N.C. 28403

Project of Contract No. : _____

Contract Date: _____

Attn: _____

Project *(Name and Address)*: _____

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the _____ *(Surety Company Name and Address)* as Surety Company on bond of _____ *(Contractor Name and Address)*, Contractor, hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety Company of any of its obligations to the Cape Fear Public Utility Authority as set forth in said Surety Company's Bond.

IN WITNESS WHEREOF, the Surety Company has hereunto set its hand and seal this ____day of _____, 20____.

SURETY COMPANY: _____ SEAL:

Address: _____
_____

To be signed by an Authorized Agent:

By: _____
Printed: _____
Title: _____

ATTEST:

By: _____
Printed: _____
Title: _____

Sworn and subscribed to before me this ____day of _____, 20____.

_____
Notary Public

(Seal)

My Commission Expires_____

Cape Fear Public Utility Authority (CFPUA)
Work Change Directive No. _____

Project:	CFPUA Capital Project No.:
Contractor:	CFPUA Contract No.:
Engineer:	Date of Issuance:
CFPUA Project Manager:	Effective Date:

This is a directive to proceed with a change that may affect the contract price or times. A change order, if any, should be considered promptly. If the change involves an increase in Contract Price and the estimated amount below is approached before the additional or changed work is completed, another Work Change Directive must be issued to change the estimated price or Contractor may stop changed work when estimated time is reached. Paragraph 10.03.A.2 of the General Conditions requires that a Change Order be initiated and processed to cover any undisputed sum or amount of time for Work actually performed pursuant to this Work Change Directive.

Contractor is directed to proceed promptly with the following change(s):

Item No.	Description

Attachments (list documents supporting change):

Purpose for Work Change Directive:

Authorization for Work described herein to proceed on the basis of Cost of the Work due to:

- ☐ Non-agreement on pricing of proposed change.
- ☐ Necessity to expedite Work described herein prior to agreeing to changes on Contract Price and Contract Time.
- ☐ Bid quantity adjustment.

Estimated not-to-exceed change in Contract Price and Contract Times (as applicable):

Contract Price $_____ (increase/decrease) Contract Time _____ (increase/decrease)
days

Recommended for Approval by Engineer:	Date:
Authorized for CFPUA by Director of Engineering: Carel Vandermeyden	Date:
This instrument has been pre-audited in a manner required by the Local Government Budget & Fiscal Control Act Chief Financial Officer: John McLean	Date:
Received for Contractor by:	Date:

This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared by

ENGINEERS JOINT CONTRACT DOCUMENTS COMMITTEE

and

Issued and Published Jointly by

ACEC
American Council of Engineering Companies

The Associated General Contractors of America — Skill Responsibility Integrity

ASCE American Society of Civil Engineers

National Society of Professional Engineers
Professional Engineers in Private Practice

AMERICAN COUNCIL OF ENGINEERING COMPANIES

ASSOCIATED GENERAL CONTRACTORS OF AMERICA

AMERICAN SOCIETY OF CIVIL ENGINEERS

PROFESSIONAL ENGINEERS IN PRIVATE PRACTICE
A Practice Division of the
NATIONAL SOCIETY OF PROFESSIONAL ENGINEERS

Endorsed by

CSI

CONSTRUCTION SPECIFICATIONS INSTITUTE

These General Conditions have been prepared for use with the Suggested Forms of Agreement Between Owner and Contractor (EJCDC C-520 or C-525, 2007 Editions). Their provisions are interrelated and a change in one may necessitate a change in the other. Comments concerning their usage are contained in the Narrative Guide to the EJCDC Construction Documents (EJCDC C-001, 2007 Edition). For guidance in the preparation of Supplementary Conditions, see Guide to the Preparation of Supplementary Conditions (EJCDC C-800, 2007 Edition).

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

TABLE OF CONTENTS

ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents and printed with initial capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument which is evidence of the agreement between Owner and Contractor covering the Work.

3. *Application for Payment*—The form acceptable to Engineer which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.

5. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

6. *Bidder*—The individual or entity who submits a Bid directly to Owner.

7. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).

8. *Bidding Requirements*—The advertisement or invitation to bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.

9. *Change Order*—A document recommended by Engineer which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, issued on or after the Effective Date of the Agreement.

10. *Claim*—A demand or assertion by Owner or Contractor seeking an adjustment of Contract Price or Contract Times, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Claim.

11. *Contract*—The entire and integrated written agreement between the Owner and Contractor concerning the Work. The Contract supersedes prior negotiations, representations, or agreements, whether written or oral.

12. *Contract Documents*—Those items so designated in the Agreement. Only printed or hard copies of the items listed in the Agreement are Contract Documents. Approved Shop Drawings, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.

13. *Contract Price*—The moneys payable by Owner to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).

14. *Contract Times*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any; (ii) achieve Substantial Completion; and (iii) complete the Work so that it is ready for final payment as evidenced by Engineer's written recommendation of final payment.

15. *Contractor*—The individual or entity with whom Owner has entered into the Agreement.

16. *Cost of the Work*—See Paragraph 11.01 for definition.

17. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Shop Drawings and other Contractor submittals are not Drawings as so defined.

18. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.

19. *Engineer*—The individual or entity named as such in the Agreement.

20. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but which does not involve a change in the Contract Price or the Contract Times.

21. *General Requirements*—Sections of Division 1 of the Specifications.

22. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.

23. *Hazardous Waste*—The term Hazardous Waste shall have the meaning provided in Section 1004 of the Solid Waste Disposal Act (42 USC Section 6903) as amended from time to time.

24. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

25. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.

26. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.

27. *Notice of Award*—The written notice by Owner to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, Owner will sign and deliver the Agreement.

28. *Notice to Proceed*—A written notice given by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work under the Contract Documents.

29. *Owner*—The individual or entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.

30. *PCBs*—Polychlorinated biphenyls.

31. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.

32. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Times.

33. *Project*—The total construction of which the Work to be performed under the Contract Documents may be the whole, or a part.

34. *Project Manual*—The bound documentary information prepared for bidding and constructing the Work. A listing of the contents of the Project Manual, which may be bound in one or more volumes, is contained in the table(s) of contents.

35. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.

36. *Resident Project Representative*—The authorized representative of Engineer who may be assigned to the Site or any part thereof.

37. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.

38. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.

39. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

40. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.

41. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements for access thereto, and such other lands furnished by Owner which are designated for the use of Contractor.

42. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto.

43. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

44. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion thereof.

45. *Successful Bidder*—The Bidder submitting a responsive Bid to whom Owner makes an award.

46. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.

47. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.

48. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.

49. *Unit Price Work*—Work to be paid for on the basis of unit prices.

50. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.

51. *Work Change Directive*—A written statement to Contractor issued on or after the Effective Date of the Agreement and signed by Owner and recommended by Engineer ordering an

addition, deletion, or revision in the Work, or responding to differing or unforeseen subsurface or physical conditions under which the Work is to be performed or to emergencies. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the change ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order following negotiations by the parties as to its effect, if any, on the Contract Price or Contract Times.

1.02 *Terminology*

A. The words and terms discussed in Paragraph 1.02.B through F are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Paragraph 9.09 or any other provision of the Contract Documents.

C. *Day:*

1. The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective:*

1. The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

a. does not conform to the Contract Documents; or

b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

c. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 14.04 or 14.05).

E. *Furnish, Install, Perform, Provide:*

1. The word "furnish," when used in connection with services, materials, or equipment, shall mean to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, shall mean to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, shall mean to furnish and install said services, materials, or equipment complete and ready for intended use.

4. When "furnish," "install," "perform," or "provide" is not used in connection with services, materials, or equipment in a context clearly requiring an obligation of Contractor, "provide" is implied.

F. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

A. When Contractor delivers the executed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner such bonds as Contractor may be required to furnish.

B. *Evidence of Insurance:* Before any Work at the Site is started, Contractor and Owner shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Owner respectively are required to purchase and maintain in accordance with Article 5.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor up to ten printed or hard copies of the Drawings and Project Manual. Additional copies will be furnished upon request at the cost of reproduction.

2.03 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the thirtieth day after the Effective Date of the Agreement or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Agreement. In no event will the Contract Times commence to run later than the sixtieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

2.04 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work shall be done at the Site prior to the date on which the Contract Times commence to run.

2.05 *Before Starting Construction*

A. *Preliminary Schedules:* Within 10 days after the Effective Date of the Agreement (unless otherwise specified in the General Requirements), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.06 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work and to discuss the schedules referred to in Paragraph 2.05.A, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit instructions, receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.07 *Initial Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference attended by Contractor, Engineer, and others as appropriate will be held to review for acceptability to Engineer as provided below the schedules submitted in accordance with Paragraph 2.05.A. Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedules. No progress payment shall be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on

Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to component parts of the Work.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to Owner.

C. Clarifications and interpretations of the Contract Documents shall be issued by Engineer as provided in Article 9.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of Owner, Contractor, or Engineer, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to Owner, Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor's Review of Contract Documents Before Starting Work*: Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein and all applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from Engineer before proceeding with any Work affected thereby.

2. *Contractor's Review of Contract Documents During Performance of Work*: If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 6.16.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and:

a. the provisions of any standard, specification, manual, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Amending and Supplementing Contract Documents*

A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by either a Change Order or a Work Change Directive.

B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work may be authorized, by one or more of the following ways:

1. A Field Order;

2. Engineer's approval of a Shop Drawing or Sample (subject to the provisions of Paragraph 6.17.D.3); or

3. Engineer's written interpretation or clarification.

3.05 *Reuse of Documents*

A. Contractor and any Subcontractor or Supplier shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media editions; or

2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

A. Unless otherwise stated in the Supplementary Conditions, the data furnished by Owner or Engineer to Contractor, or by Contractor to Owner or Engineer, that may be relied upon are limited to the printed copies (also known as hard copies). Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.

B. Because data stored in electronic media format can deteriorate or be modified inadvertently or otherwise without authorization of the data's creator, the party receiving electronic files agrees that it will perform acceptance tests or procedures within 60 days, after which the receiving party shall be deemed to have accepted the data thus transferred. Any errors detected within the 60-day acceptance period will be corrected by the transferring party.

C. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. Owner will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities. If Contractor and Owner are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, as a result of any delay in Owner's furnishing the Site or a part thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings:* The Supplementary Conditions identify:

1. those reports known to Owner of explorations and tests of subsurface conditions at or contiguous to the Site; and

2. those drawings known to Owner of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice:* If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any "technical data" on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or

2. is of such a nature as to require a change in the Contract Documents; or

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except as aforesaid) until receipt of written order to do so.

B. *Engineer's Review*: After receipt of written notice as required by Paragraph 4.03.A, Engineer will promptly review the pertinent condition, determine the necessity of Owner's obtaining additional exploration or tests with respect thereto, and advise Owner in writing (with a copy to Contractor) of Engineer's findings and conclusions.

C. *Possible Price and Times Adjustments:*

1. The Contract Price or the Contract Times, or both, will be equitably adjusted to the extent that the existence of such differing subsurface or physical condition causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

a. such condition must meet any one or more of the categories described in Paragraph 4.03.A; and

b. with respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraphs 9.07 and 11.03.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times if:

a. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract; or

b. the existence of such condition could reasonably have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and

contiguous areas required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such final commitment; or

c. Contractor failed to give the written notice as required by Paragraph 4.03.A.

3. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times, or both, a Claim may be made therefor as provided in Paragraph 10.05. However, neither Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to Owner or Engineer by the owners of such Underground Facilities, including Owner, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. Owner and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and

2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:

a. reviewing and checking all such information and data;

b. locating all Underground Facilities shown or indicated in the Contract Documents;

c. coordination of the Work with the owners of such Underground Facilities, including Owner, during construction; and

d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.16.A), identify the owner of such Underground Facility and give written notice to that owner and to Owner and Engineer. Engineer will promptly review the Underground Facility and determine the extent, if any, to which a change is required in the Contract Documents to reflect and document the

consequences of the existence or location of the Underground Facility. During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

2. If Engineer concludes that a change in the Contract Documents is required, a Work Change Directive or a Change Order will be issued to reflect and document such consequences. An equitable adjustment shall be made in the Contract Price or Contract Times, or both, to the extent that they are attributable to the existence or location of any Underground Facility that was not shown or indicated or not shown or indicated with reasonable accuracy in the Contract Documents and that Contractor did not know of and could not reasonably have been expected to be aware of or to have anticipated. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment in Contract Price or Contract Times, Owner or Contractor may make a Claim therefor as provided in Paragraph 10.05.

4.05 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.06 *Hazardous Environmental Condition at Site*

A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at the Site.

B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Except for such reliance on such "technical data," Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or

2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any "technical data" or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.

D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.16.A); and (iii) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 4.06.E.

E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Owner has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such special conditions under which Work is agreed to be resumed by Contractor, either party may make a Claim therefor as provided in Paragraph 10.05.

F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a Claim therefor as provided in Paragraph 10.05. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 7.

G. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition: (i) was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be included within the scope of the Work, and (ii) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

H. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.H shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

I. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

B. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority shall show that it is effective on the date the agent or attorney-in-fact signed each bond.

C. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in any state where any part of the Project is located or it ceases to meet the requirements of Paragraph 5.01.B, Contractor shall promptly notify Owner and Engineer and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01.B and 5.02.

5.02 *Licensed Sureties and Insurers*

A. All bonds and insurance required by the Contract Documents to be purchased and maintained by Owner or Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the jurisdiction in which the Project is located to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also

meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.03 *Certificates of Insurance*

A. Contractor shall deliver to Owner, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Owner or any other additional insured) which Contractor is required to purchase and maintain.

B. Owner shall deliver to Contractor, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance requested by Contractor or any other additional insured) which Owner is required to purchase and maintain.

C. Failure of Owner to demand such certificates or other evidence of Contractor's full compliance with these insurance requirements or failure of Owner to identify a deficiency in compliance from the evidence provided shall not be construed as a waiver of Contractor's obligation to maintain such insurance.

D. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor.

E. The insurance and insurance limits required herein shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

5.04 *Contractor's Insurance*

A. Contractor shall purchase and maintain such insurance as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:

1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;

2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees;

3. claims for damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees;

4. claims for damages insured by reasonably available personal injury liability coverage which are sustained:

a. by any person as a result of an offense directly or indirectly related to the employment of such person by Contractor, or

b. by any other person for any other reason;

5. claims for damages, other than to the Work itself, because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom; and

6. claims for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance or use of any motor vehicle.

B. The policies of insurance required by this Paragraph 5.04 shall:

1. with respect to insurance required by Paragraphs 5.04.A.3 through 5.04.A.6 inclusive, be written on an occurrence basis, include as additional insureds (subject to any customary exclusion regarding professional liability) Owner and Engineer, and any other individuals or entities identified in the Supplementary Conditions, all of whom shall be listed as additional insureds, and include coverage for the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of all such additional insureds, and the insurance afforded to these additional insureds shall provide primary coverage for all claims covered thereby;

2. include at least the specific coverages and be written for not less than the limits of liability provided in the Supplementary Conditions or required by Laws or Regulations, whichever is greater;

3. include contractual liability insurance covering Contractor's indemnity obligations under Paragraphs 6.11 and 6.20;

4. contain a provision or endorsement that the coverage afforded will not be canceled, materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other additional insured identified in the Supplementary Conditions to whom a certificate of insurance has been issued (and the certificates of insurance furnished by the Contractor pursuant to Paragraph 5.03 will so provide);

5. remain in effect at least until final payment and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work in accordance with Paragraph 13.07; and

6. include completed operations coverage:

a. Such insurance shall remain in effect for two years after final payment.

b. Contractor shall furnish Owner and each other additional insured identified in the Supplementary Conditions, to whom a certificate of insurance has been issued, evidence satisfactory to Owner and any such additional insured of continuation of such insurance at final payment and one year thereafter.

5.05 *Owner's Liability Insurance*

A. In addition to the insurance required to be provided by Contractor under Paragraph 5.04, Owner, at Owner's option, may purchase and maintain at Owner's expense Owner's own liability insurance as will protect Owner against claims which may arise from operations under the Contract Documents.

5.06 *Property Insurance*

A. Unless otherwise provided in the Supplementary Conditions, Owner shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). This insurance shall:

1. include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee;

2. be written on a Builder's Risk "all-risk" policy form that shall at least include insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment in transit, and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions.

3. include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);

4. cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;

5. allow for partial utilization of the Work by Owner;

6. include testing and startup; and

7. be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor, and Engineer with 30 days written notice to each other loss payee to whom a certificate of insurance has been issued.

B. Owner shall purchase and maintain such equipment breakdown insurance or additional property insurance as may be required by the Supplementary Conditions or Laws and Regulations which will include the interests of Owner, Contractor, Subcontractors, and Engineer, and any other individuals or entities identified in the Supplementary Conditions, and the officers, directors,

members, partners, employees, agents, consultants and subcontractors of each and any of them, each of whom is deemed to have an insurable interest and shall be listed as a loss payee.

C. All the policies of insurance (and the certificates or other evidence thereof) required to be purchased and maintained in accordance with this Paragraph 5.06 will contain a provision or endorsement that the coverage afforded will not be canceled or materially changed or renewal refused until at least 30 days prior written notice has been given to Owner and Contractor and to each other loss payee to whom a certificate of insurance has been issued and will contain waiver provisions in accordance with Paragraph 5.07.

D. Owner shall not be responsible for purchasing and maintaining any property insurance specified in this Paragraph 5.06 to protect the interests of Contractor, Subcontractors, or others in the Work to the extent of any deductible amounts that are identified in the Supplementary Conditions. The risk of loss within such identified deductible amount will be borne by Contractor, Subcontractors, or others suffering any such loss, and if any of them wishes property insurance coverage within the limits of such amounts, each may purchase and maintain it at the purchaser's own expense.

E. If Contractor requests in writing that other special insurance be included in the property insurance policies provided under this Paragraph 5.06, Owner shall, if possible, include such insurance, and the cost thereof will be charged to Contractor by appropriate Change Order. Prior to commencement of the Work at the Site, Owner shall in writing advise Contractor whether or not such other insurance has been procured by Owner.

5.07 *Waiver of Rights*

A. Owner and Contractor intend that all policies purchased in accordance with Paragraph 5.06 will protect Owner, Contractor, Subcontractors, and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) in such policies and will provide primary coverage for all losses and damages caused by the perils or causes of loss covered thereby. All such policies shall contain provisions to the effect that in the event of payment of any loss or damage the insurers will have no rights of recovery against any of the insureds or loss payees thereunder. Owner and Contractor waive all rights against each other and their respective officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for all losses and damages caused by, arising out of or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Subcontractors and Engineer, and all other individuals or entities identified in the Supplementary Conditions as loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) under such policies for losses and damages so caused. None of the above waivers shall extend to the rights that any party making such waiver may have to the proceeds of insurance held by Owner as trustee or otherwise payable under any policy so issued.

B. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them for:

1. loss due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other perils whether or not insured by Owner; and

2. loss or damage to the completed Project or part thereof caused by, arising out of, or resulting from fire or other insured peril or cause of loss covered by any property insurance maintained on the completed Project or part thereof by Owner during partial utilization pursuant to Paragraph 14.05, after Substantial Completion pursuant to Paragraph 14.04, or after final payment pursuant to Paragraph 14.07.

C. Any insurance policy maintained by Owner covering any loss, damage or consequential loss referred to in Paragraph 5.07.B shall contain provisions to the effect that in the event of payment of any such loss, damage, or consequential loss, the insurers will have no rights of recovery against Contractor, Subcontractors, or Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them.

5.08 *Receipt and Application of Insurance Proceeds*

A. Any insured loss under the policies of insurance required by Paragraph 5.06 will be adjusted with Owner and made payable to Owner as fiduciary for the loss payees, as their interests may appear, subject to the requirements of any applicable mortgage clause and of Paragraph 5.08.B. Owner shall deposit in a separate account any money so received and shall distribute it in accordance with such agreement as the parties in interest may reach. If no other special agreement is reached, the damaged Work shall be repaired or replaced, the moneys so received applied on account thereof, and the Work and the cost thereof covered by an appropriate Change Order.

B. Owner as fiduciary shall have power to adjust and settle any loss with the insurers unless one of the parties in interest shall object in writing within 15 days after the occurrence of loss to Owner's exercise of this power. If such objection be made, Owner as fiduciary shall make settlement with the insurers in accordance with such agreement as the parties in interest may reach. If no such agreement among the parties in interest is reached, Owner as fiduciary shall adjust and settle the loss with the insurers and, if required in writing by any party in interest, Owner as fiduciary shall give bond for the proper performance of such duties.

5.09 *Acceptance of Bonds and Insurance; Option to Replace*

A. If either Owner or Contractor has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the other party in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the objecting party shall so notify the other party in writing within 10 days after receipt of the certificates (or other evidence requested) required by Paragraph 2.01.B. Owner and Contractor shall each provide to the other such additional information in respect of insurance provided as the other may reasonably request. If either party does not purchase or maintain all of the bonds and insurance required of such party by the Contract Documents, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage. Without prejudice to any other right or remedy, the other party may elect to obtain equivalent bonds or insurance to protect such other party's

interests at the expense of the party who was required to provide such coverage, and a Change Order shall be issued to adjust the Contract Price accordingly.

5.10 *Partial Utilization, Acknowledgment of Property Insurer*

A. If Owner finds it necessary to occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work as provided in Paragraph 14.05, no such use or occupancy shall commence before the insurers providing the property insurance pursuant to Paragraph 5.06 have acknowledged notice thereof and in writing effected any changes in coverage necessitated thereby. The insurers providing the property insurance shall consent by endorsement on the policy or policies, but the property insurance shall not be canceled or permitted to lapse on account of any such partial use or occupancy.

ARTICLE 6 – CONTRACTOR'S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction. Contractor shall not be responsible for the negligence of Owner or Engineer in the design or specification of a specific means, method, technique, sequence, or procedure of construction which is shown or indicated in and expressly required by the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during regular working hours. Contractor will not permit the performance of Work on a Saturday, Sunday, or any legal holiday without Owner's written consent (which will not be unreasonably withheld) given after prior written notice to Engineer.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

6.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.07 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.07) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times. Such adjustments will comply with any provisions of the General Requirements applicable thereto.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Times may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment or material or equipment of other Suppliers may be submitted to Engineer for review under the circumstances described below.

1. *"Or-Equal" Items:* If in Engineer's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by Engineer as an "or-equal" item, in which case review and approval of the proposed item may, in Engineer's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that:

1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and

3) it has a proven record of performance and availability of responsive service.

b. Contractor certifies that, if approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

a. If in Engineer's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it will be considered a proposed substitute item.

b. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by Engineer from anyone other than Contractor.

c. The requirements for review by Engineer will be as set forth in Paragraph 6.05.A.2.d, as supplemented by the General Requirements, and as Engineer may decide is appropriate under the circumstances.

d. Contractor shall make written application to Engineer for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application:

1) shall certify that the proposed substitute item will:

a) perform adequately the functions and achieve the results called for by the general design,

b) be similar in substance to that specified, and

c) be suited to the same use as that specified;

2) will state:

a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of Substantial Completion on time,

b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item, and

c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty;

3) will identify:

a) all variations of the proposed substitute item from that specified, and

b) available engineering, sales, maintenance, repair, and replacement services; and

4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and claims of other contractors affected by any resulting change.

B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by Engineer. Contractor shall submit sufficient information to allow Engineer, in Engineer's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. The requirements for review by Engineer will be similar to those provided in Paragraph 6.05.A.2.

C. *Engineer's Evaluation:* Engineer will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No "or equal" or substitute will be ordered, installed or utilized until Engineer's review is complete, which will be evidenced by a Change Order in the case of a substitute and an approved Shop Drawing for an "or equal." Engineer will advise Contractor in writing of any negative determination.

D. *Special Guarantee:* Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

E. *Engineer's Cost Reimbursement*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

F. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity (including those acceptable to Owner as indicated in Paragraph 6.06.B), whether initially or as a replacement, against whom Owner may have reasonable objection. Contractor shall not be

required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection.

B. If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, or other individuals or entities to be submitted to Owner in advance for acceptance by Owner by a specified date prior to the Effective Date of the Agreement, and if Contractor has submitted a list thereof in accordance with the Supplementary Conditions, Owner's acceptance (either in writing or by failing to make written objection thereto by the date indicated for acceptance or objection in the Bidding Documents or the Contract Documents) of any such Subcontractor, Supplier, or other individual or entity so identified may be revoked on the basis of reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor, Supplier, or other individual or entity, and the Contract Price will be adjusted by the difference in the cost occasioned by such replacement, and an appropriate Change Order will be issued. No acceptance by Owner of any such Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, shall constitute a waiver of any right of Owner or Engineer to reject defective Work.

C. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

   1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between Owner or Engineer and any such Subcontractor, Supplier or other individual or entity; nor

   2. shall create any obligation on the part of Owner or Engineer to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.

D. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.

E. Contractor shall require all Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work to communicate with Engineer through Contractor.

F. The divisions and sections of the Specifications and the identifications of any Drawings shall not control Contractor in dividing the Work among Subcontractors or Suppliers or delineating the Work to be performed by any specific trade.

G. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of Owner and Engineer. Whenever any such agreement is with a Subcontractor or Supplier who is listed as a loss payee on the property insurance provided in Paragraph 5.06, the agreement between the Contractor and the Subcontractor or Supplier will contain provisions whereby the Subcontractor or Supplier waives all rights against Owner,

Contractor, Engineer, and all other individuals or entities identified in the Supplementary Conditions to be listed as insureds or loss payees (and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them) for all losses and damages caused by, arising out of, relating to, or resulting from any of the perils or causes of loss covered by such policies and any other property insurance applicable to the Work. If the insurers on any such policies require separate waiver forms to be signed by any Subcontractor or Supplier, Contractor will obtain the same.

6.07 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by Owner in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.08 *Permits*

A. Unless otherwise provided in the Supplementary Conditions, Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement. Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

6.09 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.03.

C. Changes in Laws or Regulations not known at the time of opening of Bids (or, on the Effective Date of the Agreement if there were no Bids) having an effect on the cost or time of performance of the Work shall be the subject of an adjustment in Contract Price or Contract Times. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

6.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

6.11 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.

2. Should any claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly settle with such other party by negotiation or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law.

3. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought

by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused by or based upon Contractor's performance of the Work.

B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.

C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all approved Shop Drawings will be available to Engineer for reference. Upon completion of the Work, these record documents, Samples, and Shop Drawings will be delivered to Engineer for Owner.

6.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;

2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and

shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.

C. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. The Supplementary Conditions identify any Owner's safety programs that are applicable to the Work.

D. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

E. All damage, injury, or loss to any property referred to in Paragraph 6.13.A.2 or 6.13.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and Engineer has issued a notice to Owner and Contractor in accordance with Paragraph 14.07.B that the Work is acceptable (except as otherwise expressly provided in connection with Substantial Completion).

6.14 *Safety Representative*

A. Contractor shall designate a qualified and experienced safety representative at the Site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of safety precautions and programs.

6.15 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

6.16 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If Engineer determines that a change in the Contract Documents is

required because of the action taken by Contractor in response to such an emergency, a Work Change Directive or Change Order will be issued.

6.17 *Shop Drawings and Samples*

A. Contractor shall submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as Engineer may require.

1. *Shop Drawings:*

a. Submit number of copies specified in the General Requirements.

b. Data shown on the Shop Drawings will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide and to enable Engineer to review the information for the limited purposes required by Paragraph 6.17.D.

2. *Samples:*

a. Submit number of Samples specified in the Specifications.

b. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the submittal for the limited purposes required by Paragraph 6.17.D.

B. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Submittal Procedures:*

1. Before submitting each Shop Drawing or Sample, Contractor shall have:

a. reviewed and coordinated each Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determined and verified all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto;

c. determined and verified the suitability of all materials offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

d. determined and verified all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

2. Each submittal shall bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal.

3. With each submittal, Contractor shall give Engineer specific written notice of any variations that the Shop Drawing or Sample may have from the requirements of the Contract Documents. This notice shall be both a written communication separate from the Shop Drawings or Sample submittal; and, in addition, by a specific notation made on each Shop Drawing or Sample submitted to Engineer for review and approval of each such variation.

D. *Engineer's Review:*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the Schedule of Submittals acceptable to Engineer. Engineer's review and approval will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

3. Engineer's review and approval shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 6.17.C.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer's review and approval shall not relieve Contractor from responsibility for complying with the requirements of Paragraph 6.17.C.1.

E. *Resubmittal Procedures:*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous submittals.

6.18 *Continuing the Work*

A. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as permitted by Paragraph 15.04 or as Owner and Contractor may otherwise agree in writing.

6.19 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.

B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:

1. observations by Engineer;

2. recommendation by Engineer or payment by Owner of any progress or final payment;

3. the issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. use or occupancy of the Work or any part thereof by Owner;

5. any review and approval of a Shop Drawing or Sample submittal or the issuance of a notice of acceptability by Engineer;

6. any inspection, test, or approval by others; or

7. any correction of defective Work by Owner.

6.20 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss, or damage is attributable to bodily injury, sickness, disease, or death, or to injury to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable .

B. In any and all claims against Owner or Engineer or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 6.20.A shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

C. The indemnification obligations of Contractor under Paragraph 6.20.A shall not extend to the liability of Engineer and Engineer's officers, directors, members, partners, employees, agents, consultants and subcontractors arising out of:

1. the preparation or approval of, or the failure to prepare or approve maps, Drawings, opinions, reports, surveys, Change Orders, designs, or Specifications; or

2. giving directions or instructions, or failing to give them, if that is the primary cause of the injury or damage.

6.21 *Delegation of Professional Design Services*

A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Contractor shall not be required to provide professional services in violation of applicable law.

B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, Owner and Engineer will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer.

C. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided Owner and Engineer have specified to Contractor all performance and design criteria that such services must satisfy.

D. Pursuant to this Paragraph 6.21, Engineer's review and approval of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. Engineer's review and approval of Shop Drawings and other submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.17.D.1.

E. Contractor shall not be responsible for the adequacy of the performance or design criteria required by the Contract Documents.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

A. Owner may perform other work related to the Project at the Site with Owner's employees, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then:

1. written notice thereof will be given to Contractor prior to starting any such other work; and

2. if Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in the Contract Price or Contract Times that should be allowed as a result of such other work, a Claim may be made therefor as provided in Paragraph 10.05.

B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and Owner, if Owner is performing other work with Owner's employees, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected. The duties and responsibilities of Contractor under this Paragraph are for the benefit of such utility owners and other contractors to the extent that there are comparable provisions for the benefit of Contractor in said direct contracts between Owner and such utility owners and other contractors.

C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

7.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:

1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;

2. the specific matters to be covered by such authority and responsibility will be itemized; and

3. the extent of such authority and responsibilities will be provided.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

7.03 *Legal Relationships*

A. Paragraphs 7.01.A and 7.02 are not applicable for utilities not under the control of Owner.

B. Each other direct contract of Owner under Paragraph 7.01.A shall provide that the other contractor is liable to Owner and Contractor for the reasonable direct delay and disruption costs incurred by Contractor as a result of the other contractor's wrongful actions or inactions.

C. Contractor shall be liable to Owner and any other contractor under direct contract to Owner for the reasonable direct delay and disruption costs incurred by such other contractor as a result of Contractor's wrongful action or inactions.

ARTICLE 8 – OWNER'S RESPONSIBILITIES

8.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

8.02 *Replacement of Engineer*

A. In case of termination of the employment of Engineer, Owner shall appoint an engineer to whom Contractor makes no reasonable objection, whose status under the Contract Documents shall be that of the former Engineer.

8.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

8.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in Paragraphs 14.02.C and 14.07.C.

8.05 *Lands and Easements; Reports and Tests*

A. Owner's duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

8.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 5.

8.07 *Change Orders*

A. Owner is obligated to execute Change Orders as indicated in Paragraph 10.03.

8.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.B.

8.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

8.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract Documents.

8.12 *Compliance with Safety Program*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed pursuant to Paragraph 6.13.D.

ARTICLE 9 – ENGINEER'S STATUS DURING CONSTRUCTION

9.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract Documents.

9.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe as an experienced and qualified design professional the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or

continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 9.09. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

9.03 *Project Representative*

A. If Owner and Engineer agree, Engineer will furnish a Resident Project Representative to assist Engineer in providing more extensive observation of the Work. The authority and responsibilities of any such Resident Project Representative and assistants will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in Paragraph 9.09. If Owner designates another representative or agent to represent Owner at the Site who is not Engineer's consultant, agent or employee, the responsibilities and authority and limitations thereon of such other individual or entity will be as provided in the Supplementary Conditions.

9.04 *Authorized Variations in Work*

A. Engineer may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on Owner and also on Contractor, who shall perform the Work involved promptly. If Owner or Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, or both, and the parties are unable to agree on entitlement to or on the amount or extent, if any, of any such adjustment, a Claim may be made therefor as provided in Paragraph 10.05.

9.05 *Rejecting Defective Work*

A. Engineer will have authority to reject Work which Engineer believes to be defective, or that Engineer believes will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Engineer will also have authority to require special inspection or testing of the Work as provided in Paragraph 13.04, whether or not the Work is fabricated, installed, or completed.

9.06 *Shop Drawings, Change Orders and Payments*

A. In connection with Engineer's authority, and limitations thereof, as to Shop Drawings and Samples, see Paragraph 6.17.

B. In connection with Engineer's authority, and limitations thereof, as to design calculations and design drawings submitted in response to a delegation of professional design services, if any, see Paragraph 6.21.

C. In connection with Engineer's authority as to Change Orders, see Articles 10, 11, and 12.

D. In connection with Engineer's authority as to Applications for Payment, see Article 14.

9.07 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, subject to the provisions of Paragraph 10.05.

9.08 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder. All matters in question and other matters between Owner and Contractor arising prior to the date final payment is due relating to the acceptability of the Work, and the interpretation of the requirements of the Contract Documents pertaining to the performance of the Work, will be referred initially to Engineer in writing within 30 days of the event giving rise to the question.

B. Engineer will, with reasonable promptness, render a written decision on the issue referred. If Owner or Contractor believes that any such decision entitles them to an adjustment in the Contract Price or Contract Times or both, a Claim may be made under Paragraph 10.05. The date of Engineer's decision shall be the date of the event giving rise to the issues referenced for the purposes of Paragraph 10.05.B.

C. Engineer's written decision on the issue referred will be final and binding on Owner and Contractor, subject to the provisions of Paragraph 10.05.

D. When functioning as interpreter and judge under this Paragraph 9.08, Engineer will not show partiality to Owner or Contractor and will not be liable in connection with any interpretation or decision rendered in good faith in such capacity.

9.09 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 9 or under any other provision of the Contract Documents nor any decision made by Engineer in good faith either to exercise or not

exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer shall create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Paragraph 14.07.A will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals that the results certified indicate compliance with, the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 9.09 shall also apply to the Resident Project Representative, if any, and assistants, if any.

9.10 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Engineer has been informed pursuant to Paragraph 6.13.D.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS

10.01 *Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work by a Change Order, or a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided).

B. If Owner and Contractor are unable to agree on entitlement to, or on the amount or extent, if any, of an adjustment in the Contract Price or Contract Times, or both, that should be allowed as a result of a Work Change Directive, a Claim may be made therefor as provided in Paragraph 10.05.

10.02 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.16 or in the case of uncovering Work as provided in Paragraph 13.04.D.

10.03 *Execution of Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders recommended by Engineer covering:

1. changes in the Work which are: (i) ordered by Owner pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08.A or Owner's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;

2. changes in the Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive; and

3. changes in the Contract Price or Contract Times which embody the substance of any written decision rendered by Engineer pursuant to Paragraph 10.05; provided that, in lieu of executing any such Change Order, an appeal may be taken from any such decision in accordance with the provisions of the Contract Documents and applicable Laws and Regulations, but during any such appeal, Contractor shall carry on the Work and adhere to the Progress Schedule as provided in Paragraph 6.18.A.

10.04 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

10.05 *Claims*

A. *Engineer's Decision Required*: All Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the Engineer for decision. A decision by Engineer shall be required as a condition precedent to any exercise by Owner or Contractor of any rights or remedies either may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Claims.

B. *Notice:* Written notice stating the general nature of each Claim shall be delivered by the claimant to Engineer and the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto. The responsibility to substantiate a Claim shall rest with the party making the Claim. Notice of the amount or extent of the Claim, with supporting data

shall be delivered to the Engineer and the other party to the Contract within 60 days after the start of such event (unless Engineer allows additional time for claimant to submit additional or more accurate data in support of such Claim). A Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.B. A Claim for an adjustment in Contract Times shall be prepared in accordance with the provisions of Paragraph 12.02.B. Each Claim shall be accompanied by claimant's written statement that the adjustment claimed is the entire adjustment to which the claimant believes it is entitled as a result of said event. The opposing party shall submit any response to Engineer and the claimant within 30 days after receipt of the claimant's last submittal (unless Engineer allows additional time).

C. *Engineer's Action*: Engineer will review each Claim and, within 30 days after receipt of the last submittal of the claimant or the last submittal of the opposing party, if any, take one of the following actions in writing:

1. deny the Claim in whole or in part;

2. approve the Claim; or

3. notify the parties that the Engineer is unable to resolve the Claim if, in the Engineer's sole discretion, it would be inappropriate for the Engineer to do so. For purposes of further resolution of the Claim, such notice shall be deemed a denial.

D. In the event that Engineer does not take action on a Claim within said 30 days, the Claim shall be deemed denied.

E. Engineer's written action under Paragraph 10.05.C or denial pursuant to Paragraphs 10.05.C.3 or 10.05.D will be final and binding upon Owner and Contractor, unless Owner or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.

F. No Claim for an adjustment in Contract Price or Contract Times will be valid if not submitted in accordance with this Paragraph 10.05.

ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

11.01 *Cost of the Work*

A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work or because of the event giving rise to the Claim. Except as otherwise may be agreed to in writing by Owner, such costs shall be in amounts no higher than those prevailing in the locality of the Project, shall not include any of the costs itemized in Paragraph 11.01.B, and shall include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include, but not be limited to, salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, shall be included in the above to the extent authorized by Owner.

2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts shall accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts shall accrue to Owner. All trade discounts, rebates and refunds and returns from sale of surplus materials and equipment shall accrue to Owner, and Contractor shall make provisions so that they may be obtained.

3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, who will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.

4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.

5. Supplemental costs including the following:

    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.

    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.

    c. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of

said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of property insurance established in accordance with Paragraph 5.06.D), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as telegrams, long distance telephone calls, telephone service at the Site, express and courier services, and similar petty cash items in connection with the Work.

i. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.

2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not

limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

5. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraphs 11.01.A.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order or when a Claim for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to Engineer an itemized cost breakdown together with supporting data.

11.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances:*

1. Contractor agrees that:

a. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.

C. *Contingency Allowance:*

1. Contractor agrees that a contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to

the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by Engineer subject to the provisions of Paragraph 9.07.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Paragraph 10.05 if:

1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

2. there is no corresponding adjustment with respect to any other item of Work; and

3. Contractor believes that Contractor is entitled to an increase in Contract Price as a result of having incurred additional expense or Owner believes that Owner is entitled to a decrease in Contract Price and the parties are unable to agree as to the amount of any such increase or decrease.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIMES

12.01 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Claim for an adjustment in the Contract Price shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. The value of any Work covered by a Change Order or of any Claim for an adjustment in the Contract Price will be determined as follows:

1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or

2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2); or

3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).

C. *Contractor's Fee:* The Contractor's fee for overhead and profit shall be determined as follows:

1. a mutually acceptable fixed fee; or

2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

   a. for costs incurred under Paragraphs 11.01.A.1 and 11.01.A.2, the Contractor's fee shall be 15 percent;

   b. for costs incurred under Paragraph 11.01.A.3, the Contractor's fee shall be five percent;

   c. where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent of the amount paid to the next lower tier Subcontractor;

   d. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.4, 11.01.A.5, and 11.01.B;

   e. the amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent of such net decrease; and

   f. when both additions and credits are involved in any one change, the adjustment in Contractor's fee shall be computed on the basis of the net change in accordance with Paragraphs 12.01.C.2.a through 12.01.C.2.e, inclusive.

12.02 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Claim for an adjustment in the Contract Times shall be based on written notice submitted by the party making the Claim to the Engineer and the other party to the Contract in accordance with the provisions of Paragraph 10.05.

B. Any adjustment of the Contract Times covered by a Change Order or any Claim for an adjustment in the Contract Times will be determined in accordance with the provisions of this Article 12.

12.03 *Delays*

A. Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefor as provided in Paragraph 12.02.A. Delays beyond the control of Contractor shall include, but not be limited to, acts or

neglect by Owner, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God.

B. If Owner, Engineer, or other contractors or utility owners performing other work for Owner as contemplated by Article 7, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times, or both. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.

C. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph 12.03.C.

D. Owner, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.

E. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 *Notice of Defects*

A. Prompt notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 *Tests and Inspections*

A. Contractor shall give Engineer timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.

B. Owner shall employ and pay for the services of an independent testing laboratory to perform all inspections, tests, or approvals required by the Contract Documents except:

1. for inspections, tests, or approvals covered by Paragraphs 13.03.C and 13.03.D below;

2. that costs incurred in connection with tests or inspections conducted pursuant to Paragraph 13.04.B shall be paid as provided in Paragraph 13.04.C; and

3. as otherwise specifically provided in the Contract Documents.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

D. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, or approvals required for Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, or approvals shall be performed by organizations acceptable to Owner and Engineer.

E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation.

F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense unless Contractor has given Engineer timely notice of Contractor's intention to cover the same and Engineer has not acted with reasonable promptness in response to such notice.

13.04 *Uncovering Work*

A. If any Work is covered contrary to the written request of Engineer, it must, if requested by Engineer, be uncovered for Engineer's observation and replaced at Contractor's expense.

B. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.

C. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05.

D. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, Contractor may make a Claim therefor as provided in Paragraph 10.05.

13.05 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work shall not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

A. Promptly after receipt of written notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Engineer, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents) or by any specific provision of the Contract Documents, any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by Owner or permitted by Laws and Regulations as contemplated in Paragraph 6.11.A is found to be defective, Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. repair such defective land or areas; or

2. correct such defective Work; or

3. if the defective Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.

B. If Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

C. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner (and, prior to Engineer's recommendation of final payment, Engineer) prefers to accept it, Owner may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness) and for the diminished value of the Work to the extent not otherwise paid by Contractor pursuant to this sentence. If any such acceptance occurs prior to Engineer's recommendation of final payment, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and Owner shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted. If the parties are unable to agree as to the amount thereof, Owner may make a Claim therefor as provided in Paragraph 10.05. If the acceptance occurs after such recommendation, an appropriate amount will be paid by Contractor to Owner.

13.09 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace rejected Work as required by Engineer in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, Owner may, after seven days written notice to Contractor, correct, or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 13.09, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, take possession of Contractor's tools, appliances, construction equipment and machinery at the Site, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this Paragraph.

C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and Owner shall be entitled to an appropriate decrease in the Contract Price. If the parties are unable to agree as to the amount of the adjustment, Owner may make a Claim therefor as provided in Paragraph 10.05. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 *Schedule of Values*

A. The Schedule of Values established as provided in Paragraph 2.07.A will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 *Progress Payments*

A. *Applications for Payments:*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an

Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that Owner has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate property insurance or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

2. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that all previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

3. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

B. *Review of Applications:*

1. Engineer will, within 10 days after receipt of each Application for Payment, either indicate in writing a recommendation of payment and present the Application to Owner or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 9.07, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or

involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract Documents; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work, or

   b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or

   c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work, or

   d. to make any examination to ascertain how or for what purposes Contractor has used the moneys paid on account of the Contract Price, or

   e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 14.02.B.2. Engineer may also refuse to recommend any such payment or, because of subsequently discovered evidence or the results of subsequent inspections or tests, revise or revoke any such payment recommendation previously made, to such extent as may be necessary in Engineer's opinion to protect Owner from loss because:

   a. the Work is defective, or completed Work has been damaged, requiring correction or replacement;

   b. the Contract Price has been reduced by Change Orders;

   c. Owner has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

   d. Engineer has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Payment Becomes Due:*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended will (subject to the provisions of Paragraph 14.02.D) become due, and when due will be paid by Owner to Contractor.

D. *Reduction in Payment:*

1. Owner may refuse to make payment of the full amount recommended by Engineer because:

   a. claims have been made against Owner on account of Contractor's performance or furnishing of the Work;

   b. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens;

   c. there are other items entitling Owner to a set-off against the amount recommended; or

   d. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.5.a through 14.02.B.5.c or Paragraph 15.02.A.

2. If Owner refuses to make payment of the full amount recommended by Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, when Contractor remedies the reasons for such action.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld shall be treated as an amount due as determined by Paragraph 14.02.C.1 and subject to interest as provided in the Agreement.

14.03 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

14.04 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete (except for items specifically listed by Contractor as incomplete) and request that Engineer issue a certificate of Substantial Completion.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a tentative certificate of Substantial Completion which shall fix the date of Substantial Completion. There shall be attached to the certificate a tentative list of items to be completed or corrected before

final payment. Owner shall have seven days after receipt of the tentative certificate during which to make written objection to Engineer as to any provisions of the certificate or attached list. If, after considering such objections, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the tentative certificate to Owner, notify Contractor in writing, stating the reasons therefor. If, after consideration of Owner's objections, Engineer considers the Work substantially complete, Engineer will, within said 14 days, execute and deliver to Owner and Contractor a definitive certificate of Substantial Completion (with a revised tentative list of items to be completed or corrected) reflecting such changes from the tentative certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of delivery of the tentative certificate of Substantial Completion, Engineer will deliver to Owner and Contractor a written recommendation as to division of responsibilities pending final payment between Owner and Contractor with respect to security, operation, safety, and protection of the Work, maintenance, heat, utilities, insurance, and warranties and guarantees. Unless Owner and Contractor agree otherwise in writing and so inform Engineer in writing prior to Engineer's issuing the definitive certificate of Substantial Completion, Engineer's aforesaid recommendation will be binding on Owner and Contractor until final payment.

E. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the tentative list.

14.05 *Partial Utilization*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. Owner at any time may request Contractor in writing to permit Owner to use or occupy any such part of the Work which Owner believes to be ready for its intended use and substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 14.04.A through D for that part of the Work.

2. Contractor at any time may notify Owner and Engineer in writing that Contractor considers any such part of the Work ready for its intended use and substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 14.04 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 5.10 regarding property insurance.

14.06 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

14.07 *Final Payment*

A. *Application for Payment:*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, marked-up record documents (as provided in Paragraph 6.12), and other documents, Contractor may make application for final payment following the procedure for progress payments.

2. The final Application for Payment shall be accompanied (except as previously delivered) by:

   a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.04.B.6;

   b. consent of the surety, if any, to final payment;

   c. a list of all Claims against Owner that Contractor believes are unsettled; and

   d. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of or Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 14.07.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (i) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (ii) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien.

B. *Engineer's Review of Application and Acceptance:*

1. If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying

documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract Documents have been fulfilled, Engineer will, within ten days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of payment and present the Application for Payment to Owner for payment. At the same time Engineer will also give written notice to Owner and Contractor that the Work is acceptable subject to the provisions of Paragraph 14.09. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Payment Becomes Due:*

1. Thirty days after the presentation to Owner of the Application for Payment and accompanying documentation, the amount recommended by Engineer, less any sum Owner is entitled to set off against Engineer's recommendation, including but not limited to liquidated damages, will become due and will be paid by Owner to Contractor.

14.08 *Final Completion Delayed*

A. If, through no fault of Contractor, final completion of the Work is significantly delayed, and if Engineer so confirms, Owner shall, upon receipt of Contractor's final Application for Payment (for Work fully completed and accepted) and recommendation of Engineer, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by Owner for Work not fully completed or corrected is less than the retainage stipulated in the Agreement, and if bonds have been furnished as required in Paragraph 5.01, the written consent of the surety to the payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by Contractor to Engineer with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Claims.

14.09 *Waiver of Claims*

A. The making and acceptance of final payment will constitute:

1. a waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection pursuant to Paragraph 14.06, from failure to comply with the Contract Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Contract Documents; and

2. a waiver of all Claims by Contractor against Owner other than those previously made in accordance with the requirements herein and expressly acknowledged by Owner in writing as still unsettled.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by notice in writing to Contractor and Engineer which will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be granted an adjustment in the Contract Price or an extension of the Contract Times, or both, directly attributable to any such suspension if Contractor makes a Claim therefor as provided in Paragraph 10.05.

15.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04);

2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;

3. Contractor's repeated disregard of the authority of Engineer; or

4. Contractor's violation in any substantial way of any provisions of the Contract Documents.

B. If one or more of the events identified in Paragraph 15.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor (without liability to Contractor for trespass or conversion);

2. incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere; and

3. complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 15.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when

so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this Paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 15.02.B and 15.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.01.A, the termination procedures of that bond shall supersede the provisions of Paragraphs 15.02.B and 15.02.C.

15.03 *Owner May Terminate For Convenience*

A. Upon seven days written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses;

3. all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) incurred in settlement of terminated contracts with Subcontractors, Suppliers, and others; and

4. reasonable expenses directly attributable to termination.

B. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

15.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (i) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (ii) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (iii) Owner fails for 30 days

to pay Contractor any sum finally determined to be due, then Contractor may, upon seven days written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the Contract and recover from Owner payment on the same terms as provided in Paragraph 15.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, seven days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this Paragraph 15.04 are not intended to preclude Contractor from making a Claim under Paragraph 10.05 for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this Paragraph.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 *Methods and Procedures*

A. Either Owner or Contractor may request mediation of any Claim submitted to Engineer for a decision under Paragraph 10.05 before such decision becomes final and binding. The mediation will be governed by the Construction Industry Mediation Rules of the American Arbitration Association in effect as of the Effective Date of the Agreement. The request for mediation shall be submitted in writing to the American Arbitration Association and the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.05.E.

B. Owner and Contractor shall participate in the mediation process in good faith. The process shall be concluded within 60 days of filing of the request. The date of termination of the mediation shall be determined by application of the mediation rules referenced above.

C. If the Claim is not resolved by mediation, Engineer's action under Paragraph 10.05.C or a denial pursuant to Paragraphs 10.05.C.3 or 10.05.D shall become final and binding 30 days after termination of the mediation unless, within that time period, Owner or Contractor:

1. elects in writing to invoke any dispute resolution process provided for in the Supplementary Conditions; or

2. agrees with the other party to submit the Claim to another dispute resolution process; or

3. gives written notice to the other party of the intent to submit the Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 *Giving Notice*

A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:

1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or

2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

17.02 *Computation of Times*

A. When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

17.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

17.06 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SUPPLEMENTAL CONDITIONS TO THE GENERAL CONDITIONS

This document is the supplementary conditions to the EJCDC Standard General Conditions of the Construction Contract copyrighted 2007. Under no circumstances shall these conditions be revised without written consent from Cape Fear Public Utility Authority. Supplementary conditions specific to projects shall be either included in the Agreement or within sections of Division 1: General Requirements.

SC – 1.01 Defined Terms

A.14 *Add the following sentence:*

Contract Times shall be measured in consecutive calendar days.

A.44 *Add the following sentence:*

A Substantial Complete date is the date the Owner accepts Substantial Completion in writing.

Add new term:

Soft Costs: Those costs not directly related to the construction, but are required to complete the Work and meet the requirements of this Contract. These costs include, but are not limited to, architect's and engineer's fees, testing and reporting fees, the appraisal fee, attorney's fees, government fees, permitting fees, tapping fees, assessment fees, interest, and loan fees.

SC – 2.01 Delivery of Bonds and Evidence of Insurance

B. *Add the following sentence:*

It is mutually agreed that CONTRACTOR is an independent contractor and not an agent or employee of the Authority nor does this create any type of joint employment relationship with any of the employees of the CONTRACTOR. As such the CONTRACTOR, or any employees thereof, or sub-contractors, or any employees thereof, shall not be entitled to any Authority employment benefits, such as, but not limited to, wages or salary, vacation, sick leave, insurance, workers' compensation, or pension and retirement benefits.

SC – 2.02 Copies of Documents

A. *Replace* "ten printed or hard copies" *with* "up to four printed or hard copies".

SC – 2.03 Commencement of Contract Times; Notice to Proceed

A. *Delete the last sentence of the first paragraph and replace with:*

In no event will the Contract Times commence to run later than the ninetieth day after the day of Bid opening or the thirtieth day after the Effective Date of the Agreement, whichever date is earlier.

SC – 3.03 Reporting and Resolving Discrepancies

A.1 *In the second sentence, replace* "has actual knowledge of" *with* "reasonably should discover,".

A.3 Delete the entire item

SC – 4.04 Underground Facilities

Add item C as follows:

B. Extreme care shall be exercised when excavating with heavy equipment near all existing structures and utilities. This includes, but is not limited to utility lines, utility poles, drainage structures, stability cables, buildings, streets, bridges, and railroads. The Owner will not assume, nor accept, any responsibility for charges assessed by private or public utility companies, the North Carolina Department of Transportation, local municipalities, or any property owners for damages sustained to their property by virtue of action on the part of the Contractor, nor such charges as may be imposed for personnel of these parties to furnish field location of any facilities to temporarily shore these facilities during construction. All such costs are to be borne by the Contractor and shall be included in the unit prices and/or lump sum prices stated in the Bid.

SC – 4.06 Hazardous Environmental Condition at Site

A. Replace entire item with:

Any reports detailing hazardous conditions on the Project Site that have been obtained shall be included in this Project Manual.

G. *Delete the entire item.*

SC – 5 BONDS AND INSURANCE

VOID entire Article 5 of General Conditions and replace with Bonds and Insurance section as follows:

5.01 Bonds: The Contractor shall provide both a Payment Bond and a Performance Bond wherein surety waives notice of any and all modifications, omissions, additions, changes, and advance payments or deferred payments in or about the Contract, and agrees that the obligations undertaken by the Bond shall not be impaired in any manner by reason or any such modifications, omissions, additions, changes, and advance payments or deferred payments. The surety bonds must set forth no requirements that suit be initiated prior to the time stipulated in applicable North Carolina Statutes of Limitation.

The Payment Bond and Performance Bond shall be executed by one or more surety companies legally authorized to do business in the State of North Carolina and shall become effective upon the awarding of the Contract. The attorney-in-fact who executes the required bonds on behalf of the surety shall attach a certified current copy of his or her power of attorney indicating his or her authority to execute the bonds and the monetary limit of such power.

These bonds shall remain in effect until two years after the date when final payment becomes due or until completion of the correction period specified in Paragraph 13.07, whichever is later, except as provided otherwise by Laws or Regulations by the Contract Documents.

The following are the requirements for both the Payment Bond and the Performance Bond for this Contract.

Payment Bond The Contractor shall provide a Payment Bond in the amount of one hundred percent (100%) of the Contract Price, conditioned upon the prompt payment for all labor or materials for which a Contractor or subcontractor is liable. The Payment Bond shall be solely for the protection of the persons furnishing materials or performing labor for which a Contractor or subcontractor is liable.

Performance Bond The Contractor shall provide a Performance Bond in the amount of one hundred percent (100%) of the Contract Price, conditioned upon the plans, specifications, and the Contract. The Performance Bond shall be solely for the protection of the Owner.

5.02 General Insurance: The Owner has listed standard **MINIMUM** insurance coverage in the Supplementary Conditions that the Contractor shall purchase, unless directed otherwise in writing. Additional insurance coverage requirements specific to this Project may be stated in Division I of the Project Manual. It is the responsibility of the Contractor to purchase the minimum required insurance stated in this Project Manual, as well as any other insurance it deems necessary to protect Contractor and the Owner.

5.03 Certificates and Notice of Cancellation: Before commencing Work, Contractor shall furnish Owner with Certificates of Insurance required as part of this Contract. Contractor shall maintain insurance from companies licensed to write business in North Carolina, with an A.M. Best Rating of "A VII" or higher and acceptable to Owner. The Certificates of Insurance shall indicate the type, amount, class of operations covered, applicable deductibles, effective date and expiration date of all policies.

The Certificates of Insurance, naming the OWNER as an additional insured where specified, shall be further evidenced by an actual endorsement furnished to the Owner before signing the contract between the Contractor and Owner.

The Contractor shall be solely responsible for securing Certificates of Insurance as therefore specified from all Subcontractors engaged in the Work.

5.04 **Workers Compensation and Employers Liability Insurance:** The Contractor shall provide Workers Compensation covering all of the Contractor's employees including officers, owners, and relatives to be engaged in the Work under this Contract, providing the required statutory benefits under North Carolina Workers Compensation Law, as well as Employers Liability Insurance providing limits at least in the amount of $1,000,000/$1,000,000/$1,000,000 applicable claims due to bodily injury by accident or disease and/or property damage.

The insurer shall agree to waive all rights of subrogation against the Cape Fear Public Utility Authority, its officers, officials, and employees for losses arising from work performed by the contractor for Cape Fear Public Utility Authority. Certificate of Insurance shall be further evidenced by an actual endorsement furnished to the Owner before signing the contract between the Contractor and Owner.

5.05 **Commercial General Liability Insurance:** The Contractor shall provide Commercial General Liability Insurance including coverage for the independent contractor operations, contractual liability assumed under the provisions of this Contract, products/completed operations liability, and broad form property damage liability. Exclusions applicable to explosion, collapse, and underground hazards are to be deleted when the Work involves these exposures. The policy shall provide liability limits at least in the amount listed in the table depending on the Contract Price:

Contract Price	Per Occurrence	Aggregate
Under $500,000	$1,000,000	$2,000,000
$500,000 and Above	$3,000,000	$5,000,000

The policy shall provide combined single limits, applicable to claims due to bodily injury and/or property damage evidenced by Endorsement #CG20 10 07 04. Owner shall be named as an additional insured under this policy.

5.06 **Automobile Liability Insurance:** The Contractor shall provide Automobile Liability Insurance covering all owned, non-owned, and hired vehicles to be used upon site or in connection with the Work. Contractor shall

provide liability limits at least in the amount of $1,000,000 per occurrence combined single limits applicable to claims due to bodily injury and/or property damage. Owner shall be named as an additional insured under this policy.

5.07 Umbrella Liability Insurance: The Contractor shall provide Umbrella Liability Insurance as excess coverage above the underlying Employers Liability Insurance, Commercial General Liability Insurance, and Automobile Liability Insurance policies required by this Contract. This coverage shall provide excess liability limits at least in the amount of $10,000,000 per occurrence, combined single limits, applicable to claims arising from bodily injury, personal injury, and/or property damage. The parties named as additional insured under the primary underlying policies are to be included as additional insured under the Umbrella Liability Insurance coverage.

5.08 Contractors Installation Floater: The Contractor shall provide and maintain Contractors Installation Floater. The following are the **MINIMUM** requirements for Contractors Installation Floater. Additional requirements specific to this Project may be stated in Division I of the Project Manual. It is the responsibility of the Contractor to purchase the minimum required insurance stated in this Project Manual, as well as any other insurance it deems necessary to protect Contractor and the Owner.

Contractors Installation Floater The Contractor shall provide and maintain Contractors Installation Floater or appropriate insurance protecting against loss or damage of the equipment to be installed. Coverage shall be written in the amount of one hundred percent (100%) of the value of the equipment and materials in force until accepted by the Owner. The coverage shall be written in the Contractor's name and shall protect the Owner as its interests may appear. Contractor shall be responsible for any loss within the deductible applicable to this insurance.

5.09 Subcontractors: The Contractor shall be fully responsible for all acts and omissions of its Subcontractors and of persons and organizations employed by it to the same extent that Contractor would be responsible for these acts and omissions.

The Contractor shall either (a) require each of his Subcontractors to procure and to maintain during the life of his subcontract, Subcontractor's Public Liability and Property Damage, and Vehicular Liability of the type and in the same amounts as specified in the preceding paragraph, or (b) insure the activities of his Subcontractors in his own policy.

SC – 6.01 Supervision and Superintendence

A. *Add the following paragraphs:*

At no time during the course of construction shall any of the Contractor's personnel, including Subcontractors and their personnel, behave in a rude or abusive manner on the Project Site, or in any of this Project's meetings on and offsite. This type of behavior shall be grounds for dismissal of such personnel from the Project.

No alcoholic beverages or narcotics of any description will be allowed on the Project Site at any time. Furthermore, anyone under the influence of alcohol or narcotics shall be removed from the Project Site immediately and shall permanently cease from performing any further Work on the Project.

B. *Replace item B with the following:*

At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who shall not be replaced without written notice and approval by Owner and Engineer, which approval shall not be unreasonably be withheld.

Add the following sentences and items 1 and 2:

The superintendent shall be Contractor's representative at the Project Site and shall have authority to act on behalf of Contractor. All communications given to or received from the superintendent shall be binding on the Contractor.

1. The resident superintendent shall be on Site at all times while construction is in process, and shall be able to speak, read, and comprehend English.

2. The Owner and Engineer shall have the authority to approve or disapprove the Project superintendent and any subcontractors employed on the Project, if the superintendent or any subcontractors fail to meet stated qualifications made part of the bid package. The decision of the Owner and Engineer for approval or disapproval of the superintendent or any subcontractors shall be final and binding.

SC – 6.02 Labor; Working Hours

Add the following items C and D:

C. No Work shall be done between the hours of 7:00 PM and 7:00 AM without the prior written permission of the Owner. However, emergency Work may be done at any hour without prior permission.

D. Work between the hours of 7:00 PM and 7:00 AM may be undertaken as a regular procedure with the prior written permission of the Owner. Such permission, however, may be revoked at any time by Owner, if Contractor fails to maintain adequate equipment and supervision for the proper execution and control of the Work during such hours.

SC – 6.03 Services, Materials, and Equipment

Add the following items D, E, F, G, H, and I:

D. Unless otherwise written, all work shall meet Owner's standards, which include CFPUA Material Specification Manual, CFPUA Technical Specifications for Construction, and CFPUA Standard Details. CFPUA standards are posted at www.cfpua.org. It shall be the Contractor's responsibility to ensure he/she is referring to the correct versions of these documents.

E. Contractor shall be responsible for all erosion and sediment control practices, both on and offsite.

F. Contractor shall provide any and all construction stakeout services as required to complete the Work.

G. Until the entire Work is accepted by Owner, Contractor shall have responsible charge and care of the Work and of all equipment and material to be used therein, and shall bear the risk of injury, loss, or damage to any part of the Work by action of the elements or from any other cause, whether or not it occurred during execution of the Work.

H. At Contractor's expense, Contractor shall rebuild, repair, restore, and make good all injuries, losses, or damages to any portion of the Work and any materials and equipment damaged or lost before the Work is complete. Contractor, at no additional expense to the Owner, shall provide suitable drainage and suitable structures as necessary to protect the Work or any portion thereof from damage.

I. Suspension of the Work or the granting of an extension of time for any cause shall not relieve Contractor of its responsibilities for the Work specified herein.

SC – 6.05 Substitutes and "Or-Equals"

A. *Remove the following from the 2nd sentence:*

"Unless the specification or description contains or is followed by the words reading that no like, equivalent, or "or-equal" item or no substitution is permitted,"

SC – 6.06 Concerning Subcontractors, Suppliers, and Others

A. *Add the following paragraphs:*

The Contractor may be permitted to subcontract a portion of the Work. If the Contractor decides to subcontract, the Contractor shall perform no less than 50% of the total contract amount and no less than 50% of the total labor within its own organization, unless permission is granted in writing from the Owner detailing an acceptable construction organization. Upon request by the Owner, the Contractor shall furnish sufficient documentation, satisfactory to the Owner, to demonstrate compliance herewith.

A subcontractor shall not subcontract, sell, transfer, assign, or otherwise dispose of its contract with the Contractor, nor any portion thereof, or of its right, title, or interest therein.

SC – 6.08 Permits

Add the following paragraph:

A. Contractor shall contact City of Wilmington, New Hanover County and North Carolina Department of Transportation prior to the start of construction to obtain and confirm all permits have been acquired. This includes but not limited to; Street Cut, Tree Removal, Traffic Control and Building Permits.

SC – 6.09 Laws and Regulations

Add the following items D, E, F, G and H:

D. North Carolina License Requirement: Pursuant to North Carolina General Statutes Section 87-15, Bidders must show evidence of a North Carolina Contractor's License prior to consideration of their Bids. Contractor shall at all times during the performance of the Work maintain a valid North Carolina General Contractor's License.

E. Discrimination: In accordance with the North Carolina General Statutes Section 143-135.5, any Bidder who has been found guilty of discrimination on the basis of race, gender, religion, national origin, age, physical disability, or any other unlawful basis in its solicitation, selection, hiring, or treatment of other businesses are debarred from bidding on this Work.

F. Contractor shall be in full compliance with Article 2 of Chapter 64 of North Carolina General Statutes. Contractor must ensure compliance of any subcontractors subsequently hired after the bid.

G. The Contractor shall adhere to applicable regulations and standards pertaining to the work including but not limited to the following:

1. CFPUA Standard Details, Specifications, and Ordinances
2. North Carolina Department of Environment and Natural Resources (NCDENR)

3. Division of Coastal Management (CAMA)
4. U.S. Army Corp of Engineers (USACE)
5. City of Wilmington Standard Details, Specifications, and Ordinances
6. North Carolina Department of Transportation (NCDOT)

H. The Contractor shall notify CFPUA in the event that applicable regulations and standards cannot be followed.

SC – 6.10 Taxes

Add item B as follows:

B. Pursuant to North Carolina General Statutes Section 105-164.14, the Owner is eligible for sales and use tax refunds on all materials that become a permanent part of the construction. The Contractor agrees to provide the Owner documentation which meets the requirements of Sales and Use Tax Regulation 42 regarding request for refund of sales and use taxes.

Those requirements are outlined below:

All refund claims must be substantiated by proper documentary proof and only those taxes actually paid by the claimant during the fiscal year covered by the refund claim may be included in the claim.

Any local sales or use taxes included in the claim must be separately stated in the claim for refund. In cases where more than one county's sales and use tax has been paid, a breakdown must be attached to the claim for refund showing the amount of each county's local tax separately.

To substantiate a refund claim for sales and use taxes paid on purchases of building materials, supplies, fixtures, and equipment by its Contractor, the claimant (Owner) must secure from such Contractor certified statements setting forth the cost of the property purchased from each vendor and the amount of state and local sales and/or use taxes paid thereon. Such statement must also include the cost of any tangible personal property withdrawn from the Contractor's warehouse stock and amount of state and local sales or

use tax paid therein by the Contractor. Similar certified statements by its Subcontractors must be obtained by the general Contractor and furnished to the claimant. Any local sales or use taxes included in the Contractor's statement must be shown separately from the State sales or use taxes. The Contractor's statements must not contain sales or use taxes paid on purchases of tangible personal property purchased by such Contractors for use in performing the Contract which does not annex to, affix to, or in some manner become a part of the building or structure being erected, altered, or repaired for the governmental entities as defined by North Carolina General Statutes Section 105-164(c). Examples of property on which sales and use tax has been paid by Contractor and which should not be included in the Contractor's statement are scaffolding, forms of concrete, fuel for the operation of machinery and equipment, tools, equipment repair, parts and equipment rentals, blueprints, etc.

NOTE: The State and County of purchase MUST be stated on the statement.

SC – 6.11 Use of Site and Other Areas

B. *Add the following sentence:*

The Contractor shall also be responsible for disposal of all other waste/spoil materials. Means of disposal shall be subject to the Engineer's approval.

E. *Add the following paragraph:*

Site Signage: Prior to any construction activity the Contractor shall erect sign(s) to inform the public work is in progress per sign detail that can be found at www.cfpua.org and per the following guidance:

1. The Contractor shall furnish and install construction sign(s) for identification of the project and shall be constructed in accordance with the following detail.

2. Construction sign(s) shall be located at or near the project site and amenable to public viewing. For work in right-of-ways, there shall

be a sign on both ends of the work facing out to on-coming traffic. Sign locations shall be approved by the Owner prior to erection.

3. The sign shall be adequately supported with regard to site conditions and will be an adequate distance above the prevailing grade to permit public viewing.

4. The sign shall be constructed of 3.0 feet by 6.0 feet exterior type high density overlaid plywood or other sign material of equivalent quality and framed, as necessary to protect the sign from deterioration.

5. The sign lettering shall be of professional quality, black and either painted or vinyl on a matt white background. The CFPUA logo shall be strictly painted or vinyl to the color and proportion noted on the following detail.

6. Contractor may add information/logos to the sign with written permission.

7. A draft sign shall be rendered and reviewed and approved by Owner prior to production.

8. Sign(s) shall be maintained in good condition by the Contractor until completion of the construction project.

9. Sign(s) shall be removed and appropriately disposed of when the construction is complete and accepted by Owner.

SC – 6.13 Safety and Protection

A.3 *Add the following:*

Upon completion of the Work, all fences, signs and structures are to be restored to their original location and condition, unless shown differently on the Plans. The Contractor shall purchase new material, if necessary, to replace all materials damaged, lost, or destroyed. Landscape items, such as shrubs, bushes, and plantings, etc., shall be replaced as necessary to the satisfaction of the Owner.

A.4 *Add item 4 as follows:*

Throughout the duration of the Project, the convenience and the protection of the public must be provided for, and interference held to a minimum.

a. The Contractor shall, at all times, conduct the Work in such a manner as to ensure the least practicable obstruction to public travel. The convenience of the general public and the residents along and adjacent to the area of the Work shall be provided for in a satisfactory manner, consistent with the operation and local conditions. Roads and streets must be kept open at all times or suitable detours provided. Detours that are not provided in the Plans shall be preapproved by the Engineer. All detours and detour devices shall meet the Federal Highway Administration's (FHWA) guidelines, which can be found in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). Local law enforcement, fire, and rescue agencies shall be notified before any street is closed, and again as soon as it is opened. Access to fire hydrants and other fire extinguishing equipment shall be provided and maintained at all times.

b. When necessary, the Contractor shall provide watchmen and appropriate lighting between twilight and sunrise, and shall erect and maintain barriers and all other necessary protection about the Work at its own expense. The Contractor shall take any other necessary precautions to protect life, limb, and property.

c. WORK NOTIFICATIONS: Contractor shall place a written notification on an accessible door believed to be most used of the residence/business within 48 hours and 72 hours of a disturbance to the property. Disturbance includes, but is not limited to, access to the property/main driveway, utility/telecommunication service disruption, and traffic detours in the area.

B. *Add the following paragraphs:*

The Contractor shall be aware of and abide by all Occupational Safety & Health Administration Laws and Regulations developed under the U.S. Department of Labor.

SC – 6.16 Emergencies

A. *Replace the second sentence with the following:*

The Contractor shall give the Engineer written notice immediately, and in no instance more than 24 hours after the alleged emergency, if Contractor believes that any significant changes in the Work or variations from the Contract Documents are required as a result. Changes in the Work or variations from the Contract Documents shall only be approved by Owner or Engineer if a written Work Change Directive or Change Order regarding such changes or variations is issued.

SC – 6.17 Shop Drawings and Samples

D. *Add new item 4 as follows:*

Contractor shall furnish required submittals with sufficient information and accuracy in order to obtain required approval of an item with no more than three (3) submittals. Engineer will record Engineer's time for reviewing subsequent submittals of Shop Drawings, Samples, or other items requiring approval and Contractor shall reimburse Owner for Engineer's charges for such time.

In the event that Contractor requests a change of a previously approved item, Contractor shall reimburse Owner for Engineer's charges for its review time unless the need for such a change is beyond the control of the Contractor.

Contractor shall submit to the Owner an electronic copy of all approved submittals prior to final payment.

SC – 6.19 Contractor's General Warranty and Guarantee

Add items D and E as follows:

D. Except as otherwise specified, all Work shall be guaranteed by the Contractor and its sureties against defects resulting from the use of faulty or inferior materials, equipment, or workmanship for one year from the date of Substantial Completion of the Work.

E. A list of warranty start dates for equipment, products, and systems shall be maintained by the Contractor during construction and submitted to the Owner and Engineer prior to closeout.

SC – 6.20 Indemnification

Replace item A with the following:

A. To the fullest extent permitted by Laws and Regulations, Contractor shall hold harmless and indemnify the Authority, its officers, directors, members, partners, employees, of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of the obligations herein undertaken or resulting from the operations conducted, to the extent caused by any negligent act or omission of Contractor, any sub-consultant of Contractor, or any individual or entity employed by any of them to perform any of the Services or anyone for whose acts any of them may be liable.

Add new item as follows:

A.1 The indemnification obligation shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the Contractor or any Subcontractor under Workmen's Compensation Acts, Disability Benefit Acts or other employee benefits acts.

New Article Section

SC – 7.04 Claims Between Contractors

A. Should Contractor cause damage to the Work or property of any separate contractor at the Site, or should any claim arising out of the Contractor's performance of the Work at the Site be made by any separate contractor against Contractor, Owner, Engineer, or any other person, Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute. Contractor shall, to the fullest extent permitted by Laws and Regulations, indemnify and hold Owner and Engineer harmless from and against all claims, damages, losses and expenses (including, but not limited to, fees of engineers, architects, and other professionals, and fees arising from dispute settlement such as reasonable attorneys, court costs, mediation costs, and arbitration costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any separate contractor against Owner or Engineer to the extent based on a claim arising out of Contractor's performance of the Work.

Should a separate contractor cause damage to the Work or property of the Contractor or should the performance of the work by a separate contractor at the Site give rise to any other claim, Contractor shall not institute any action, legal or equitable, against Owner or Engineer, or permit any action against either of them to be maintained and continued in its name or for its benefit on any action which seeks to impose liability on, or to recover damages from. Owner or Engineer on account of any such damage or claim. If Contractor is delayed at any time in performing or furnishing the Work by any act or neglect of a separate contractor, the Owner and Contractor may consider an adjustment on the Contract Time attributable thereto. An extension of the Contract Time shall be Contractor's exclusive remedy with respect to Owner and Engineer for any delay, disruption, interference or hindrance caused by a separate contractor.

SC- 9.02 Visits to Site

A. *Replace the last sentence with the following:*

On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will use reasonable care to guard Owner against defective Work. If Engineer observes any Work that does not conform to the Contract Documents, Engineer shall immediately make an oral and written report to the Owner detailing such defective Work.

SC-9.05 Rejecting Defective Work

A. *Make the following Modification:*

Add, and shall reject Work, in the first sentence after Engineer will have authority to reject Work.

SC – 9.09 Limitation of Engineer's Authority and Responsibilities

B. & C. *Add the following to the end of Paragraph B and C:*

, provided that Engineer has given prompt notice to the Owner of any deviations from the Contract Document or any defects or deficiencies in the Work of which the Engineer has knowledge, or reasonably should have knowledge.

SC – 10.01 Authorized Changes in the Work

A. *Add the following sentence:*

A change in the Contract Price or Contract Time shall only be accomplished by a written amendment to the Contract Documents, a written Change Order, or a written Work Change Directive.

SC – 10.03 Execution of Change Orders

A. Replace the first sentence with the following:

Owner and Contractor shall execute appropriate Change Orders recommended by Engineering and agreed upon by the parties covering:

SC – 11.01 Cost of the Work

A.1 *Remove the following:*

Remove the word “bonuses” from the fourth sentence.

Add the following:

Add the word “only” to the last sent after “shall be included in the above.”

A.4 *Add the following phrase to the end of the last sentence:*

but only to the extent authorized and approved in writing by the Engineer prior to incurring such costs.

A.5 *Replace item c as follows:*

c. Rentals of all construction equipment and machinery, and the parts thereof in accordance with rental agreements approved by Owner with the advice of Engineer, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

Add item j as follows:

j. Any minor details of the Work not specifically mentioned in the specifications or shown on the plans, but obviously necessary for the proper completion of the Work, which shall be considered incidental as being a part of and included with the Work for which prices are given in the Bid Form.

SC – 11.03 Unit Price Work

D. *Replace the entire item with the following:*

The unit price of an item of Unit Price Work shall be subject to re-evaluation and adjustment under the following conditions:

1. If the total cost of a particular item of Unit Price Work amounts to 10% or more of the Contract Price and the variation in the quantity of that particular item of the Unit Price Work performed by Contractor differs by more than 25% from the estimated quantity of such item indicated in the Agreement; and

2. If there is no corresponding adjustment with respect to any other item of Work; and

3. If Contractor believes that Contractor has incurred additional expense as a result thereof or if Owner believes that the quantity variation entitles Owner to an adjustment in the unit price, either Owner or Contractor may make a Claim for an adjustment in the Contract Price in accordance with Article 11 of the General Conditions if the parties are unable to agree as to the effect of any such variation in the quantity of Unit Price Work performed.

SC – 12.03 Delays

A. *Add the following paragraph:*

Time extensions for abnormal adverse weather delays shall be granted according to the number of days during the month when precipitation exceeds the historical average number of rain events of 0.1 inches of rainfall or greater, as established by the National Oceanic and Atmospheric Administration (NOAA). The evaluation of weather will be based on the total number of such days over the entire Contract Time.

The following is a table created from data obtained by the Climatological Reports prepared between September 2007 and August 2008 by the NOAA National Weather Service Weather Forecast Office of Melbourne, Florida for Wilmington, North Carolina. This table indicates the average number of calendar days per month with precipitation of 0.1 inches or more as determined between the years 1971 through 2000.

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
8	6	7	5	6	7	8	7	6	5	5	6

Delays caused by adverse weather shall warrant an extension of Contract Time as specified above; however, no adjustment of Contract Price shall be granted.

A & C. *Add the following:*

After the word “abnormal” and before the word “weather” add the word “adverse”.

C. *Add the following at the end of the paragraph:*

In no event shall Contractor be entitled to an adjustment in the Contract Price based on causes beyond control of Owner or Contractor.

E. *Add the following to end of the first sentence:*

, including but not limited to, claims for delay due to adverse weather conditions not of an abnormal nature.

SC – 13.03 Tests and Inspections

A. *Add the following sentence:*

Contractor shall provide Engineer with copies of all testing results and inspection reports.

D. *Add the following paragraph:*

Contractor also shall be responsible for arranging, obtaining, and paying for all costs for compaction tests and proof rolling of subgrade and base for roadway sections.

SC – 14.01 Schedule of Values

A. *Add the following to the end of the first sentence:*

and Owner.

SC – 14.02 Progress Payments

A.1 *replace “*At least 20 days before the date established in the Agreement for each progress payments”*with “*No later than the 30th day of every month”

A. *Add items 4 and 5 as follows:*

4. When the Owner agrees to pay for stored material and/or equipment, payments for stored material and equipment shall be based only upon actual cost to Contractor, and shall not include overhead and profit to Contractor.

5. Applications for Payment shall be accompanied with an accurate and complete updated schedule of operation or progress report, as applicable, and such other schedules and reports (including, without limitation, shop drawing schedule, procurement schedule, values of material, and equipment on hand) as Owner and Engineer may require.

B.5 *Add items e, f, g, h, i, j, and k as follows with the word "or" preceding:*

e. Contractor has failed to make payment to Subcontractors, suppliers or labor;

f. Contractor has failed to make acceptable submittals in accordance with accepted schedules;

g. Contractor has failed to submit an updated schedule of operation or progress report, as indicated above in Paragraph 14.02 A.5, with the Application for Payment;

h. There is reasonable evidence that the Work will not be completed within the Contract Times.

i. Contractor has caused damage to the Owner, separate contractor or a third party to whom the Owner is, or may be, liable;

j. Contractor owes Owner compensation for reimbursement charges incurred with respect to services performed by the Engineer for submittal review as stated in Supplementary Conditions Section 6.17; or

k. Contractor owes Owner compensation for reimbursement charges incurred with respect to services performed by the Engineer for

overtime inspection hours, if required when Contractor works more than 8 hours per day or 40 hours per week.

C.1 *Replace* "Ten days" *with* "Fifteen days".

D.1 *Add the item e as follows with the word "or" preceding*:

e. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraph 14.02 B.5 of the General and Supplementary Conditions.

SC – 14.07 Final Payment

A.2 *Add item e as follows:*

e. An affidavit stating all payrolls, invoices for materials and equipment, and other liabilities connected with the Work for which the Owner, or the Owner's property, might be responsible have been fully paid or otherwise satisfied.

C.1 *Replace entire item with:*

Final payment shall become due at the time provided in the North Carolina General Statutes Section 143-134.1.

D. *Add paragraph D as follows:*

D. Reduction in Payment:

Owner may refuse to make payment of full amount because:

1. Contractor has incurred liability for liquidated damages; or

2. Owner has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02 B.5 and 14.02 D.1 of the General and Supplementary Conditions.

SC – 14.09 Waiver of Claims

Delete paragraph A.1 in its entirety.

SC – 15.01 Owner may Suspend Work

A. Replace the third sentence with the following and add a fourth sentence:

Contractor shall be granted an extension of the Contract Times directly attributable to any such suspension if Contractor makes a Claim therefor as provided in paragraph 10.05. Contractor shall not be entitled to an adjustment of the Contract Price on account of any suspension of not more than 90 consecutive days.

SC – 15.02 Owner May Terminate for Cause

A.4 *Replace the Following:*

Replace the word "substantial" with word "material."

SC – 15.03 Owner May Terminate For Convenience

Replace the entire section as follows:

A. The Owner may, at any time, terminate the Contract in whole or in part for the Owner's convenience and without cause. Termination by the Owner under this paragraph shall be by written notice of termination delivered to the Contractor specifying the extent of the termination and effective date.

B. Upon receipt of a notice of termination for convenience, the Contractor shall immediately, in accordance with instructions from the Owner, proceed with performance of the following duties regardless of delay in determining or adjusting amounts due under this paragraph:

1. Cease operations as specified in the notice;

2. Place no further orders and enter into no further subcontracts for materials, labor, services, or facilities except as necessary to complete continued portions of the Contract;

3. Terminate all subcontracts and orders to the extent they relate to the Work terminated;

4. Proceed to complete the performance of Work not terminated;

5. Take actions that may be necessary, or that the Owner may direct, for the protection and preservation of the terminated Work; and

6. Transfer title to the Owner of completed or partially completed Work and materials, equipment, parts, fixtures, information, and Contract rights as the Contractor has.

C. Upon such termination, the Contractor shall recover as its sole remedy payment of the percentage of the Contract Price equal to the percentage of the Work performed satisfactorily and not previously paid for as determined by the Engineer. The Contractor hereby waives and forfeits all other claims for payment and damages, including but not limited to anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

D. The Owner shall be credited for:

1. Payments previously made to the Contractor for the terminated portion of the Work;

2. Claims that the Owner has against the Contractor under this Contract; and

3. The value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Price.

SC – 15.04 Contractor May Stop Work or Terminate

Replace the entire section as follows:

A. If the Work is stopped for a period of ninety (90) days by an order of any court or other public authority, or as a result of an act of the Government, through no fault of the Contractor or any person or entity working directly or indirectly for the Contractor, the Contractor may, upon ten (10) days' written notice to the Owner terminate performance under this Contract and recover from the Owner payment for the actual reasonable expenditures of the Contractor for all Work executed and for materials, equipment, tools, construction equipment, and machinery actually

purchased or rented solely for the Work, less any salvage value of such items.

New Article Section

SC – 16.02 Dispute Resolution Miscellaneous

A. The costs of any mediation shall be divided between parties in the dispute with at least one-third of the cost to be paid by the OWNER, if the OWNER is a party to the dispute.

B. All parties agree that only the North Carolina Courts located in New Hanover County shall have jurisdiction over the Contract, and any controversies arising out of this Contract and this Agreement not resolved by the mediation process shall be governed and construed in accordance with the law of the State of North Carolina.

C. Dispute resolution procedure is available to all parties involved in the construction project, including the architect, the construction manager at risk, the construction manager at risk, and the contractors (including all levels of subcontractors).

D. Any dispute seeking a non-monetary recovery or a monetary recovery of less than $15,000 is not subject to this mediation process.

SC – 17.04 Survival of Obligations

Add paragraph B as follows:

B. Contractor shall obtain from all Suppliers and manufacturers any and all warranties and guarantees of such Suppliers and manufacturers, whether or not specifically required in other areas of the Contract Documents, and shall assign such warranties and guarantees to Owner. Contractor further agrees to perform the Work in such a manner to preserve any and all manufacturer's warranties. With respect thereto, Contractor shall render reasonable assistance to Owner when requested, in order to enable Owner to enforce such warranties and guarantees. The assignment of any warranties and guarantees shall not affect the correction period or any other provisions of these Contract Documents.

New Article Sections

SC – 17.07 Precedence

Where conflicts exist between these General Conditions, Supplementary Conditions, Division 1 sections of this Project Specification Manual, and the design drawings, the most stringent requirements shall govern.

SC– 17.08 Abiding by Gift Policy

All entities contracted by the AUTHORITY shall abide by the AUTHORITY's policy on Gifts and Favors by not knowingly place any AUTHORITY employee in a position to violate the AUTHORITY's policy on Gifts and Favors, which is as follows:

Authority Policy - Gifts and Favors

Authority employees are to serve all persons fairly and equitably without regard to personal or financial benefit. Therefore, all Authority employees are prohibited from accepting a non-monetary gift that exceeds a nominal value ($25). Non-monetary gifts may include: advertising items or souvenirs, honoraria for participating in meetings, and meals at banquets. Non-monetary free meals not provided at banquets are prohibited from being accepted by Authority employees. Any non-monetary gift received by an Authority employee must be reported to their respective Department Head. All Authority employees are strictly prohibited from accepting any type of direct or implied cash or monetary payment, gift or reward. All Authority employees are strictly prohibited from soliciting or receiving any gift, reward, promise of reward, or anything of value, directly or indirectly, in exchange of, or consideration for, some action to be taken or not taken in the performance of the employee's duties. All Authority employees are strictly prohibited from disclosing confidential information concerning the property, government, or affairs of the Authority or using such information to advance the financial or other private interest of themselves or others.

SC– 17.09 Advertising

No advertising, sales promotion, other materials or presentations of the Contractor will identify or reference this contract, or the Cape Fear Public Utility Authority's name without the written consent of the Authority. This includes professional conferences, meetings and other events where the Contractor may be discussing or referencing either verbally or in writing CFPUA and/or the services or products covered under this contract. Exception may be taken to the

above with regard to listing the Authority as a job history reference in responses to requests for proposals.

TECHNICAL SPECIFICATIONS

KINGS BLUFF RAW WATER TRANSMISSION MAIN

Issued for Bid
Not For Construction

Prepared for:

Cape Fear Public Utility Authority
235 Government Center Drive
Wilmington, NC 28403

Prepared by:

McKIM&CREED
ENGINEERS SURVEYORS PLANNERS

243 NORTH FRONT STREET
WILMINGTON, NC 28401
PHONE: (910) 343-1048

M&C Project # 05367-0038
License #F-1222

June 2019

Cape Fear Public Utility Authority
Kings Bluff Raw Water Transmission Main

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SPECIAL PROJECT CONDITIONS

SPC – 1 The contractor shall be required to submit a proposed sequence of construction which shall be reviewed and approved by the owner and the Engineer (where applicable). Reference major task sequence of construction in specification section 01101. This sequence shall detail the methods, equipment, means, and scheduling and estimated construction time for the project.

SPC – 2 Work Schedule Priority

Contractor is advised of the proposed work schedule priority and shall provide adequate forces necessary to meet this schedule:

SCHEDULE I

Substantial Completion	790 Calendar Days

Substantial completion of Schedule I includes installation of all pipe, fittings, testing, miscellaneous appurtenances, and acceptance by the owner such that the new raw water main can be placed into service and convey raw water from the Kings Bluff Raw Water Pump Station to the 3 MG ground tank. All items not specifically designated at Schedule II in the Contract Documents shall be included in Schedule I.

SCHEDULE II

Substantial Completion	120 Calendar Days After Schedule I Substantial Completion

After Substantial Completion has been achieved on Schedule I, Contractor shall proceed with Schedule II work as delineated in the Contract Documents. Schedule II work shall not proceed until Schedule I has been substantially completed, is operational, and accepted by the owner. Note that all work not specifically designated at Schedule II in the Contract Documents shall be included in Schedule I. The scope of Schedule II is generally summarized as follows:

- Plan Sheet C-1: Installation of Pressure Reducing Valve Assembly A and Pressure Reducing Valve Assembly B.
- Plan Sheet C-10: Installation of the interconnection to the existing 48-Inch PCCP raw water main.
- Plan Sheet C-22: Installation of the interconnection to the existing 48-Inch PCCP raw water main.
- Plan Sheet C-36: Installation of the interconnection to the existing 48-Inch PCCP raw water main.
- Plan Sheet C-60: Installation of the new raw water meter valve vault, interconnections, stub-outs, electrical, etc.

Contractor must complete the work identified as Schedule II on Plan Sheet C-60 for Schedule II must be completed prior to all other work noted in Schedule II.

SCHEDULE I AND SCHEDULE II

Final Completion of all Work 1000 Calendar Days

Contractor is advised of the timetable established for this project and shall provide necessary means and forces to complete the work on schedule. The Owner and Engineer will work with the contractor to facilitate scheduling and construction of the project.

SPC – 3 Contractor is advised that well point and dewatering activities are the sole responsibility of the contractor. Contractor shall control discharge of all groundwater resulting from such activities and is advised that erosion control measures shown on the plan are not intended to control such discharges from groundwater. Contractor will be responsible for damages to owner as a result of failure to comply with applicable erosion control requirements while de-watering excavation.

SPC – 4 All work shall be performed in accordance with approved permits and encroachment agreements.

SPC – 5 Pre-Construction Conference

After award of the project, but before beginning work, a preconstruction conference shall be held which shall be attended by the Engineer, Contractors, and Contractors' project superintendents, and the Owner's representatives. Work schedules, estimate and payment procedures, etc., will be discussed.

SPC – 6 The contractor shall be required to submit a plan to the Engineer showing proposed material storage locations and areas for stockpiling excavated materials, including safety measures to protect community residents. No work shall begin prior to approval. No heavy equipment shall be allowed to cross traverse within 10' of the centerline of existing raw water main. See Easement Equipment Access and Staging detail.

SPC – 7 Contractor shall maintain a clean worksite. Littering by employees shall not be permitted. Trash shall be picked-up at the end of each work day.

SPC – 8 All pavement markings (lane designation arrows, crosswalks, striping, if damaged, etc), shall be repainted/replaced with current NCDOT approved material and methods, at no additional cost to owner.

SPC – 9 At no time shall any vegetation within the public right-of-way be cut or removed without prior approval by the Owner or Engineer.

SPC – 10 Verification of Dimensions and Elevations

Dimensions and elevations indicated on the drawings in reference to existing structures, location of utilities, or other information on existing facilities, are the best available data obtainable but are not guaranteed by the Engineer. The Engineer will not be responsible for their accuracy. Before proceeding with any work dependent upon the data involved, the Contractor shall field check and verify all dimensions, grades, inverts, lines, elevations, or other conditions or limitations at the site of the work to avoid construction errors or damage to existing facilities. If

any work is performed by the Contractor, or any subcontractors, prior to adequate verification of applicable data, any resultant extra cost for adjustment of work necessary to conform to existing conditions, or damage to existing facilities, shall be assumed by the Contractor without reimbursement or compensation by the Owner.

If the Contractor in the course of the work finds any discrepancy between the drawings and the physical conditions of the locality or any errors or omissions in drawings or in the layout as given by survey points and instructions, he shall immediately inform the Engineer, in writing. The Engineer will promptly investigate the reported conditions and issue such instructions as may be necessary for the proper execution of the work. Any work done after such discovery and prior to receipt of such instructions shall be at the risk of the Contractor.

SPC – 11 Contractor shall not overload haul trucks to avoid damage to existing roadways.

SPC – 12 Property corners or right-of-way markers disturbed by the Contractor during construction shall be replaced at Contractor's expense by a North Carolina registered surveyor.

SPC – 13 Care of Existing Facilities

In executing the work, the Contractor shall take necessary steps not to damage existing facilities. Any damage that is done thereto shall be promptly repaired by the Contractor at own expense.

Contractor shall not interrupt or interfere with operation of the existing facilities during construction except when absolutely necessary. When this is the case, Contractor shall consult with the Engineer and the Owner for procedure and shall be governed by their decision.

1. The Engineer does not guarantee that all existing facilities such as buildings, fences, pipelines, electrical lines, gas mains, conduit, telephone cable, service connections, or other facilities are shown on the Plans. It shall be the Contractor's responsibility to locate and protect all such existing facilities prior to beginning construction.

2. Any existing surface or subsurface improvements, such as pavement, curbs, sidewalks, pipes or utilities, footings or structures (including portions thereof), trees and shrubbery, not indicated on the drawings or noted in the specifications as being removed or altered shall be protected from damage during construction of the project.

3. Any such improvements damaged during construction of the project shall be restored to a condition equal to the existing at time of award of contract.

4. Contractor is advised that water and sewer service to residents, businesses, etc. shall always be maintained and operational. If shutdown or disruption of service is required for construction activities and/or relocation of services, the shutdown shall be limited to no more than 4 hours. Contractor shall contact and coordinate with property owners impacted by disruptions minimum 72 hours in advance of the disruption. If disruption of service exceeds 8 hours, contractor shall reimburse property

owner for the costs of a hotel room and food until such time that service is restored. This shall be included in the cost of the work and no separate payment shall be made.

SPC – 14 The Contractor shall maintain and coordinate driveway connections to the road system to provide access for residents along the construction route. Contractor shall coordinate with property owner if disruption of access is anticipated. Night or weekend work may be required for disruptions at no additional cost to owner.

SPC – 15 Contractor shall contact homeowners, business owners, schools, fire rescue, and 911 service a minimum 72 hours prior to the start of construction and coordinate alternate parking arrangements as required to allow access to homes, schools, or businesses at all times during construction.

SPC – 16 Contractor to coordinate with respective owner for the interruption of utility services. Down time of the existing utility lines shall be held to a minimum. Contractor shall have repair materials on-site at all times for ¾" and 1" class 200 polyethylene pipe, 2", 4", and 6" SDR-21, PVC, C-900 PVC, and ductile iron pipe.

Contractor shall also have repair materials onsite at all times to repair the existing 48-inch pre-stressed concrete cylinder pipe (PCCP) if damaged during construction. At a minimum, repair materials shall include:

- (4) Four 20 LF Joints 48-inch D.I.P.
- (2) Two PCCP to DIP adapters
- (4) Four 48-inch Mega- Lug Restraints
- (4) Four 48-inch M.J. Sleeves

Any unused repair materials for the existing 48" pipe shall become property of the pipeline owners after construction is complete.

SPC – 17 All dimensions shown on the construction documents for road rights-of-ways, edge of pavements, storm drains and miscellaneous site features are approximate. Contractor shall field verify all dimensions prior to the start of construction.

SPC – 18 Contractor shall be required to video tape any project areas near or adjacent to any existing structures (ex. buildings, roads, etc.) prior to start of construction and provide 2 digital copies of the video to the Engineer.

SPC – 19 At no time shall the contractor place spoil material or overburden in freshwater wetlands, coastal wetlands, or CAMA jurisdictional waters. Contractor shall provide all means, methods, materials as required for management of spoil material during construction of this project. Fourteen days (minimum) prior to commencing work in these areas, Contractor shall submit method for handling spoil material or overburden to the Engineer for approval.

SPC – 20 OSHA

The Contractor shall comply with the Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-054).

SPC – 21 GEOTECHNICAL INFORMATION

A Geotechnical Report has been provided in Appendix A for Informational purposes only.

SPC – 22 Lines, Grades and Site Data

The Engineer has established control points for the horizontal control of the work, and has established bench marks for the vertical control of the work as shown on the plans. Engineer has provided basic coordinates and dimensions for project stakeout. Electronic CADD files can be provided to the contractor to be used at his own risk. All construction staking and layout shall be the responsibility of the Contractor.

a For all work, the Contractor shall have on the job, at all times, an employee who is capable of setting stakes and replacing damaged stakes, and who understands the value and use of stakes and cut sheets, to whom the Engineer may deliver information. The Contractor shall furnish and set necessary batter boards and other means of control and shall be fully responsible for their accuracy.

b The Contractor shall be responsible for preserving all stakes and shall replace or bear the cost of replacing all stakes needlessly damaged during construction. The cost of replacing damaged stakes due to negligence or needless damage by the Contractor, if done by the Engineer, will be charged to the Contractor at the Engineer's cost of performing the work.

c The Engineer may make available to all prospective bidders, prior to the receipt of bids, information that he may have as to subsurface conditions in the vicinity of the work, topographical maps, or other information that might assist the bidder in properly evaluating the amount and character of the work that might be required in the construction. Such information is given, however, as being the best information available to the Engineer at the specific location without the assumption of responsibility for its accuracy or for any conclusions that the Contractor might draw there from.

The Contractor shall satisfy himself as to the nature of the work, shall investigate all other matters, which can in any way affect the work under this Contract, and shall determine the character of equipment and facilities needed preliminary to and during the prosecution of the work. No verbal agreement or conversation with any officer, agent or employee of the Owner or the Engineer, either before or after the execution of this Contract, shall affect or modify any of the terms or obligations herein contained.

SPC – 23 Shop Drawings

All shop drawings for material and equipment shall be submitted to the Engineer for approval before final orders for materials or equipment are placed. It shall be the Contractor's responsibility to check these drawings for accuracy and conformity with the Specifications before submission to the Engineer. Each drawing shall be clearly marked "Approved" or "Approved Subject to Noted Corrections," dated and signed by the Contractor before it is submitted to the Engineer. Any drawings not so marked will be returned to the Contractor without the Engineer's approval. The Contractor shall make additional changes or corrections, required by the Engineer, and resubmit such drawings for approval. Engineer's approval of such drawings or schedules shall not relieve the Contractor from responsibility for deviations from plans or specifications, nor shall it relieve him from responsibility for errors of any sort on shop drawings or schedules.

SPC – 24 Discharge of groundwater during construction activities adjacent to International Paper ponds shall be discharged into International Paper's groundwater storage ponds as shown on plans.

SPC – 25 **Weyman Creek, Livingston Creek, and Hood Creek are classified as Anadromous Fish Spawning areas by the NCWRC. No work shall take place in these waters between February 15th and June 30th.**

SPC – 26 International Paper (IP) Outage – Contractor shall not be allowed to work on IP property during an outage (except boring activities under the railyard) without written permission from IP. See specification section 01101.

SPC – 27 Contractor shall coordinate with electrical utility company for any relocation of electrical distribution poles due to construction. All cost shall be included in the contract.

SPC – 28 Contractor shall provide vibration monitoring per SP 3 - Geotechnical Instrumentation and Monitoring. Contractor shall notify property owners minimum 30 days in advance of construction in the subject area and shall be responsible for communicating the construction process, monitoring approach, and coordination with property owner as required to complete the work required in the Contract Documents.

SPC – 28 Contractor shall coordinate with land owners and provide temporary fencing if required when working in livestock areas. **All cost shall be included in the contract.**

SPC – 29 Contractor shall replace any damaged storm drain pipe with minimum same diameter reinforced concrete pipe. All cost shall be included in the contract.

SPC – 30 Contractor shall access utility easement from NCDOT right of ways. Contractor shall provide proof of permission in writing should other areas of access be used. Contractor shall provide temporary construction access at all points that the right of way is accessed from roadways, private properties, etc.

SPC – 31 Contractor shall have a licensed NC surveyor perform as-built surveys of the raw water main at a minimum of every vertical and horizontal bend or every 500 linear feet.

SPC – 32 Contractor shall provide a dewatering and pond level monitoring plan for review and approval by International Paper (IP).

SPC – 33 Contractor personnel and subcontractors shall meet all International Paper (IP) safety requirements when working on IP property.

SPC – 34 Contractor shall comply with all requirements of NCDOT regulations including Traffic Control and Bonding.

SPC – 35 Potable water lines or sanitary sewer lines repaired or replaced during construction shall meet all NCDEQ regulations and CFPUA Standards and Specifications.

SPC – 36 Contractor shall be responsible for temporary construction facilities. Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist on-site.

Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction including, but not limited to, the following:

1. Building code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, fire department, and rescue squad rules.
5. Environmental protection regulations.

Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."

Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code."

Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

SPC – 37 Contractor is advised that the Contract Documents require the following submittals to be made by the Contractor, prior to the first pay request. Note that payment will not be made until these items have been submitted. Note that this list may or may not include all submittals required as part of this project:

- Construction Schedules
- Sequence of Construction
- Schedule of Values
- Cash Outlay Schedule
- Schedule of Shop Drawing Submittals
- Shop Drawings

SPC – 37 Contractor shall notify NCDOT minimum of thirty (30) days prior to road closure activities. Contractor shall provide NCDOT with information listed below for each proposed closure:

- State Road (SR) Name and Number
- Direction
- Nearest Cross Street Name and Number
- Impact to Traffic (low, medium, high)
- Detour Description

SPC – 38 Contractor shall submit monthly aerial photographs of construction area showing construction progress utilizing a drone.

Commercial Drone Pilot Requirements-

1. All companies hired must have a Part 107 UAV (Unmanned Air Vehicle) Certification or someone with the certification present for all flights.
2. The Remote PIC overseeing the flight must have their airman certificate, a preflight checklist, flight logs, and any other documentation to comply with FAA regulations.
3. The pilot of the UAV must either be the Remote PIC (Pilot in command) or one must be on the flight crew.
4. The drone must be registered with the FAA and have its registration number displayed on the UAV.
5. A visual observer must part of the flight crew when flying.
6. The pilot shall obtain permission to fly in the airspace.

Drone Camera Recommendations For Visual Inspection or Imaging-

1. Drone should be equipped with at least front and bottom obstacle avoidance sensors.
2. At minimum a 10 megapixel camera.
3. Camera shall produce images in a RAW format, or equal.

Recommended DJI Drone Models for Visual Inspection and Imaging-

1. Phantom 3 Advance
2. Phantom 4, 4 Pro or 4 Pro V2.0
3. Inspire 1 and 2
4. Matice 100, 200, 210 and 600.

END OF SPECIAL PROJECT CONDITIONS

SECTION 01000 – NC ADMINISTRATIVE CODE COMPLIANCE WITH GENERAL STATUTE 133-3

These specifications, plans, and contract documents detail the required performance and design characteristics of materials and equipment. When impossible or impractical to specify the required performance and design characteristics, brand name examples may be listed to establish an acceptable range of items of equal or equivalent design. These examples are used only to denote the quality standard of the product desired and they do not restrict to a specific brand, make, manufacturer, or specific name. Rather they set forth and convey the general style, character, and quality of the product desired, and equivalents that will be accepted. Substitution of materials, items, or equipment of equal or equivalent design shall adhere to Article 6.05 Substitutes and "Or-Equals" of the "Standard General Conditions of the Construction Contract.

These specifications, plans, and contract documents shall comply with General Statue GS133-3 of the North Carolina Administrative Code.

END OF SECTION 01000

SECTION 01010 – SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 WORK COVERED BY CONTRACT:

A. The Project consists of the installation of approximately 14 miles of 54" raw water transmission pipe line.

1. Project Location: The project begins at the Kings Bluff pumping station in Bladen County and connects to the Lower Cape Fear Water and Sewer Authority ground reservoir and interim booster pump station site located in Brunswick County.

2. Owner: Cape Fear Public Utility Authority

B. Contract Documents, dated June 29th, 2019 were prepared for the Project by McKim & Creed, 243 North Front Street, Wilmington, North Carolina, (910) 343-1048.

C. The Work consists of furnishing all labor, materials, tools, equipment and related items and services required for construction in strict accordance with the Contract Documents. All Bids shall include mobilization, administration labor, materials, tools, equipment, transportation, taxes, insurance, and all other items necessary for a complete and acceptable project.

D. The Work will be constructed under a single prime contract or multiple prime contracts based on the final award.

1.3 WORK UNDER OTHER CONTRACTS: (NOT APPLICABLE)

1.4 FUTURE WORK: (Not Applicable)

1.5 WORK SEQUENCE:

A. The Work shall be conducted in an orderly manner by the Contractor. The Contractor shall employ sufficient number of construction crews such that each area of construction shall be complete including line installation, clean-up, restoration and seeding.

1.6 CONTRACTOR USE OF PREMISES:

A. General: During the construction period the Contractor shall have full use of the premises for construction operations, including use of the site. The Contractor's

use of the premises is limited only by the Owner's right to perform work or to retain other contractors on portions of the Project.

With the exception of specific job related communications and construction tasks, the Contractor’s employees and agents shall not enter the existing plant facilities nor shall the Contractor’s employees operate any equipment valves without the direction of the Engineer or Owner.

1.7 OCCUPANCY REQUIREMENTS:

A. Full Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate owner usage. Perform the Work so as not to interfere with the Owner's operations.

1.8 PRODUCTS ORDERED IN ADVANCE: (Not Applicable)

1.9 OWNER-FURNISHED PRODUCTS: (Not Applicable)

1.10 MISCELLANEOUS PROVISIONS: (Not Applicable)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01010

SECTION 01011 – EXISTING UNDERGROUND UTILITY LINES AND STRUCTURES

PART 1 - GENERAL

1.1 CONTRACTOR'S RESPONSIBILITY

A. Every landowner, developer or contractor who contracts to perform excavation or demolition activities within a site located in Bladen, Columbus, or Brunswick Counties is responsible to ascertain the location and type of other underground utility lines or structures that may be located within the limits of his work area. Some of these underground utilities or structures have been designated on the plans, however, the exact location may vary and others may not be designated. The contractor is, therefore, fully responsible for verification of the exact location of all underground utility lines or structures within the work limits, whether shown on the plans or not, and for providing necessary protection or repair if damaged.

1.2 UNDERGROUND DAMAGE PREVENTION ACT

A. The contractor is directed to comply fully with the applicable provisions of Senate Bill 168 "Underground Damage Prevention Act" as passed by the General Assembly of the State of North Carolina.

B. Listing of Utility Companies: The following utility companies may have facilities within the work limits and it is recommended that the contractor establish coordination with each prior to initiating work. There may be others not mentioned herein.

1. Time Warner Cable
   2508 Shipyard Boulevard
   Wilmington, North Carolina 28412
   Phone: 796-6880
2. Cape Fear Public Utility Authority
   235 Government Center Drive
   Wilmington, North Carolina 28403
   Phone: 332-6560
3. City of Northwest
   4889 Vernon Road
   Northwest, NC 28451
   Phone: 910-655-3110
4. Brunswick County
   P.O. Box 249
   Bolivia, NC 28422
   910-253-2017
5. North Carolina Natural Gas Corporation
   Phone: 800-275-6264
6. Duke Energy
   Phone:800-419-6356/800-452-2777

1.3 REQUEST FOR EXISTING UNDERGROUND UTILITY LINE OR STRUCTURE LOCATION AND MARKING BY OWNERS

A. The contractor shall make a written request to facilitate utility owners in locating their facilities within the limits of this contract at least 48 hours in advance of the day excavation or demolition work is scheduled to begin. Location assistance requested from the owner should include the actual horizontal location, type number, size and depth of all lines. Some, but not all inclusive, cooperative actions the contractor should take either, on or off the job site are as follows:

1. The contractor shall ascertain if the user desires to have his representative present during the work.
2. The contractor shall comply with all standard regulations and take all precautions required by the owner of the facility.
3. All costs associated with locating and marking existing utilities or these utilities' representatives shall be borne by the contractor.
4. The contractor shall inform all equipment operators, those employed by him or those employed by his subcontractors, at the job site of information obtained from the owners prior to initiation of work.
5. The contractor shall immediately notify utility owner of any leaks or breaks, dents, gouges, grooves or other damages to such line coating or cathodic protection created or discovered by him in the course of the work.
6. The contractor must immediately alert the occupants of the adjacent premises of any emergencies that he may create or discover at the work site.

1.4 LOCATION AND PROTECTION OF UTILITY LINES

A. The location of all utilities shall be made with locating equipment well in advance of actual work. The located facility shall be plainly marked by coded paint designations on the paved areas or by coded stakes or flags along the unpaved areas. All marked locations are to be made at least 500 feet in advance of all trench excavation and the location and utility protection provided by the contractor must be to the satisfaction of the engineer at no extra cost. Further, the contractor shall uncover any utility and obtain the utility elevation as required by the engineer at no additional cost. All damages to existing utility facilities in the work area during trenching and installation of facilities for this contract are the responsibility of the contractor and he shall repair or replace damaged lines to the satisfaction of the utility owner at no extra cost to the Owner.

1.5 PROTECTION OF EXISTING UTILITIES AND FACILITIES

A. In the conducting of his operations, the Contractor shall take special precautions to protect equipment, structures, utility lines, roadways and subsurface, and submerged and overhead facilities remaining in place for damage or disturbed by his operations. In the event the facilities are disturbed, damaged or injured as a result of the contractor operation, the contractor shall immediately notify the owner and in conjunction with the owner determine the proper method of replacing, repairing or restoring the affected facilities at least to the conditions which existed prior to the Contractor's operations.

The Contractor shall, at his own expense, replace, repair or restore the affected facilities or areas to their original condition or shall reimburse the owner of said facilities for such expenses as the said owner may accrue in performing the work.

B. In the conducting of his operation, the contractor shall notify the Postal Service as to coordinate and facilitate the mail delivery with the construction.

1.6 CONNECTIONS TO EXISTING FACILITIES

A. Connections to existing facilities, which are in service, shall be thoroughly planned in advance, and all required equipment, materials and labor shall be on hand at the time of undertaking the connections. Work shall proceed continuously (around the clock) if necessary to complete connections in the minimum time. Operation of valves or other appurtenances on existing utilities, when required, shall be by or under the direct supervision of the owning utility.

1.7 PAYMENT

A. No separate payment will be made for location of existing underground utility lines and structures. All costs incurred by the contractor for this work should be included in the unit price or lump sum price for the item of work to which it pertains.

End Section 01011

SECTION 01025 – MEASUREMENT AND PAYMENT

1.1 SUMMARY

The Measurement and Payment Section Includes:

A. Defines how work items are measured and paid for on Unit Price Contracts. These items include unit price, lump sum price, and allowance payment items.

B. In the case of conflict between this Section and the measurement methods specified in the individual Technical Specification Sections, the measurement methods in Technical Specification Sections shall govern.

C. The Contractor shall receive payment for work after it is installed. Payment for material on hand can only be paid for if allowed by the Agreement, the General and/or Special Conditions.

D. Partial payment may be requested for items partially installed when agreed to by the Owner.

1.2 UNIT PRICE ITEMS

A. Quantity and measurement estimates stated in the Bid Form are estimates for bidding purposes only. Actual payments shall be based on actual quantities installed, in-place, as measured and/or verified by the Engineer. A Change Order will be required for any actual installed quantities in excess of the estimated quantities.

B. Unless otherwise stated in the Contract Documents, the bid unit prices shall be in effect throughout the contract duration. When the variance between the estimated quantities and the actual installed quantities are more than 25 percent, the Contractor or the Owner may negotiate a change to the Unit Price. That change will be made in accordance with the Change Order process as defined in the Contract Documents.

C. Except as defined above, the Contractor shall make no claim, nor receive any compensation, for anticipated profits, loss of profit, damages, or any extra payment due to any difference between the amounts of work actually completed, or materials or equipment furnished, and the estimated quantities.

D. Contractor shall assist Engineer by providing necessary equipment, workers, and survey personnel as required to measure quantities.

E. Unless stated in the Contract Documents, measured quantities shall be rounded to the nearest whole integer.

F. Measurement:

1) Measurement for progress payment shall be made by, or approved by, the Engineer based on the actual quantities installed. The actual quantities installed can be adjusted for corrections to previous calculations, incomplete elements or components if agreed to in advance and in writing by the Engineer.
2) Unless otherwise provided for in the Contract Documents, unit price items are all

inclusive of all related work, direct and indirect costs, to provide a complete and functional item.

3) The final measurement shall be based on actual installed quantities, jointly measured and agreed to by the Contractor and the Engineer. Quantities can be adjusted (increased or decreased) based on a final calculation of quantities by the Engineer and Contractor.

G. Payment:

1) Progress payments shall be in accordance with the Contract Documents based on estimated quantities installed paid at the bid unit price.
2) The final payment shall be based on actual quantities, fully installed, tested and placed into service, paid at the bid unit price.

1.3 LUMP SUM ITEMS

A. Progress payments for Lump Sum items in the Bid Schedule will be based on the breakdown identified in the schedule of values prepared by the Contractor and approved by the Engineer and Owner before acceptance of the Application for Payment for the Lump Sum item.

B. Lump Sum payment will be for the entire item as specified and as indicated in the Contract Documents. Payment for all bid items indicated as Lump Sums shall include the cost of all labor, materials, equipment and incidentals necessary to furnish, install, clean, test, and place each bid item into operation; including permitting, general conditions, overhead and profit.

1.4 MEASUREMENT AND PAYMENT

A. Basis of Bid Items

SCHEDULE I

Bid Item 1 - Mobilization

1) This work shall include all costs for bonds, insurance, permits, establishing field offices, moving construction equipment to the site, and other necessary but "non-scheduled" work.
2) Mobilization shall not exceed 3% of Total Bid.
3) Payment for mobilization will be paid in full during the first monthly pay application.

Bid Item 2 - Construction Surveying and Staking:

1) This work shall consist of providing construction surveying and staking to establish project control points based on NC state plane coordinate system, locate and mark the limits of disturbance, provide layout of the work proposed, etc.
2) Payment will be spread out over the duration of the project; monthly payment will be based on an estimate of the work completed.

Bid Item 3 – Revised After Construction Surveying and Record Drawings:

1) This work shall consist of performing a final survey of constructed improvements and record drawings of the facilities and utilities constructed. Survey files and record drawings must be prepared, signed and sealed by a NC licensed surveyor.
2) No payment will be made until a final accepted AutoCAD file and signed and

sealed set of record drawings are submitted and approved by the owner.

3) Survey data provided by contractor under this line item shall include:
   i) Top of pipe elevation at 100-foot intervals along the entire length of the pipeline installed to include northing and easting on NC grid coordinates.
   ii) Location and elevation of all fittings, bends, valves, air release\air vacuum valves, blow-offs, pressure reducing valve assemblies, meter vault assemblies, new fences, bollards, pigging facilities, encasement pipes, and miscellaneous appurtenances to include northing and easting on NC grid coordinates.
   iii) All manways installed along the pipeline to include northing and easting on NC grid coordinates.
   iv) Interconnections to the existing raw water main and existing system to include northing and easting on NC grid coordinates.
   v) Three (3) mylar copies of sealed "Revised After Construction" documents, one (1) electronic PDF, and one (1) electronic AutoCADD file.

Bid Item 4 - Clearing and Grubbing:

1) This work shall include all removal, and proper disposal to a contractor selected off site location, of all trees, brush, roots, and other debris within the limits of the easements.
2) Payment will be spread out over the duration of the project; monthly payment will be based on an estimate of the work completed.

Bid Item 5 - 54-inch Diameter Raw Water Main Pipe (Sub-Items a, b, c)

1) Measurement for payment for raw waterline (waterline) pipe will be the actual number of linear feet of pipe installed, complete in-place measured horizontally along the centerline of the pipe.
2) The unit price bid per linear foot for the construction of the waterline shall include all the Contractor's cost for the complete construction of the waterline, exclusive of bore & jack installations, Livingston Creek Aerial Crossing, and other items provided for elsewhere in the Bid Form.
3) The price bid shall include: furnishing, transporting, unloading and temporary storage, and installing all pipe and materials including special coatings or linings; furnishing and installing fittings or specials including bulkheads and outlets not otherwise provided for in the Bid Form; joints and jointing including welding; bonding wires; surveying; exploratory excavation; trench excavation including rock and all other materials; bracing, shoring, and sheeting; trenching, dewatering as required; constructing the specified bedding; backfilling (method of backfill and compaction as specified); casing spacers as specified; restoration and all ground surfaces not listed as a separate bid item; protection and adjusting of aboveground and underground utilities and service connections; legal disposal of spoil; testing; inspection; seeding; soil erosion and sediment control measures (except those specifically listed separately in the Bid Form), clean up, and all other related and necessary materials, work, and equipment required to construct a complete operable waterline in accordance with the Contract Documents.
4) Depth of waterline: Minimum pipe depth shall be as indicated in the Contract Documents. No individual prices based on 'depth of bury' will be included in the bid. No additional compensation will be given when the depth of bury must be increased beyond that indicated on the Drawings due to actual utility locations or for any other reason.
5) Installation inside steel casing pipe: The same bid price for open trench installation will be paid for pipe installed inside casing pipe. Work includes pipe spacers and

concrete grout to be installed between the casing pipe and the carrier pipe.

6) Miscellaneous work: Include in the unit price all required work to meet all the requirements of the contract documents, specification, drawing notes, etc., for which no other bid item addresses.

Bid Item 6 – Bore & Jack 72-Inch Diameter Steel Encasement Pipe Min. 0.625-inch Wall Thickness (Sub-Items a, b, c, d)

1) Measurement for payment will be the actual number of linear feet of steel casing pipe installed. No extra payment will be made for extending the casing pipe beyond the limits identified in the Contract Documents.
2) This work shall include excavation of trenches and bore pits, barricades, shoring and bracing, coordinating with and locating existing utilities, dewatering, disposal of cuttings and excess soils, furnishing and installation of casing, equipment (including appropriate cutting heads, machines and methods for materials encountered to install casing on grade and alignment indicated), backfilling, restoring crossing to original condition, and all other items required by the Contract Documents, and Permits.
3) No price adjustments will be made for upsizing casing at the Contractor's option, unanticipated soil conditions, abandoned or misaligned bore holes, boring through rock, adjusting depth of bury due to actual utility locations, or for need to reduce bore pit length and install shorter pipe sections to meet field and project conditions.
4) Sub item d) International Paper Rail Yard pipe encasement shall have minimum 1.0" wall thickness as shown on plans.

Bid Item 7 – Sheet C-27 Livingston Creek Aerial Crossing

1) Measurement for payment will be at the lump sum price as indicated in the bid form.
2) This work shall include all equipment, labor, materials as required, and all other items required by the Contract Documents and Permits to construct the aerial crossing of Livingston Creek. This includes, but not limited to, piles, reinforcing, dewatering, erosion control, access, bracing, support, concrete, access walkway, raw water main piping, valves, air release/air vacuum valves, and all appurtenances required to complete the work identified for this crossing. **Steel pipe wall thickness shall be increased to min. 1/2-inch wall thickness for above grade pipe.**
3) This lump sum price for this item also includes obtaining a qualified geotechnical firm to conduct the monitoring as specified in the Contract Documents. Contractor shall submit a monitoring plan to Engineer and Owner for review prior to the start of construction.
4) Refer to specification section 01101 for sequencing

Bid Item 8 - Raw Water Main Fittings (Ductile Iron Pipe ONLY)

1) All ductile iron fittings shall be paid for per pound based on manufacturer's published weights, not including gaskets, retaining rings, restraints, or any other hardware. Payment shall be made for fittings installed, complete, including all gaskets, hardware, thrust blocking, thrust collars, mechanical restraints, and all other materials and labor necessary for a complete installation. No payment will be made for fittings not specifically listed. All additional sleeves, or other types of fittings not listed but required for a complete pipeline installation will be included in the total cost for work and no separate payment will be made. Fittings in addition

to those called out on plan sheets must be approved by the engineer prior to installation to be paid for.

Bid Item 9 – Pigging Facilities (Sub-Items a & b)

1) Measurement for payment will be lump sum for the pigging facilities to include the pig launcher and pig retriever as indicated in the Bid Form and Contract Documents.
2) This work Price shall include all valves, fittings, bends, sleeves, materials, labor, tools, equipment, and all work including concrete blocking where required, restrained joints, or other restraining devices, and excavation and backfilling as required.

Bid Item 10 - Raw Water Main Valves (Sub-Items a, b)

1) Measurement for payment for valves shall be the actual number installed. The unit price bid shall include furnishing and installing all materials, labor, and equipment necessary for a complete and operable installation including excavation, bedding, backfill, restrained joints or other restraining devices, valve box and lid with protective ring, marker post, and all other miscellaneous work.

Bid Item 11 - Raw Water Main Connections (Sub-Items a, b)

1) Measurement for payment will be lump sum for each connection completed.
2) This work shall include coordinating with Cape Fear Public Utility Authority, Brunswick County and Lower Cape Fear Water and Sewer Authority staff to shut-off existing waterlines, removing existing fittings or cutting into existing piping as required, dewatering, furnishing and installing required pipe and fittings and couplings, installing concrete blocking or other restraining devices where required, connecting into proposed and existing piping, bedding and backfill materials, and all other required work to make the connection. Contractor shall refer to Specification Section 01101 for sequencing.
3) Sub-Item 11.a: Sheet C-1. Connection at existing stub-out at STA 100+03. This work includes locating the existing pipe, excavation, removal of existing 54" restrained joint cap, dewatering existing pipe and trench, connecting to existing 54" pipe, all restraint and blocking and all related work to make a complete connection.
4) Sub-Item 11.b: Sheet C-50. Connections to existing 48-inch stub outs at two locations as indicated on Plan Sheet C-50. This work includes locating the existing pipe, excavation, removal of existing restrained joint cap, dewatering existing pipe and trench, connecting to existing pipe, all restraint and blocking and all related work to make a complete connection.

Bid Item 12 - 48-inch Diameter Raw Water Main Pipe

1) Measurement for payment for raw waterline (waterline) pipe shall be the actual number of linear feet of pipe installed, complete in-place measured horizontally along the centerline of the pipe.
2) Payment for 48" pipe at interconnections to the existing PCCP raw water main, the new pressure reducing valve, and the connection to the new meter shall be included in Bid Items 26, 27, and 28 and will not be paid for as part of this bid item.

Bid Item 13 - Combination Air Vacuum / Air Release Valve and Vault

1) Measurement for payment for valves shall be the actual number installed.
2) This work shall include all excavation, bedding, backfill, the main line tee or outlet, blind flange, piping and gate valve, air release/air vacuum valve, manhole, vent

pipe, and all other required work.

Bid Item 14 - Blow-off/Drain Assembly

1) Measurement for payment for valves shall be the actual number installed.
2) This work shall include all excavation, bedding, backfill, the main line 12-inch outlet, piping and fittings, gate valve, riprap apron, and all other required work.

Bid Item 15 - 30-inch Raw Water Main Pipe Replacement (Sheet C-2)

1) Measurement for payment will be lump sum for the complete replacement of the pipe section. Work shall only take place between Nov. 1st and April 30th.
2) This work shall include coordinating with CFPUA staff to shut-off existing waterlines, cutting into existing piping as required, dewatering, furnishing and installing required pipe and fittings, adapters, and couplings, installing concrete blocking or other restraining devices where required, connecting into existing piping, bedding and backfill materials, flowable fill, and all other required work to replace and reconnect the section of existing 30-inch raw water main such that it can be placed back into normal operation.

Bid Item 16 - Roadway Repair and Restoration (Sub-Items a,b,c)

1) This work shall include cutting, milling, removing and disposing existing material; furnishing and placing all material; replacing signs if damaged or removed; coordination with NCDOT; adhering to all NCDOT permit requirements; and all other work required to restore roadways and driveways.
2) For asphalt trench repair, measurement will be per linear foot measured along the pipe centerline regardless of the width of disturbance.
3) For asphalt trench overlay, measurement for payment will be per square yard and shall include milling to the appropriate depth for the required overlay.
4) For temporary roads, measurement for payment will be per each. Complete payment will not be made until temporary road is removed and area is restored to pre-construction conditions.
5) Traffic control shall be provided at each crossing or shall include all necessary signage, flagmen, detours, barricades, traffic control plans and related requirements of the NCDOT and local government agencies that have authority over the roads. Traffic control shall be included in the cost of the work and no separate payment shall be made.

Bid Item 17 – Cathodic Protection Installation and Testing

1) Measurement for payment will be lump sum for the completed work.
2) Payment will be spread out over the duration of the project; monthly payment will be based on an estimate of the work completed.
3) This work shall include all corrosion control related materials and work, wiring and conduits, test stations and terminal boards with marker posts, anodes, insulating flange kits, all required testing, and all other required work.

Bid Item 18 – Utility Marker

1) Measurement and payment will be paid for per each marker installed. Utility markers shall be installed as shown on the plans in locations near roadway crossings as designated by Owner or Engineer. Contractor shall be responsible for coordination for approval of marker locations.

Bid Item 19 - Subgrade Stabilization Stone

1) Measurement for payment will be the actual quantity of stone installed per linear foot in 6-inch lifts. Only stone installed within the limits approved by the Owner will be paid. No extra payment shall be made for work not authorized by the Engineer, or for stone required by other bid items.
2) This work shall include excavation, proper disposal of unsuitable material, furnishing, hauling, placing, and compacting imported stabilization stone and furnishing and placing filter fabric around the stabilization stone.

Bid Item 20 – Modify/Relocate 12" Raw Water Main Stub-Out & Valve (Sheet C-2)

1) Measurement and payment shall be lump sum for the completed work. Price shall include exploratory excavation to physically locate the pipeline, valves, appurtenances, and determine size and material. Price shall include removal of the portion of 12-inch line in conflict with the proposed 54-inch raw water main, new 12-inch line stop, installation of a new 12-inch valve, and new 12-inch plug/cap, with restraints and blocking as required.

Bid Item 21 – Sheeting/Shoring at Duke Energy Transmission Structure (C-44)

1) Measurement and payment shall be lump sum for the completed work. Price shall include all labor, equipment, materials, etc. as required to install sheeting/shoring in the vicinity of the Duke Energy Transmission structure on Plan Sheet C-44. The sheeting/shoring shall be designed by the contractor's Engineer to protect the Duke infrastructure in this area as required for a complete installation of the proposed 54-inch raw water main. Calculations shall be sealed by a NC Professional Engineer and shall be submitted to the Engineer prior to construction. Design shall be in accordance with current Duke Energy requirements. This item shall also include the cost of coordination with Duke Energy as required to conduct and complete the work.

Bid Item 22 – Restore Tennis Court

1) Measurement and payment shall be lump sum for the completed work. Price shall include all labor, equipment, materials, etc. as required to restore the tennis court indicated on plan sheet C-41. Line item shall include replacement of fencing, nets, net posts, benches, landscaping, paving, resurfacing, and all miscellaneous items impacted by construction.

Bid Item 23 - Erosion and Sedimentation Control (Sub-Items a, b, c, d)

1) Sub-Item 23.a: Measurement and payment shall be paid per liner foot. Unit price shall include all materials as shown on plan sheets, labor, and necessary incidentals, complete in place. Contractor will be responsible for maintenance of silt fence and shall replace damaged sections immediately at no additional cost to the owner.
2) Sub-Item 23.b: Measurement and payment shall be paid per each, complete, in place including all labor, materials as detailed on the plan sheets, and incidentals. Payment will include contractor's labor to removed sediment when build up has accumulated to 50% of check dam height. Maintenance of check dams will be required until erosion has stopped due to established vegetation. Contractor will be required to repair damaged stone check dams at no additional cost to the owner.
3) Sub-Item 23.c: Measurement and payment shall be paid per each, complete, in place including all labor, materials as detailed on the plan sheets, and incidentals. Payment will include contractor's labor to maintain silt curtain during construction

and replacement if damaged. Contractor will be required to repair/replace silt curtains if damaged or clogged at no additional cost to the owner.

4) Sub-Item 23.d: Measurement and payment shall be paid at the price per linear foot as indicated in the bid form. Seeding and restoration shall be completed in accordance with plans and specifications, and with applicable permit requirements included in the appendix of the contract documents.

Bid Item 24 – Replacement/Restoration of Driveways (Sub-Items a, b, c, d)

Measurement and payment shall be paid per liner foot as indicated in the bid form. Unit price shall include all materials as required to restore/replace driveways impacted during construction to match original grade and condition. Depth of asphalt, stone base, concrete, and gravel shall be restored to pre-construction conditions. Compacted soil driveways shall be restored and re-compacted to pre-construction conditions.

Bid Item 25 – Geotechnical Instrumentation and Monitoring (Sub-Items a, b)

Measurement and payment shall be per each except for the IP Rail Yard Crossing as indicated in the bid form. Unit price shall include obtaining a qualified geotechnical firm to conduct the monitoring as specified in the Contract Documents. Contractor shall submit a monitoring plan to Engineer and Owner for review prior to the start of construction.

SCHEDULE II

Bid Item 26 - Sheet C-60 Connection to Brunswick Service Main and Meter to include Meter Installation, Valves Vault, Electrical, Controls, Bypass Piping, Fencing, and all Miscellaneous Appurtenances for a Complete Installation (STA. 809+50)

5) Measurement for payment will be lump sum as indicated in the bid form.
6) This work includes locating the existing raw water supply main pipe, cutting the existing pipe, all restraint and blocking and all related work to make a complete connection. Include furnishing and installing all materials, labor, and equipment necessary for a complete and operable installation including meter, vaults, electrical, controls valves, fittings, bends, sleeves, electrical, controls, excavation, bedding, backfill, restrained joints or other restraining devices and all other miscellaneous work as shown on plans. All bypass piping and associated work shall be included in the cost of this bid item. This work shall include coordinating with Cape Fear Public Utility Authority, Brunswick County and Lower Cape Fear Water and Sewer Authority staff to shut-off existing waterlines for installation.
7) Refer to specification section 01101 for sequencing

Bid Item 27 – Pressure Reducing Valve Assemblies (Sub-Items a & b)

1) Measurement for payment will be lump sum, per each as indicated in the bid form.
2) This work shall include all excavation, bedding, backfill, fittings, tees, piping and gate valves, pressure reducing valves, hot box enclosures, stone, concrete, and all other required work for a complete installation as shown on plans.
3) Refer to specification section 01101 for sequencing

Bid Item 28 - Raw Water Main Connections (Sub-Items a, b, & c)

1) Measurement for payment will be lump sum, per each connection as indicated in the bid form.

2) This work shall include coordinating with Cape Fear Public Utility Authority, Brunswick County and Lower Cape Fear Water and Sewer Authority staff to shut-off existing waterlines, removing existing fittings or cutting into existing piping as required, dewatering, furnishing and installing required pipe and fittings and couplings, installing concrete blocking or other restraining devices where required, connecting into proposed and existing piping, bedding and backfill materials, and all other required work to make the connection. Contractor shall refer to Specification Section 01101 for sequencing.
3) This work includes locating the 48" existing pipe, excavation, removal of existing fittings and concrete blocking if present, cutting of existing pipe, dewatering existing pipe and trench, connecting to existing 48" pipe, all restraint and blocking and all related work to make a complete connection. All pipe and PCCP adapters required to construct the connection from the proposed raw waterline to the existing raw waterline shall be included in the cost of this bid item. All fittings, including bends, reducers, and tees, shown on the drawings shall be included in the cost of this bid item. Valves shown on the drawings are included in Bid Item No. 10 – Raw Water Main Valves. The cost to furnish and install large diameter gate valves shall NOT be included in this bid item.

Bid Item 29 – New Fences at Interconnections

1) Sub-Item 30.a: Measurement and payment shall be paid per liner foot. Unit price shall include all materials as shown on plan sheets, labor, and necessary incidentals for complete installation.
2) Sub-Item 30.b: Measurement and payment shall be paid per each installed. Unit price shall include all materials as shown on plan sheets, labor, and necessary incidentals for complete installation.
3) Sub-Item 30.c: Measurement and payment shall be paid per square yard. Unit price shall include all materials as shown on plan sheets, labor, and necessary incidentals for complete installation.

Bid Item 30 – Bollards

1) Sub-Item 30.b: Measurement and payment shall be paid per each installed. Unit price shall include all materials as shown on plan sheets, labor, and necessary incidentals for complete installation.

1.5 General & Miscellaneous Items

a. Field Engineering and Value Engineering - No separate payment will be made for field engineering or value engineering. All costs incurred by the Contractor for this work should be included in the unit price or lump sum price for the item of work to which it pertains.

b. Project Meetings - No separate payment will be made for project meetings.

c. Temporary Facilities and Controls - No payment will be made for temporary facilities and controls.

d. Protection and Security Fencing - No separate payment shall be made for the protection and security fencing, gates and accessories installed under this contract.

e. Temporary Fencing for Livestock – Contractor shall provide temporary fencing (electric and non-electric as indicated in the contract documents) as required to contain livestock in areas where construction activities occur on land where livestock exists. Contractor will be required to work with the Owner, Engineer, and private property owner to determine extent of fencing required. This shall be included in the cost of the work and no separate payment shall be made.

f. Restoration of Underground Pipelines - No separate payment will be made for Restoration of Underground Pipelines unless specifically noted in the contract documents and bid form as a pay item.

g. Landscaping - No separate payment will be made for Landscaping. All costs incurred by the Contractor for this work shall be included in the unit price or lump sum price for the item of work to which it pertains.

h. Utility Conflicts - No separate payment shall be made for negotiating conflicts with underground (or aboveground) utilities to include cables, power poles, pedestals, storm drain pipes and structures, whether indicated or not indicated on the construction documents. All costs incurred by the Contractor for negotiating these conflicts shall be included in the cost of work to which it pertains.

i. Traffic Control – Traffic control shall be included in the total cost of work and no separate payment will be made as such. All traffic control measures to be in accordance with DOT, local jurisdictions, Owner, and Engineer's Requirements which are not specifically listed but may be requested during construction.

j. Drainage & Ditches – Contractor shall restore all drainage, ditches, and ditch lines impacted by construction to original grade, elevations, and conditions. This shall be included in the cost of the work and no separate payment shall be made.

k. Supporting and Bracing of Power Poles – Support and bracing of power poles, light poles, and miscellaneous structures as required for construction shall be included in the cost of the work and no separate payment shall be made.

l. Demolition - The cost for demolition shall be included in the cost of the work; therefore, no separate payment shall be made.

m. Sheeting, Shoring and Bracing - Sheeting, shoring, bracing, etc., installed where required for trench stabilization and protection of adjacent roads, utilities, and properties shall be included in the cost of the pipe (unless otherwise specified in the contract documents) and no separate payment will be made thereof.

n. Pavement and Road Surface Cleaning - Cleaning pavement and/or road surfaces shall be included in the cost of the pipe and no separate payment will be made therefore.

o. Dust Control – Contractor shall at all times provide necessary measures to minimize dust within the project limits and area. This shall be included in the cost of the work and no separate payment shall be made.

p. Miscellaneous Items - Removing and replacing of miscellaneous items including but not limited to, mail boxes, fences, shrubbery, walls, steps, and other ornamental items

shall be included in the cost of the pipe and no additional payment will be made thereof.

q. Clearing, Grading, and Excavation

a) Clearing, grubbing, stripping, storing of topsoil, and disposal of debris shall be included in the cost of the work; therefore, no separate payment shall be made.
b) Excavation, grading, and compacted fill, including all fine grading, shall be included in the cost of the work; therefore, no separate payment shall be made.
c) Replacement and spreading of topsoil to preconstruction conditions shall be included in the cost of the pipe; therefore, no separate payment shall be made. Excavation shall be unclassified.
d) There shall be no separate payment for rock or muck excavation or dewatering, and related backfill excavation. Trenching and backfill costs shall be included in the unit price bid for installation of all work.

r. Pavement Markings and Striping - Contractor shall be responsible for replacing, restoring, and or repainting all pavement markings and striping to match pre-construction conditions and in compliance with NCDOT standards. This shall be included in the cost of the work and no separate payment shall be made.

s. Repainting of Street Addresses - If applicable, contractor shall be responsible for repainting street addresses painted on existing curb and gutter or asphalt gutter which are damaged as a result of construction. This shall be included in the cost of the work and no separate payment shall be made.

t. Replacement of Irrigation systems – existing irrigation pipelines damaged during construction shall be replaced with like materials and appurtenances upon completion of construction. This shall be included in the cost of the work and no separate payment shall be made.

u. All required permits and safety training requirements for access within International Paper property shall be included in the cost of the work and no separate payment shall be made.

ii. ITEMS NOT PAID FOR

1. No payment will be made for any item not specifically listed in the Bid Form. All ancillary items required for a complete, functioning, installation, including fittings, testing, cleanup, seeding restoration, etc. will be the responsibility of the contractor to include in the cost of line items listed on the Bid Form.

2. The owner nor engineer takes no responsibility for subsurface conditions, including unyielding material and existing utilities not indicated or shown on the plans.

1.6 SCOPE OF PAYMENT

A. The contractor shall receive and accept compensation provided for in the contract as full payment for furnishing all materials, for performing all work under the contract in a complete and acceptable manner, and for all risk, loss, damage, or expense of whatever character arising out of the nature of the work or the prosecution thereof.

B. When the "basis of payment" subsection of a technical specification requires that the contract price (price bid) include compensation for certain work or material essential to the item, this same work or material will not also be measured for payment under any other contract item which may appear elsewhere in the contract, plans, or specifications.

1.7 COMPENSATION FOR ALTERED QUANTITIES

A. When the accepted quantities of work vary from the quantities in the proposal, the contractor shall accept as payment in full, so far as contract items are concerned, payment at the original contract price for the accepted quantities of work actually completed and accepted. No allowance, will be made for any increased expense, loss of expected reimbursement, or loss of anticipated profits suffered or claimed by the contractor which results directly from such alterations or indirectly from his unbalanced allocation of overhead and profit among the contract items, or from any other cause.

1.8 PAYMENT FOR OMITTED ITEMS

A. The Owner shall have the right to omit from the work (order nonperformance) any contract item, except major contract items, in the best interest of the owner.

B. Should the Owner omit or order nonperformance of a contract item or portion of such item from the work, the contractor shall accept payment in full at the contract prices for any work actually completed and acceptable prior to the Owner's order to omit or nonperformance such contract item.

C. Acceptable materials ordered by the contractor or delivered on the work prior to the date of the Owner's order will be paid for at the actual cost to the contractor only if it has been approved in the submittal process by the engineers.

END OF SECTION 01025

SECTION 01027 - APPLICATIONS FOR PAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies administrative and procedural requirements governing each prime contractor's Applications for Payment.

1. Coordinate the Schedule of Values and Applications for Payment with the Contractor's Construction Schedule, Submittal Schedule, and List of Subcontracts.

B. Related Sections: The following Sections contain requirements that relate to this Section.

1. Schedules: The Contractor's Construction Schedule and Submittal Schedule are specified in Division 1 Section "Submittals."

1.3 SCHEDULE OF VALUES:

A. Coordination: Each prime Contractor shall coordinate preparation of its Schedule of Values for its part of the Work with preparation of the Contractors' Construction Schedule.

1. Correlate line items in the Schedule of Values with other required administrative schedules and forms, including:

a) Contractor's Construction Schedule.
b) Cash Outlay Schedule
c) Application for Payment forms, including Continuation Sheets.
d) List of subcontractors.
e) Schedule of alternates.
f) List of products.
g) List of principal suppliers and fabricators.
h) Schedule of submittals.

2. Submit the Schedule of Values to the Engineer at the earliest possible date but no later than 21 days after the issuance of the Notice to Proceed. No payment will be provided until schedule of values has been approved.

3. Subschedules: Where Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

B. Format and Content: Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:

a) Project name and location.
b) Name and address of the Owner.
c) Name and address of the Engineer.
d) Project number.
e) Contractor's name and address.
f) Date of submittal.

2. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:

a) Related Specification Section or Division.
b) Description of Work.
c) Name of subcontractor.
d) Name of manufacturer or fabricator.
e) Name of supplier.

3. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports.

4. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed.

a) Differentiate between items stored on-site and items stored off-site. Include requirements for insurance and bonded warehousing, if required.

5. Provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

6. Schedule Updating: Update and resubmit the Schedule of Values prior to the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.4 APPLICATIONS FOR PAYMENT:

A. Each Application for Payment shall be consistent with previous applications and payments as certified by the Engineer and paid for by the Owner.

1. The initial Application for Payment, the Application for Payment at time of Substantial Completion, and the final Application for Payment involve additional requirements.

B. Payment-Application Times: The cut-off date for each progress payment is the 20th day of each month. The period covered by each Application for Payment starts on the day following the end of the preceding period and ends 15 days prior to the date for each progress payment.

C. Payment-Application Forms: Use USDA-FmHA Form 1924-18 as the form for Applications for Payment or unless otherwise approved by Owner and Engineer.

D. Application Preparation: Complete every entry on the form. Include notarization and execution by a person authorized to sign legal documents on behalf of the Contractor. The Engineer will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and the Contractor's Construction Schedule. Use updated schedules if revisions were made.

2. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

E. Transmittal: Submit 6 signed and notarized original copies of each Application for Payment to the Engineer by a method ensuring receipt within 24 hours. Sales tax report and stored materials log shall be submitted with each copy.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information related to the application, in a manner acceptable to the Engineer.

2. Submit final Applications for Payment with or preceded by final waivers of lien and payment from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

3. Waiver Forms: Submit waivers of lien and payment on forms, and executed in a manner, acceptable to the Owner.

F. Initial Application for Payment: Administrative actions and submittals, that must precede or coincide with submittal of the first Application for Payment, include the following:

1. List of subcontractors.
2. List of principal suppliers and fabricators.
3. Schedule of Values.
4. Cash Outlay Schedule
5. Contractor's Construction Schedule (preliminary if not final).
6. Schedule of principal products.
7. Schedule of unit prices.
8. Submittal Schedule (preliminary if not final).
9. Copies of building permits.

10. Copies of authorizations and licenses from governing authorities for performance of the Work.

G. Application for Payment at Substantial Completion: Following issuance of the Certificate of Substantial Completion, submit an Application for Payment.

1. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

2. Administrative actions and submittals that shall precede or coincide with this application include:

a) Occupancy permits and similar approvals.
b) Warranties (guarantees) and maintenance agreements.
c) Test/adjust/balance records.
d) Maintenance instructions.
e) Meter readings.
f) Startup performance reports.
g) Changeover information related to Owner's occupancy, use, operation, and maintenance.
h) Final cleaning.
i) Application for reduction of retainage and consent of surety.
j) List of incomplete Work, recognized as exceptions to Engineer's Certificate of Substantial Completion.

H. Final Payment Application: Administrative actions and submittals that must precede or coincide with submittal of the final Application for Payment include the following:

1. Completion of Project closeout requirements.
2. Completion of items specified for completion after Substantial Completion.
3. Ensure that unsettled claims have been settled.
4. Transmittal of required Project construction records to the Owner including “as-built” drawings.
5. Submittal of all Operations and Maintenance Manuals.
6. Proof that taxes, fees, and similar obligations were paid.
7. Removal of temporary facilities and services.
8. Removal of surplus materials, rubbish, and similar elements.
9. Submittal of all waivers of lien and payment from subcontractors and material suppliers.
10. Submittal of final Sales Tax Report.
11. Submittal of Consent of Surety for Final Payment.
12. Release statements from NCDOT and railroad encroachments.

I. Each application shall be accompanied by a “Sales Tax Report Form” with supporting invoices. If no sales tax was paid this period, submit form stating “No Sales Tax this Period”.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01027

SECTION 01030 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements governing Alternates.

1.3 DEFINITIONS:

A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES:

A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates. Alternates may be added to the Contract at a later date as directed by the Owner.

C. Execute accepted alternates under the same conditions as other Work of this Contract.

D. Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES:

A. As indicated in the Bid Form.

END OF SECTION 01030

SECTION 01035 - MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies administrative and procedural requirements for handling and processing contract modifications.

1. Multiple Prime Contracts: Provisions of this Section apply to the work of each prime contractor.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Unit and Lump Sum Prices" for administrative requirements governing use of unit prices.
2. Division 1 Section "Submittals" for requirements for the Contractor's Construction Schedule.
3. Division 1 Section "Applications for Payment" for administrative procedures governing Applications for Payment.
4. Division 1 Section "Product Substitutions" for administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 MINOR CHANGES IN THE WORK:

A. The Engineer will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or Contract Time as a field order in letter form.

1.4 CHANGE ORDER PROPOSAL REQUESTS:

A. Owner-Initiated Proposal Requests: The Engineer will issue a detailed description of proposed changes in the Work that will require adjustment to the Contract Sum or Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal requests issued by the Engineer are for information only. Do not consider them as an instruction either to stop work in progress or to execute the proposed change.
2. Within 14 days of receipt of a proposal request, submit an estimate of cost necessary to execute the change to the Engineer for the Owner's review.

a) Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
b) Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
c) Include a statement indicating the effect the proposed change in the Work will have on the Contract Time.

B. Contractor-Initiated Proposals: When latent or unforeseen conditions require modifications to the Contract, the Contractor may propose changes by submitting a request for a change to the Engineer.

1. Include a statement outlining the reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
2. Include a list of quantities of products required and unit costs, with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Comply with requirements in Section "Product Substitutions" if the proposed change requires substitution of one product or system for a product or system specified.

1.5 ALLOWANCES (Not Applicable)

1.6 CONSTRUCTION WORK CHANGE DIRECTIVE:

A. Construction Work Change Directive: When the Owner and the Contractor disagree on the terms of a Proposal Request, the Engineer may issue a Construction Work Change Directive in letter form. The Construction Work Change Directive instructs the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. The Construction Work Change Directive contains a complete description of the change in the Work. It also designates the method to be followed to determine change in the Contract Sum or Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Work Change Directive.

1. After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.7 CHANGE ORDER PROCEDURES:

A. Upon the Owner's approval of a Proposal Request, the Engineer will issue a Change Order for signatures of the Owner and the Contractor on Form CO-1. Sample copy is included at the end of this section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01035

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and supervisory requirements necessary for coordinating construction operations including, but not necessarily limited to, the following:

1. General project coordination procedures.
2. Conservation.
3. Coordination Drawings.
4. Administrative and supervisory personnel.
5. Cleaning and protection.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Field Engineering" specifies procedures for field engineering services, including establishment of benchmarks and control points.
2. Division 1 Section "Project Meetings" for progress meetings, coordination meetings, and preinstallation conferences.
3. Division 1 Section "Submittals" for preparing and submitting the Contractor's Construction Schedule.
4. Division 1 Section "Materials and Equipment" for coordinating general installation.
5. Division 1 Section "Contract Closeout" for coordinating contract closeout.

1.3 COORDINATION:

A. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation. The Division I Contractor shall be responsible for overall project coordination with all multiple prime contractors.

1. Schedule construction operations in the sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.

2. Coordinate installation of different components to assure maximum accessibility for required maintenance, service, and repair.
3. Make provisions to accommodate items scheduled for later installation.

B. Where necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.

1. Prepare similar memoranda for the Owner and separate contractors where coordination of their work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and assure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of schedules.
2. Installation and removal of temporary facilities.
3. Delivery and processing of submittals.
4. Progress meetings.
5. Project closeout activities.

D. Conservation: Coordinate construction operations to assure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated in, the Work.

1.4 SUBMITTALS:

A. Coordination Drawings: Prepare coordination drawings where careful coordination is needed for installation of products and materials fabricated by separate entities. Prepare coordination drawings where limited space availability necessitates maximum utilization of space for efficient installation of different components.

1. Show the relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Comply with requirements contained in Section "Submittals."

B. Staff Names: Within 15 days of commencement of construction operations, submit a list of the Contractor's principal staff assignments, including the superintendent and other personnel in attendance at the Project Site. Identify individuals and their duties and responsibilities. List their addresses and telephone numbers.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS:

A. Inspection of Conditions: Require the Installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

B. Coordinate temporary enclosures with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION:

A. Clean and protect construction in progress and adjoining materials in place, during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.

B. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.

C. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period. Where applicable, such exposures include, but are not limited to, the following:

1. Excessive static or dynamic loading.
2. Excessive internal or external pressures.
3. Excessively high or low temperatures.
4. Thermal shock.
5. Excessively high or low humidity.
6. Air contamination or pollution.
7. Water or ice.
8. Solvents.
9. Chemicals.
10. Light.
11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining, and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High-speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.

24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

END OF SECTION 01040

SECTION 01045 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for cutting and patching.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating cutting and patching with other construction activities.
2. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 SUBMITTALS:

A. Cutting and Patching Proposal: Submit a proposal describing procedures well in advance of the time cutting and patching will be performed if the Owner requires approval of these procedures before proceeding. Request approval to proceed. Include the following information, as applicable, in the proposal:

1. Describe the extent of cutting and patching required. Show how it will be performed and indicate why it cannot be avoided.
2. Describe anticipated results in terms of changes to existing construction. Include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
3. List products to be used and firms or entities that will perform Work.
4. Indicate dates when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted.
6. Where cutting and patching involves adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with the original structure.
7. Approval by the Engineer to proceed with cutting and patching does not waive the Engineer's right to later require complete removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE: (Not Applicable)

1.5 WARRANTY:

A. Existing Warranties: Replace, patch, and repair material and surfaces cut or damaged by methods and with materials in such a manner as not to void any warranties required or existing.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL:

A. Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible if identical materials are unavailable or cannot be used. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 - EXECUTION

3.1 INSPECTION:

A. Examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed before cutting. If unsafe or unsatisfactory conditions are encountered, take corrective action before proceeding.

1. Before proceeding, meet at the Project Site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

3.2 PREPARATION:

A. Temporary Support: Provide temporary support of work to be cut.

B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.

C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

D. Avoid cutting existing pipe, conduit, or ductwork serving the building but scheduled to be removed or relocated until provisions have been made to bypass them.

3.3 PERFORMANCE:

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
2. Each Contractor shall cut, fit and patch his work as necessary to properly connect the various parts and to prepare his work to meet, fit and connect to the work of other contractors as indicated or reasonably implied by the Contract Documents. Any such cutting and fitting as may be required in connecting the work of various trades shall be executed by the respective trade. The patching and finishing of areas or items altered by cutting and fitting shall be done by the Contractor responsible for the finished work at the expense of the other contractor requiring such alterations.
3. Where practical, the General Construction Contractor shall build around the work of other separate contractors or shall leave chases, slots, and holes as required to receive and to conceal within the general construction work, the work of such other separate contractors as directed by them. Where such chases, slots, etc., are impractical, the work shall require specific approval of the Engineer.
4. Necessary chases, slots, and holes not built or left by the General Construction Contractor shall be cut by the separate contractor requiring such alterations after approval of the General Construction Contractor. The General Construction Contractor shall do all patching and finishing of his work where cut by other contractors at the expense of such other contractors.
5. No alterations shall be made which will be detrimental to any of the work. No Contractor shall endanger any work by cutting, digging, or in any other manner, nor shall he alter the work of any other contractor without prior approval of both the Engineer and such other contractor.

B. Cutting: Cut existing construction using methods least likely to damage elements retained or adjoining construction. Where possible, review proposed procedures with the original Installer; comply with the original Installer's recommendations.

1. In general, where cutting, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
3. Cut through concrete and masonry using a cutting machine, such as a Carborundum saw or a diamond-core drill.
4. Comply with requirements of applicable Division 2 Sections where cutting and patching requires excavating and backfilling.
5. Where services are required to be removed, relocated, or abandoned, by-pass utility services, such as pipe or conduit, before cutting. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.

C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.

1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3.4 CLEANING:

A. Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar items. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

END OF SECTION 01045

SECTION 01050 - FIELD ENGINEERING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. General: This Section specifies administrative and procedural requirements for field-engineering services including, but not limited to, the following:

1. Construction surveying.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 1 Section "Submittals" for submitting Project record surveys.
3. Division 1 Section "Project Closeout" for submitting final “as-builts” with Project Record Documents.

1.3 SUBMITTALS:

A. Project Record Documents: Submit a record of Work performed, “as-builts”, and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.

1.4 QUALITY ASSURANCE:

A. Construction Surveyor Qualifications: For all work, the Contractor shall have on the job, at all times, a man who is capable of setting stakes and replacing damaged stakes, and who understands the value and use of stakes and cut sheets, to whom the Engineer may deliver information.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION:

A. Identification: The Owner or Engineer will identify existing control points and property line corner stakes for the horizontal and vertical control of the work. These points have previously been set by the Engineer. All construction staking and layout shall be the responsibility of the Contractor.

B. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

1. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
2. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points.

C. Establish and maintain benchmarks on the site, referenced to data established by survey control points as required for the performance of the work.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

D. Existing Utilities and Equipment: The existence and location of underground and other utilities and construction, including dimension and elevation, indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction.

1. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.
2. If any work is performed by the Contractor, or any subcontractors, prior to adequate verification of applicable data, any resultant extra cost for adjustment of work necessary to conform to existing conditions, or damage to existing facilities, shall be assumed by the Contractor without reimbursement or compensation by the Owner.
3. If the Contractor in the course of the work finds any discrepancy between the drawings and the physical conditions of the locality or any errors or omissions in drawings or in the layout as given by survey points and instructions, he shall immediately inform the Engineer, in writing. The Engineer will promptly investigate the reported conditions and issue such instructions as may be necessary for the proper execution of the work. Any work done after such discovery and prior to receipt of such instructions shall be at the risk of the Contractor.

E. The Contractor shall satisfy himself as to the nature of the work, shall investigate all other matters, which can in any way affect the work under this Contract, and shall determine the character of equipment and facilities needed preliminary to and during the prosecution of the work. No verbal agreement or conversation with any officer, agent, or employee of the Owner or the Engineer, either before or after the execution of this Contract, shall affect or modify any terms or obligations herein contained.

3.2 PERFORMANCE:

A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

1. Advise entities engaged in construction activities of marked lines and levels provided for their use.
2. As construction proceeds, check every major element for line, level, and plumb.

B. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference.

1. Record deviations from required lines and levels, and advise the Engineer when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected.

C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out batter boards for all structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work. The General Contractor shall establish, for use by the electrical, mechanical, plumbing, and all other contractors and trades, all necessary lines and reference points for partitions, walls, floors, ceilings, openings, etc., both before and after concrete, masonry, lath and plaster, and other “roughing-in” materials are placed. The locations of all lines and points shall be verified by an overall distance check, end-to-end or side-to-side as applicable, of all intermediate dimensions.

E. New Utilities: For sewers and storm drains, the Contractor shall stake all offset lines with tack centers or use approved laser instruments to maintain proper line and grade. Tack centers shall be sufficiently off from the centerline to allow for construction, and not over 50’ apart. The Contractor shall consult with the Engineer prior to establishing the offset lines, and the Contractor shall be responsible for protecting all stakes and shall make necessary replacements. After stakes have been set, the Contractor will determine necessary elevations and develop cut sheets for field use.

For water mains, the Engineer will provide baseline and centerline dimension information or give other fixed references for location of the main by the Contractor. He will also indicate locations of fire hydrants and valves.

F. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in

or affected by construction. Coordinate with the Engineer and local authorities having jurisdiction.

G. Preservation of Construction Staking: The Contractor shall be responsible for preserving all stakes and shall replace or bear the cost of replacing all stakes needlessly damaged during construction. The cost of replacing damaged stakes due to negligence or needless damage by the Contractor, if provided by the Engineer, will be charged to the Contractor at the Engineer's cost of performing the work.

END OF SECTION 01050

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS:

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings; or to other paragraphs or schedules in the Specifications and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the user locate the reference. Location is not limited.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Engineer, requested by the Engineer, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Engineer's action on the Contractor's submittals, applications, and requests, is limited to the Engineer's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means to supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project site including the actual unloading, temporary storage, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, who performs a particular construction activity including installation, erection,

application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
2. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

    a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

J. "Project site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction with others performing work as part of the Project. The extent of the Project site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION:

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-division format and "MasterFormat" numbering system.

B. Specification Content: These Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpolated

as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS:

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with 2 or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer to the Engineer before proceeding for a decision on requirements that are different but apparently equal, and where it is uncertain which requirement is the most stringent.

   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Engineer for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

   1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source and make them available on request.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following abbreviations and acronyms, as referenced in the Contract Documents, mean the associated

names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association, Inc. 900 19th Street, NW, Suite 300 Washington, DC 20006	(202) 862-5100
AABC	Associated Air Balance Council 1518 K Street, NW Washington, DC 20005	(202) 737-0202
AAMA	American Architectural Manufacturers Assoc. 1540 E. Dundee Road, Suite 310 Palatine, IL 60067	(708) 202-1350
AAN	American Association of Nurserymen 1250 I Street, NW, Suite 500 Washington, DC 20005	(202) 789-2900
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol Street, Suite 249 Washington, DC 20001	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 One Davis Drive Research Triangle Park, NC 27709-2215	(919) 549-8141
ABMA	American Bearing Manufacturers Assoc. 1200 19th Street, Suite 300 Washington, DC 20036	(202) 429-5155
ABMA	American Boiler Manufacturers Association 950 North Glebe Road, Suite 160 Arlington, VA 22203	(703) 522-7350
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI 48219	(313) 532-2600
ACIL	American Council of Independent Laboratories 1629 K Street, NW Washington, DC 20006	(202) 887-5872
ACPA	American Concrete Pipe Association 8300 Boone Boulevard, Suite 400 Vienna, VA 22182	(703) 821-1990

ADC	Air Diffusion Council 104 S. Michigan Avenue, Suite 1500 Chicago, IL 60603	(312) 201-0101
AFBMA	Anti-Friction Bearing Manufacturers Assoc. (Now ABMA)	
AFPA	American Forest and Paper Association 1111 19th Street, NW, Suite 800 Washington, DC 20036	(202) 463-2700
AGA	American Gas Assoc. 400 N. Capital Street, NW, Suite 400 Arlington, VA 20001	(202) 347-7337
AHA	American Hardboard Assoc. 1210 W. Northwest Highway Palatine, IL 60067	(847) 934-8800
AHAM	Association of Home Appliance Manufacturers 20 N. Wacker Drive, Suite 1500 Chicago, IL 60606	(312) 984-5800
AI	Asphalt Institute Research Park Drive P.O. Box 14052 Lexington, KY 40512-4052	(606) 288-4960
AIA	The American Institute of Architects 1735 New York Avenue, NW Washington, DC 20006	(202) 626-7300
AIA	American Insurance Assoc. 1130 Connecticut Avenue, NW, Suite 1000 Washington, DC 20036	(202) 828-7100
AIHA	American Industrial Hygiene Assoc. 2700 Prosperity Avenue, Suite 250 Fairfax, VA 22031	(703) 849-8888
AISC	American Institute of Steel Construction One East Wacker Drive, Suite 3100 Chicago, IL 60601-2001	(312) 670-2400
AISI	American Iron and Steel Institute 1140 Connecticut Avenue, Suite 705 Washington, D 20036-4700	(202) 452-7100

AITC	American Institute of Timber Construction 7012 S. Revere Pkwy, Suite 140 Englewood, CO 80112	(303) 792-9559
ALA	American Laminators Association P.O. Box 2209 Seattle, WA 98111-2209	(206) 382-1671
ALI	Associated Laboratories, Inc. c/o HOH Chemicals 500 S. Vermont Street Palatine, IL 60067	(847) 358-7400
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	(301) 972-1700
AMCA	Air Movement and Control Assoc. 30 W. University Drive Arlington Heights, IL 60004-1893	(847) 394-0150
ANSI	American National Standards Institute 25 W. 43rd Street New York, NY 10036	(212) 642-4900
AOAC	AOAC International 2200 Wilson Blvd., Suite 400 Arlington, VA 22201-3301	(703) 522-3032
AOSA	Association of Official Seed Analysts 201 N. 8th Street, Suite 400, 68508 P.O. Box 81152 Lincoln, NE 68501-1151	(402) 476-3852
APA	APA-The Engineered Wood Association (Formerly American Plywood Assoc.) P.O. Box 11700 Tacoma, WA 98411	(206) 565-6600
API	American Petroleum Institute 1220 L Street, NW Washington, DC 20005	(202) 682-8000
ARI	Air-Conditioning and Refrigeration Institute 4301 Fairfax Drive, Suite 425 Arlington, VA 22203	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Assoc. 6000 Executive Drive, Suite 201 Rockville, MD 20852-3803	(301) 231-9050

ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797	(516) 576-2360
ASC	Adhesive and Sealant Council 1627 K Street, NW, Suite 1000 Washington, DC 20006-1707	(202) 452-1500
ASCE	American Society of Civil Engineers 345 East 47th Street New York, NY 10017-2398	(800) 548-2723
ASHE	American Society for Healthcare Engineering One North Franklin, 28th Floor Chicago, IL 60606	(800) AHA-2626 (312) 422-3811
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329-2305	(800) 527-4723
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017	(212) 705-7722
ASPA	American Sod Producers Assoc. (Now TPI)	
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake Village, CA 91362	(805) 495-7120
ASSE	American Society of Sanitary Engineering 901 Canterbury Road, Suite A Westlake, OH 44145	(440) 835-3040
ASTM	American Society for Testing and Materials 100 Barr Harbor Drive West Conshohocken, PA 19428	(610) 832-9585
ATIS	Alliance for Telecommunications Industry Solutions 1200 G Street, NW, Suite 500 Washington, DC 20005	(202) 628-6380
AWCMA	American Window Covering Manufacturers Assoc. (Now WCMA)	

AWI	Architectural Woodwork Institute 1952 Isaac Newton Square Reston, VA 22090	(703) 222-1100
AWPA	American Wood Preservers' Assoc. P.O. Box 286 Woodstock, MD 21163-0286	(410) 465-3169
AWPB	American Wood Preservers' Bureau (This organization is now defunct.)	
AWS	American Welding Society 550 NW 42nd Avenue Miami, FL 33126	(305) 443-9353
AWWA	American Water Works Assoc. 6666 W. Quincy Avenue Denver, CO 80235	(303) 794-7711
BANC	Brick Association of North Carolina P.O. Box 13290 Greensboro, NC 27415-3290	(910) 273-5566
BHMA	Builders Hardware Manufacturers Assoc. 355 Lexington Avenue, 17th Floor New York, NY 10017-6603	(212) 661-4261
BIA	Brick Institute of America 11490 Commerce Park Drive Reston, VA 20191	(703) 620-0010
BIFMA	The Business and Institutional Furniture Manufacturer's Association 2680 Horizon Drive, SE, Suite A1 Grand Rapids, MI 49546-7500	(616) 285-3963
CAGI	Compressed Air and Gas Institute c/o Thomas Associates, Inc. 1300 Sumner Avenue Cleveland, OH 44115-2851	(216) 241-7333
CAUS	Color Association of the United States 209 W. 44th Street New York, NY 10036	(212) 582-6884
CBM	Certified Ballast Manufacturers Assoc. 1422 Euclid Avenue, Suite 402 Cleveland, OH 44115-2851	(216) 241-0711

CCC	Carpet Cushion Council 26 Arcadia Road Bristol, CT 06010	 (203) 637-1312
CDA	Copper Development Association Inc. 260 Madison Av., 16th Floor New York, NY 10016	 (800) 232-3282 (212) 251-7200
CFFA	Chemical Fabrics & Film Association, Inc. c/o Thomas Associates, Inc. 1300 Sumner Avenue Cleveland, OH 44115-2851	 (216) 241-7333
CGA	Compressed Gas Assoc. 1725 Jefferson Davis Highway, Suite 1004 Arlington, VA 22202-4100	 (703) 412-0900
CISCA	Ceiling and Interior Systems Construction Assoc. 579 W. North Avenue, Suite 301 Elmhurst, IL 60126	 (708) 833-1919
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Road, Suite 419 Chattanooga, TN 37421	 (615) 892-0137
CLFMI	Chain Link Fence Manufacturers Institute 1776 Massachusetts Avenue, NW, Suite 500 Washington, DC 20036	 (202) 659-3537
CRI	Carpet and Rug Institute P.O. Box 2048 Dalton, GA 30722-2048	 (706) 278-0232
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173-4758	 (708) 517-1200
CTIOA	Ceramic Tile Institute of America 12061 West Jefferson Blvd. Culver City, CA 90230	 (310) 574-7800
DHI	Door and Hardware Institute 14170 Newbrook Drive Chantilly, VA 22021-2223	 (703) 222-2010
DIPRA	Ductile Iron Pipe Research Assoc. 245 Riverchase Parkway East Birmingham, AL 35124	 (205) 988-9870

DLPA	Decorative Laminate Products Assoc. 13924 Braddock Road Centreville, VA 22020	(800) 684-3572
ECSA	Exchange Carriers Standards Assoc. (Now ATIS)	
EIA	Electronic Industries Assoc. 2001 Pennsylvania Avenue, NW Washington, DC 20006-1813	(202) 457-4900
EIMA	EIFS Industry Manufacturers Assoc. 2759 State Road 580, Suite 112 Clearwater, FL 34621	(813) 726-6477
EJMA	Expansion Joint Manufacturers Assoc. 25 N. Broadway Tarrytown, NY 10591	(914) 332-0040
ETL	ETL Testing Laboratories, Inc. c/o Inchcape Testing Services P.O. Box 2040 3933 Route 11, Industrial Park Cortland, NY 13045	 (800) 345-3851 (607) 753-6711
FCI	Fluid Controls Institute c/o Thomas Associates, Inc. 1300 Sumner Avenue Cleveland, OH 44115-2851	(216) 241-7333
FCICA	Floor Covering Installation Contractors Assoc. (Formerly Floor Covering Installation Board) P.O. Box 948 Dalton, GA 30722-0948	(706) 226-5488
FGMA	Flat Glass Marketing Assoc. (Now GANA)	
FM	Factory Mutual 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062	(617) 762-4300
FTI	Facing Tile Institute P.O. Box 8880 Canton, OH 44711	(216) 488-1211
GA	Gypsum Association 810 First Street, NE, Suite 510 Washington, DC 20002	(202) 289-5440

GANA	Glass Association of North America 3310 SW Harrison Street Topeka, KS 66611-2279	(913) 266-7013
HEI	Heat Exchange Institute c/o Thomas Associates, Inc. 1300 Sumner Avenue Cleveland, OH 44115-2851	(216) 241-7333
HI	Hydraulic Institute 9 Sylvan Way Parsippany, NJ 07054-3802	(201) 267-9700
HI	Hydronics Institute P.O. Box 218 35 Russo Place Berkeley Heights, NJ 07922	(908) 464-8200
HMA	Hardwood Manufacturers Assoc. 400 Penn Center Blvd. Pittsburgh, PA 15235	(412) 829-0770
HPVA	Hardwood Plywood and Veneer Assoc. 1825 Michael Faraday Drive 20190 P.O. Box 2789 Reston, VA 20195-0789	(703) 435-2900
IBD	Institute of Business Designers 341 Merchandise Mart Chicago, IL 60654	(312) 467-1950
ICEA	Insulated Cable Engineers Association, Inc. P.O. Box 440 South Yarmouth, MA 02664	(508) 394-4424
IEC	International Electrotechnical Commission (Available from ANSI) 25 West 43rd Street, 4th Floor New York, NY 10036	(212) 642-4900
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th Street New York, NY 10017	(212) 705-7900
IESNA	Illuminating Engineering Society of North America 120 Wall Street, Floor 17 New York, NY 10005-4001	(212) 248-5000

IGCC	Insulating Glass Certification Council c/o ETL Testing Laboratories, Inc. P.O. Box 2040 Route 11, Industrial Park Cortland, NY 13045	(607) 753-6711
ILI	Indiana Limestone Institute of America Stone City Bank Building, Suite 400 Bedford, IN 47421	(812) 275-4426
IMSA	International Municipal Signal Assoc. 165 E. Union Street Newark, NY 14513	(315) 331-2182
IRI	Industrial Risk Insurers P.O. Box 5010 85 Woodland Street Hartford, CT 06102-5010	(203) 520-7300
ISA	Instrument Society of America P.O. Box 12277 67 Alexander Drive Research Triangle Park, NC 27709	(919) 549-8411
KCMA	Kitchen Cabinet Manufacturers Assoc. 1899 Preston White Drive Reston, VA 20191	(703) 264-1690
LGSI	Light Gage Structural Institute P.O. Box 866301 Plano, TX 75086-6301	(214) 618-3977
LIA	Lead Industries Association, Inc. 295 Madison Avenue New York, NY 10017	(212) 578-4750
LPI	Lightning Protection Institute 3335 N. Arlington Heights Road, Suite E Arlington Heights, IL 60004	(800) 488-6864
MBMA	Metal Building Manufacturer's Assoc. c/o Thomas Associates, Inc. 1300 Sumner Avenue Cleveland, OH 44115-2851	(216) 241-7333
MCAA	Mechanical Contractors Association of America 1385 Piccard Drive Rockville, MD 20850-4329	(301) 869-5800

MFMA	Maple Flooring Manufacturers Assoc. 60 Revere Drive, Suite 500 Northbrook, IL 60062	(708) 480-9138
MIA	Marble Institute of America 30 Eden Alley, Suite 201 Columbus, OH 43215	(614) 228-6194
MIA	Masonry Institute of America 2550 Beverly Blvd. Los Angeles, CA 90057	(213) 388-0472
ML/SFA	Metal Lath/Steel Framing Assoc. (A Division of the NAAMM) 11 South LaSalle Street, Suite 1400 Chicago, IL 60603	(312) 201-0101
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180-4602	(703) 281-6613
NAA	National Arborist Assoc. The Meeting Place Mall Route 101, P.O. Box 1094 Amherst, NH 03031-1094	(603) 673-3311
NAAMM	National Association of Architectural Metal Manufacturers 11 South LaSalle Street, Suite 1400 Chicago, IL 60603	(312) 201-0101
NAIMA	North American Insulation Manufacturers Assoc. 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314	(703) 684-0084
NAPA	National Asphalt Pavement Assoc. NAPA Building 5100 Forbes Blvd. Lanham, MD 20706-4413	(301) 731-4748
NAPF	National Association of Plastic Fabricators (Now DLPA)	
NBGQA	National Building Granite Quarries Assoc., Inc. c/o Rock of Ages 369 N. State Street Concord, NH 03301	(800) 884-7936 (603) 225-8397
NBHA	National Builders Hardware Assoc. (Now DHI)	

NCMA	National Concrete Masonry Assoc. 2302 Horse Pen Road Herndon, VA 20171-3499	 (703) 713-1900
NCPI	National Clay Pipe Institute P.O. Box 759 253-80 Center Street Lake Geneva, WI 53147	 (414) 248-9094
NCRPM	National Council on Radiation Protection and Measurements 7910 Woodmont Avenue, Suite 800 Bethesda, MD 20814	 (301) 657-2652
NCSPA	National Corrugated Steel Pipe Association 1255 23rd Street, NW, Suite 850 Washington, DC 20037	 (202) 452-1700
NEC	National Electrical Code (Available from NFPA)	
NECA	National Electrical Contractors Assoc. 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814-5372	 (301) 657-3110
NEII	National Elevator Industry, Inc. 185 Bridge Plaza, North, Room 310 Fort Lee, NJ 07024	 (201) 944-3211
NELMA	Northeastern Lumber Manufacturers Assoc. 272 Tuttle Road P.O. Box 87A Cumberland Center, ME 04021	 (207) 829-6901
NEMA	National Electrical Manufacturers Assoc. 2101 L Street, NW, Suite 300 Washington, DC 20037	 (202) 457-8400
NETA	International Electrical Testing Assoc. P.O. Box 687 Morrison, CO 80465-1526	 (303) 697-8441
NFPA	National Fire Protection Assoc. One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101	 (800) 344-3555 (617) 770-3000
NFPA	National Forest Products Assoc. (Now AFPA)	

NHLA	National Hardwood Lumber Assoc. P.O. Box 34518 Memphis, TN 38184-0518	(901) 377-1818
NKCA	National Kitchen Cabinet Assoc. (Now KCMA)	
NLGA	National Lumber Grades Authority 103-4400 Dominion Street Burnaby, BC V5G 4G3 CANADA	(604) 451-7323
NOFMA	National Oak Flooring Manufacturers Assoc. P.O. Box 3009 Memphis, TN 38173-0009	(901) 526-5016
NPA	National Particleboard Assoc. 18928 Premiere Ct. Gaithersburg, MD 20879-1569	(301) 670-0604
NPCA	National Paint and Coatings Assoc. 1500 Rhode Island Avenue, NW Washington, DC 20005	(202) 462-6272
NRCA	National Roofing Contractors Assoc. O'Hare International Center 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018-5607	(708) 299-9070
NSF	NSF International (Formerly National Sanitation Foundation) 3475 Plymouth Road P.O. Box 130140 Ann Arbor, MI 48113-0140	(313) 769-8010
NSSEA	National School Supply and Equipment Assoc. 8300 Colesville Road, No. 250 Silver Spring, MD 20910	(301) 495-0240
NTMA	National Terrazzo and Mosaic Assoc. 3166 Des Plaines Avenue, Suite 132 Des Plaines, IL 60018	(708) 635-7744
NWMA	National Woodwork Manufacturers Assoc. (Now NWWDA)	
NWWDA	National Wood Window and Door Assoc. 1400 E. Touhy Avenue, #G54 Des Plaines, IL 60018	(800) 223-2301 (708) 299-5200

PATMI	Power Actuated Tool Manufacturers' Institute, Inc. 1603 Boonslick Road St. Charles, MO 63301	(314) 947-6610
PCA	Portland Cement Assoc. 5420 Old Orchard Road Skokie, IL 60077-1083	(708) 966-6200
PCI	Precast/Prestressed Concrete Institute 175 W. Jackson Blvd. Chicago, IL 60604	(312) 786-0300
PDI	Plumbing and Drainage Institute c/o Sol Baker 1106 W. 77th Street, South Drive Indianapolis, IN 46260	(317) 251-6970
PEI	Porcelain Enamel Institute 102 Woodmont Center, Suite 360 Nashville, TN 37205	(615) 385-0758
PIMA	Polyisocyanurate Insulation Manufacturers Association 1001 Pennsylvania Avenue, NW 5th Floor North Washington, DC 20004	(202) 624-2709
RFCI	Resilient Floor Covering Institute 401 East Jeffeson Street, Sutie 102 Rockville, MD 20850	(301) 340-8580
RIS	Redwood Inspection Service 405 Enfrente Drive, Suite 200 Novato, CA 94949	(415) 382-0662
RMA	Rubber Manufacturers Assoc. 1400 K Street, NW Washington, DC 20005	(202) 682-4800
SAE	SAE International 400 Commonwealth Drive Warrendale, PA 15096-0001	(412) 776-4841
SDI	Steel Deck Institute P.O. Box 25 Fox River Grove, IL 60021	(847) 889-0010
SDI	Steel Door Institute 30200 Detroit Road Cleveland, OH 44145-1967	(216) 889-0010

SEFA	Scientific Equipment and Furniture Assoc. 1028 Duchess Drive McLean, VA 22102	(703) 790-8661
SGCC	Safety Glazing Certification Council c/o ETL Testing Laboratories U.S. Route 11, Industrial Park P.O. Box 2040 Cortland, NY 13045	(607) 753-6711
SHLMA	Southern Hardwood Lumber Manufacturers Assoc. (Now HMA)	
SIGMA	Sealed Insulating Glass Manufacturers Assoc. 401 N. Michigan Avenue Chicago, IL 60611	(312) 644-6610
SJI	Steel Joist Institute 1205 48th Avenue North, Suite A Myrtle Beach, SC 29577-5424	(803) 449-0487
SMA	Screen Manufacturers Assoc. 2850 South Ocean Boulevard, #114 Palm Beach, FL 33480-6205	(561) 533-0991
SMACNA	Sheet Metal and Air Conditioning Contractors' National Assoc. 4201 Lafayette Center Drive P.O. Box 221230 Chantilly, VA 22022-1230	(703) 803-2980
SPIB	Southern Pine Inspection Bureau 4709 Scenic Highway Pensacola, FL 32504-9094	(904) 434-2611
SPRI	SPRI (Formerly Single Ply Roofing Institute) 175 Highland Avenue Needham, MA 02194	(617) 444-0242
SSIUS	Specialty Steel Industry of the United States 3050 K Street, NW Washington, DC 20007	(202) 342-8630
SSPC	Steel Structures Painting Council 4516 Henry Street, Suite 407 Pittsburgh, PA 15213	(412) 687-1113

SSPMA	Sump and Sewage Pump Manufacturers Assoc. P.O. Box 647 Northbrook, IL 60065-0647	(708) 559-9233
STI	Steel Tank Institute 570 Oakwood Road Lake Zurich, IL 60047	(708) 438-8265
SWI	Steel Window Institute c/o Thomas Associates, Inc. 1300 Sumner Avenue Cleveland, OH 44115-2851	(216) 241-7333
SWPA	Submersible Wastewater Pump Assoc. 1806 Johns Drive Glenview, IL 60025-1657	(847) 729-7972
TCA	Tile Council of America, Inc. 100 Clemson Research Boulevard Anderson, SC 29625	(864) 646-8453
TIMA	Thermal Insulation Manufacturers Assoc. (Now NAIMA)	
TPI	Truss Plate Institute 583 D'Onofrio Drive, Suite 200 Madison, WI 53719	(608) 833-5900
TPI	Turfgrass Producers International (Formerly American Sod Producers Assoc.) 1855-A Hicks Road Rolling Meadows, IL 60008	(800) 405-8873
UL	Underwriters Laboratories 333 Pfingsten Road Northbrook, IL 60062-2096	(708) 272-8800
UNI	Uni-Bel PVC Pipe Assoc. 2655 Villa Creek Drive, Suite 155 Dallas, TX 75234	(214) 243-3902
USP	U.S. Pharmacopeia (Formerly U.S. Pharmacopoeial Convention) 12601 Twinbrook Pkwy Rockville, MD 20852	(301) 881-0666
WA	Wallcoverings Assoc. 401 N. Michigan Avenue Chicago, IL 60611-4267	(312) 644-6610

WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281	(503) 639-0651
WCMA	Window Covering Manufacturers Assoc. 355 Lexington Avenue, 17th Floor New York, NY 10017	(212) 661-4261
WIC	Woodwork Institute of California 3164 Industrial Boulevard 95891 P.O. Box 980247 West Sacramento, CA 95798-0247	(916) 372-9943
WMMPA	Wood Moulding & Millwork Producers Assoc. P.O. Box 25278 Portland, OR 97225	(503) 292-9288
WRI	Wire Reinforcement Institute 1101 Connecticut Avenue NW, Suite 700 Washington, DC 20036-4303	(202) 429-5125
WSC	Water Systems Council Building C, Suite 20 800 Roosevelt Road Glen Ellyn, IL 60137	(708) 545-1762
WSFI	Wood and Synthetic Flooring Institute (Now MFMA)	
WWCA	Western Wall and Ceiling Assoc. (Formerly Western Lath, Plaster, Drywall Industries Assoc.) 7571 Mission Gorge Road San Diego, CA 92120	(619) 229-8307
WWPA	Western Wood Products Assoc. Yeon Building 522 SW 5th Avenue Portland, OR 97204-2122	(503) 224-3930
WWPA	Woven Wire Products Assoc. 4940 Elmgate Drive Orchard Lake, MI 48324	(810) 681-1055

G. Federal Government Agencies: Names and titles of Federal Government standards- or specification-producing agencies are often abbreviated. The following abbreviations and acronyms referenced in the Contract Documents indicate names of standards- or specification-producing agencies of the Federal Government. Names and addresses are subject to change and are believed, but

are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

CE	Corps of Engineers (U.S. Department of the Army) Chief of Engineers General Information Referral 20 Massachusetts Avenue, NW Washington, DC 20314	(202) 761-0660
CFR	Code of Federal Regulations (Available from the Government Printing Office) 732 N. Capitol Street, NW Washington, DC 20401 (Material is usually published first in the "Federal Register.")	(202) 512-0000
CPSC	Consumer Product Safety Commission East West Towers 4330 East-West Hwy Bethesda, MD 20814	(800) 638-2772
CS	Commercial Standard (U.S. Department of Commerce) Government Printing Office Washington, DC 20402	(202) 512-0000
DOC	Department of Commerce 14th Street and Constitution Avenue, NW Washington, DC 20230	(202) 482-2000
DOT	Department of Transportation 400 Seventh Street, SW Washington, DC 20590	(202) 366-4000
EDA	Economic Development Administration - Regional Office 300 Fayetteville Street Mall Raleigh, NC 27601	(919) 856-4570
EPA	Environmental Protection Agency 401 M Street, SW Washington, DC 20460	(202) 260-2090
FAA	Federal Aviation Administration (U.S. Department of Transportation) 800 Independence Avenue, SW Washington, DC 20591	(202) 366-4000
FCC	Federal Communications Commission 445 12th Street SW Washington, DC 20554	(888) 225-5322

FDA	Food and Drug Administration 5600 Fishers Lane Rockville, MD 20857	(301) 443-1544
FHA	Federal Housing Administration (U.S. Department of Housing and Urban Development) 451 Seventh Street, SW Washington, DC 20410	(202) 708-1112
FS	Federal Specification Unit (Available from GSA) 470 East L'Enfant Plaza, SW, Suite 8100 Washington, DC 20407	(202) 755-0325
GSA	General Services Administration 18th and F Streets, NW Washington, DC 20405	(202) 708-5082
MIL	Military Standardization Documents (U.S. Department of Defense) Defense Printing Service 700 Robbins Avenue, Building 4D Philadelphia, PA 19111	(215) 697-2179
NIST	National Institute of Standards and Technology (U.S. Department of Commerce) Building 101, #A1134 Rte. I-270 and Quince Orchard Road Gaithersburg, MD 20899	(301) 975-2000
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor) 200 Constitution Avenue, NW Washington, DC 20210	(202) 219-5000
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, DC 20402	(202) 512-0000
RUS	Rural Utilities Service (Formerly Rural Electrification Administration) (U.S. Department of Agriculture) 14th Street and Independence Avenue, SW Washington, DC 20250	(202) 720-9560
USDA	U.S. Department of Agriculture 14th Street and Independence Avenue, SW Washington, DC 20250	(202) 720-8732

USDA	USDA Rural Development 4405 Bland Road, Suite 260 Raleigh, NC 27609	(919) 873-2054
USPS	U.S. Postal Service 475 L'Enfant Plaza, SW Washington, DC 20260-0010	(202) 268-2000

H. State Government Agencies: The following state government agency produces standards referenced in the Contract Documents:

NCDOT	NC Department of Transportation 4009 District Drive Raleigh, NC 27607	(919) 733-3213
	NC Department of Transportation District Engineer, District Office P.O. Box 2275 New Bern, NC 28560	(252) 514-4761
	NC Department of Transportation District Engineer, District Office P.O. Box 1107 Statesville, NC 28687	(704) 876-3947
	NC Department of Transportation District Engineer, District Office 2671 US 70 West Goldsboro, NC 27530	(919) 731-7938
	NC Department of Transportation District Engineer, District Office 1060 Eastern Boulevard Henderson, NC 27536	(252) 492-0111
	NC Department of Transportation District Engineer, District Office P.O. Box 502 Wilmington, NC 28402	(910) 251-5785
	NC Department of Transportation District Engineer, District Office 1701 W. 5th Street Washington, NC 27889	(252) 946-3689
Construction Grants	Division of Water Quality NCDENR 1633 Mail Service Center Raleigh, NC 27699-1633	(919) 733-6900

Water Quality Section	Division of Water Quality NCDENR 1617 Mail Service Center Raleigh, NC 27699-1617	(919) 733-5083
	Division of Water Quality NCDENR Washington Regional Office 943 Washington Square Mall Washington, NC 27889	(252) 946-6481
	Division of Water Quality NCDENR Raleigh Regional Office 1628 Mail Service Center Raleigh, NC 27699-1628	(919) 571-4700
	Division of Water Quality NCDENR Wilmington Regional Office 127 Cardinal Drive Extension Wilmington, NC 28405	(910) 395-3900
Land Quality	Division of Land Resources NCDENR Raleigh Regional Office 1628 Mail Service Center Raleigh, NC 27699-1628	(919) 571-4700
	Division of Land Resources NCDENR Washington Regional Office 943 Washington Square Mall Washington, NC 27889	(252) 946-6481
	Division of Land Quality NCDENR Wilmington Regional Office 127 Cardinal Drive Extension Wilmington, NC 28405	(910) 395-3900
Public Water Supply	Division of Environmental Health NCDENR 1634 Mail Service Center Raleigh, NC 27699-1634	(919) 733-2321

1.5 GOVERNING REGULATIONS AND AUTHORITIES: (Not Applicable)

1.6 SUBMITTALS:

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional

settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01095

SECTION 01101 - SPECIAL PROJECT PROCEDURES

PART 1 - GENERAL

1.1 DESCRIPTION

A. Pre-Construction Audio/Video Inspections and Photography

B. Safety Plan

C. Construction Sequence

D. Work Along Streets, Highways, and Railroads

E. Notification to Local Residents Impacted by Work

F. Protection of Work and Property

F. Responsibility for Damage

H. Not Applicable

I. NCDEQ Minimum Separation of Water and Sewer Facilities

J. Restoration of Disturbed Areas

K. Regulatory Enforcement Actions Imposed

1.2 PRE-CONSTRUCTION AUDIO-VIDEO INSPECTIONS AND PHOTOGRAPHY

A. The Contractor shall be responsible for performing and submitting audio-video (AV) inspections and photographs of the project areas prior to performing any Work. AV inspections and photographs shall clearly document preconstruction conditions at all proposed Work locations. AV inspections and photography work shall be considered incidental to the contract.

B. The purpose of the AV inspections and photographs shall be to document the preconstruction conditions for comparison with the final restored Work. If Engineer, Owner, or third-party claims damage or deficient restoration in a Work area that cannot be disproved by preconstruction A/V inspections and photographs, then Contractor shall be responsible for repairs or additional restoration at no additional cost, and as necessary to resolve the claim.

C. The AV inspection shall be submitted in an electronic format accompanied with the following:

1. Data stored on USB flash drive
2. Map of overall work area showing;
    a. AV sequence and direction of travel

b. AV elapsed time by location at no greater than 5 minute intervals

1.3 SAFETY PLAN

A. The Contractor shall prepare a detailed Safety Plan. This plan shall indicate the intended procedures to be used by the Contractor to comply with all OSHA requirements. Such Plan should further identify a competent person that will work with each crew. Safety plan shall be available for review at the job site at all times.

1.4 CONSTRUCTION SEQUENCE

The following describes the general requirements, constraints, and sequencing to be included in the contractor's work and means and methods:

SCHEDULE I

Schedule I - Item 1 – Connection to Existing 54-Inch Stub-Out (Plan Sheet C-1) Sta. 100+03

1) This connection can be accomplished at any time during construction, however, contractor must notify LCFWSA, Brunswick County, CFPUA, and the Engineer minimum 7 calendar days in advance of making the connection.
2) Water for testing, filling, flushing the pipeline can be obtained at this connection via the Kings Bluff Raw Water Pump Station, which is operated and maintained by Brunswick County under contract with the LCFWSA. Filling of the pipeline shall be coordinated with the Engineer, LCFWSA, and Brunswick County who operates and maintains the system for the LCFWSA.
3) Water used by the contractor via this connection will be provided for at no cost to the contractor for 1.5 times the volume of the proposed 54-inch pipe, which is estimated at 13.5 million gallons. The water flow will be metered via the Kings Bluff Raw Water Pump Station and associated customer meters. Water in excess of the 13.5 million gallons based on customer meters and total water pumped will be invoiced to the contractor at a rate of $0.50 per thousand gallons.

Schedule I - Item 2 – NCDOT Roadway Crossings

1) NCDOT roadway crossings (open cut or bore & jack) can be accomplished at any time during construction **with the exception of the bore & jack crossing under John Riegel Road indicated on plan sheet C-22 near approximate Sta. 420+00**. **See Schedule I – Item 3 for work requirements on International Paper property.**

2) Open Cut Installations with Temporary Access Roads: Contractor shall install temporary access road prior to any conducting any other work within the NCDOT right of way. Contractor shall contact and coordinate with NCDOT prior to construction of the temporary access road, which shall be approved by NCDOT prior to closing the road for pipe installation. Upon approval of the NCDOT, contractor shall install all necessary traffic control devices, equipment, flagmen, as required and shall expedite installation of the raw water main in the NCDOT right of way. Primary roadway shall be repaired as soon as pipe is installed and opened for traffic. Once traffic is restored to the primary road, the temporary access road shall be removed, and all areas impacted by the temporary road restored, reseeded, regraded to pre-construction conditions.
3) Open Cut Installations with Detour: Contractor shall install shall contact and coordinate with NCDOT prior to installation of detours. Detours, to include all traffic control devices, equipment, flagmen, as required shall be approved by NCDOT prior to construction.

Upon approval of the NCDOT, contractor shall install shall expedite installation of the raw water main in the NCDOT right of way. Primary roadway shall be repaired as soon as pipe is installed and opened for traffic. Once traffic is restored to the primary road, the detour shall be removed.

Schedule I - Item 3 – International Paper Property Crossing (Sta. 393+00 to Sta. 488+43)

1) Contractor shall acquire all certifications for safety and access to the International Paper (IP) site and shall follow all rules and requirements stipulated by IP for work on their property.

   International Paper Contact: Wallace Coverdale
   Phone: (910) 512-6581 Email: Wallace.Coverdale@IPaper.com

2) International Paper Plant Outage Schedule is as follows and is subject to change:

Start Date	End Date
3/4/2020	3/25/2020
9/10/2021	9/25/2021
9/9/2022	9/27/2022

3) **Contractor must conduct and complete bore & jack operations underneath the IP railyard during plant outage and must schedule/sequence his work accordingly.**
4) **Contractor shall not conduct any other construction activities on the IP property during any plant outage, including the bore & jack installation under John Riegel Road (Sheet C-22, Sta. 420+00+/-) and the water system interconnection (Sheet C-22, Sta. 416+35+/-). Contractor must schedule/sequence his work accordingly.**

Schedule I - Item 4 – Livingston Creek Aerial Crossing (Sheet C-27)

1) Contractor is advised that some of this work may be conducted on International Paper (IP) property and shall comply with the requirements noted in Schedule I - Item 3 above.
2) As required by NCDEQ, CAMA, and US Fish & Wildlife, construction in Livingston Creek must be conducted between July 1st and February 14th (see Appendix for permit requirements). No work may occur or be conducted between February 15th and June 30th. Contractor schedule/sequence his work accordingly.

Schedule I - Item 5 – Holding/Storage and Treatment Ponds on IP Property

1) Contractor is advised that this work will be conducted on International Paper (IP) property and shall comply with the requirements and restrictions noted in Schedule I - Item 3 above.
2) At all times during installation of the pipeline or associated construction activities, contractor shall monitor the levels of the storage and treatment ponds in the vicinity of the project. If changes in pond levels, impacts from dewatering, or excavations are observed, contractor shall immediately notify IP personnel, the Engineer, and CFPUA.

SCHEDULE II

Schedule II - Item 6 - Brunswick County Raw Water Main and Meter (Plan Sheet C-48 & 60) Sta. 809+50

1) **Note that Item 6 must be completed, accepted, and operational before any other Schedule II work can begin. Once Item 6 is completed, Contractor may proceed with construction of the remaining items identified in Schedule II.**
2) Under Item 6, connection to the existing 48-Inch raw water main, the Brunswick County Water Treatment Plant raw water main, and installation of the new meter vault cannot be completed until the new 54-inch raw water main is complete and operational under Schedule I. When the new 54-inch raw water main is complete, it will be placed into service and the existing 48-inch PCCP raw water main can be removed from service in order to make the final interconnections with the new 54-inch raw water main. The tee and valve to be installed with the new 54-inch raw water main shall be installed and in-place (under Schedule I) prior placing the 54-inch raw water main in service and removing the existing 48-inch raw water main out of service. Temporary blocking, rodding, and restraints will be required on the stub-out tees/valves until such time that the interconnections can be completed.
3) The contract documents require a temporary supply pipeline to be installed at the Brunswick County meter connection in order to complete this work and maintain raw water supply to the water plant. Contractor shall coordinate with Brunswick County, CFPUA, and the Engineer prior to making this connection. A construction sequence plan must be provided by the contractor for review by Brunswick County and the engineer prior to construction.

Schedule II - Item 7 – Water System Interconnections

(To be Completed After Schedule II - Item 6)

- **Sheet C-10 Station 243+25+/-**
- **Sheet C-22 Station 416+35+/-**
- **Sheet C-36 Station 636+65+/-**

1) Interconnections to the existing 48-Inch raw water main at the locations noted above cannot be completed until the new 54-inch raw water main is complete and operational under Schedule I. When the new 54-inch raw water main is complete, it will be placed into service and the existing 48-inch PCCP raw water main can be removed from service in order to make the final interconnections with the new 54-inch raw water main. The tee and valve to be installed with the new 54-inch raw water main shall be installed and in-place (under Schedule I) prior placing the 54-inch raw water main in service and removing the existing 48-inch raw water main out of service. Temporary blocking, rodding, and restraints will be required on the stub-out tees/valves until such time that the interconnections can be completed.
2) Contractor is further advised that the interconnection on Sheet C-22 approximate Station 416+35 will be constructed on International Paper (IP) property and shall comply with the requirements and restrictions noted in Schedule I - Item 3 above.

Schedule II - Item 8 - Connection to Existing 48-inch Raw Water Main Stub-Out (Plan Sheet C-50) Sta. 832+40

(To be Completed After Schedule II - Item 6)

1) This connection can be accomplished at any time during construction, however, contractor must notify LCFWSA, Brunswick County, CFPUA, and the Engineer minimum 14 calendar days in advance of making the connection. Note that water for testing and filling the line will not be supplied via this connection.

Schedule II - Item 9 – Installation of Pressure Reducing Valve and Assembly A and Pressure Reducing Valve Assembly B (Sheet C-1)

(To be Completed After Schedule II - Item 6)

1) Pressure Reducing Valve Assembly A and Pressure Reducing Valve Assembly B on the existing 48-Inch raw water main cannot be completed until the new 54-inch raw water main is complete and operational (Schedule I). When the new 54-inch raw water main is complete (Schedule I), it will be placed into service and the existing 48-inch PCCP raw water main can be removed from service in order install the pressure reducing valve assemblies.

1.5 WORK ALONG STREETS, HIGHWAYS AND RAILROADS

A. Traffic Control and Maintenance:

1. The proposed work may be performed within rights-of-way or easements as follows:

a. NC Department of Transportation public streets and roads

1) Encroachment agreement obtained by Engineer/Owner

d. Dedicated utility rights-of-way or easements

1) Encroachment obtained by Contractor/Owner

2. Contractor shall adhere to the bounds as set forth in all rights-of-way and easements unless prior written approval of the current property owner is obtained and submitted to the Engineer and State, CFPUA, and local utility authorities for approval.

3. Contractor shall submit a traffic control plan for approval by NCDOT in accordance with the respective encroachment agreement. When feasible, at least one lane of traffic will be safely maintained at all times when construction is in progress, otherwise, a detour plan must be submitted and approved with the traffic control plan.

4. Traffic will be maintained on all streets or private drives throughout the work. All matters related to traffic maintenance must be done in a manner consistent with the Manual on Uniform Traffic Control Devices. No roads shall be closed for construction activities unless approved otherwise.

5. Access to businesses and residences along the roads shall be maintained at all times. All lanes will be open when work is suspended for three hours or longer. Warning signs and devices will be placed in advance of all construction activity in accordance with the most recent copy of the Manual on Uniform Traffic Control Devices.

6. The Contractor shall provide all appropriate signing and barricades and shall provide flag persons at all times and places necessary.

7. Traffic control will be strictly enforced in order to provide fire and police protection to the area and access to drives while construction is in progress.

8. In the event of a necessary road or driveway closure, occupants and/or property owners must be notified a minimum of Seventy-Two (72) hours in advance to any private drive closings.
9. Where businesses have only one means of access, the Contractor shall provide an alternative means
of access or perform work during hours when the business is closed.
10. Property owners and surrounding residents will be provided an additional notice if work is to extend outside normal business hours.
12. The Contractor will notify CFPUA Seventy-Two (72) hours prior to commencing any construction within any right-of-way or easement.

B. Installation of Pipe Under Streets, Highways and Railroads:

1. The Contractor shall furnish and install protective steel pipe casings and/or carrier pipe under highways/railroads in the pipe size, thickness, length, location and details as shown on the drawings and specified herein.
2. The construction shall not be started until the necessary permits have been obtained, a copy is at the job site, and proper notice and approval for construction has been obtained from the owner of the street/highway/railroad and the Engineer.
3. All necessary materials, equipment, labor and traffic protection devices shall be on the job site before starting the Work.
4. Steel casings and the installation thereof required for street/highway/railroad crossings shall be in accordance with the permitted standards and requirements of NCDOT.

1.6 NOTIFICATION TO LOCAL RESIDENTS IMPACTED BY WORK

A. The Contractor shall provide work schedules, traffic control plans, and other information needed for accurate notifications to local residents of construction activity area. The Contractor shall coordinate with CFPUA and NCDOT to provide public notifications within fourteen (14) days prior to beginning work in an area. CFPUA shall be responsible for issuing public notification to the media when necessary. Contractor shall be responsible for placing door hangars in advance of scheduled work. Copies of door hangars to be distributed to local residents shall be submitted to the CFPUA Project Manager for approval prior to distribution.

1.7 PROTECTION OF WORK AND PROPERTY

A. Property Monuments: The Contractor shall be responsible for the preservation of all public and private property, and shall protect carefully from disturbance or damage all land monuments and property markers until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed. Any property monuments, iron pins, etc., disturbed by the Contractor's actions will be restored at the Contractor's expense. Only licensed land surveyors will be utilized to restore property monuments, etc.
B. Clearing: To lessen the impact to adjacent property owners, the Contractor will submit a request to the Engineer and Owner for any clearing activities. Only the area required for access and Work will be cleared, as approved by the Engineer and CFPUA.
C. Protection of Shallow Buried Pipelines: The Contractor shall protect the integrity of all shallow public and private utility mains at all times, via approved resources such as

wood road mats, crane mats, PE mats, road plates, etc, to be installed prior to the beginning of work. The approved protection method shall be maintained during and properly removed at the end of the Work.

D. Tree Protection: All trees located in the road right-of-way and along the sewer easements shall be protected from damage. Any trees damaged shall be replaced to the satisfaction of the Engineer and CFPUA at no additional cost to the Owner.

1.8 RESPONSIBILITY FOR DAMAGE

A. The Contractor shall be responsible for all damage or injury to property of any character, during the prosecution of the work, resulting from any act, omission, neglect, or misconduct in his manner or method of executing the work, or at any time due to defective work or materials, and said responsibility will not be released until the project shall have been completed and accepted.

B. When or where any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work, or inconsequence of the non-execution thereof by the contractor, he shall restore, at his own expense, such property to a condition equal to or better than existing before such damage or injury was done, by repairing, rebuilding, or otherwise restoring as may be directed, or he shall make good such damage or injury in an acceptable manner.

1.9 Not Applicable

1.10 NCDEQ MINIMUM SEPARATION OF WATER AND SEWER UTILITIES

A. In accordance with 15A NCAC 02T .0305 (f), the following minimum separations shall be provided for the sewer system except as allowed by Paragraph (g) of this Rule:

1. Storm sewers and other utilities not listed below	
(vertical)	24 inches
2. Water mains	
(vertical-water over sewer including in benched trenches)	18 inches
(horizontal)	10 feet
3. Reclaimed water lines	
(vertical – reclaimed over sewer)	18 inches
(horizontal)	2 feet
4. Any private or public water supply source, including any wells, WS-I waters or Class I or Class II impounded reservoirs used as a source of drinking water	100 feet
5. Waters classified WS (except WS-I or WS-V), B, SA, ORW, HQW, or SB from normal high water (or tide elevation) and wetlands	50 feet
6. Any other stream, lake, impoundment, or ground water lowering and surface drainage ditches	10 feet
7. Any building foundation	5 feet
8. Any basement	10 feet
9. Top slope of embankment or cuts of 2 feet or more vertical height	10 feet
10. Drainage systems and interceptor drains	5 feet
11. Any swimming pool	10 feet
12. Final earth grade (vertical)	36 inches

B. In accordance with 15A NCAC 02T .0305 (g), the following alternatives where separations in Paragraph (f) of this Rule cannot be achieved. Nothing in this Paragraph shall supersede the allowable alternatives provided in the Commission for Public Health Public Water Supply Rules (15A NCAC 18C), Commission for Public Health Sanitation Rules (15A NCAC 18A) or the Groundwater Protection Rules (15A NCAC 02L and 15A NCAC 02C) that pertain to the separation of sewer systems to water mains or public or private wells:

1. For storm sewers, engineering solutions such as ductile iron pipe or structural bridging to prevent crushing the underlying pipe.
2. For public or private wells, piping materials, testing methods and acceptability standards meeting water main standards shall be used where these minimum separations cannot be maintained. All appurtenances shall be outside the 100-foot radius. The minimum separation shall however not be less than 25-feet from a private well or 50-feet from a public well.
3. For public water mains horizontal or vertical separations, alternatives as described in 15A NCAC 18C .0906(b) and (c) as follows:
    a. (b) Crossing a Water Main Over a Sewer. Whenever it is necessary for a water main to cross over a sewer, the water main shall be laid at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer, unless local conditions or barriers prevent an 18-inch vertical separation, in which case, both the water main and sewer shall be constructed of ferrous materials and with joints that are equivalent to water main standards for a distance of 10-feet on each side of the point of crossing.
    b. (c) Crossing a Water Main Under a Sewer. Whenever it is necessary for a water main to cross under a sewer, both the water main and the sewer shall be constructed of ferrous materials and with joints equivalent to water main standards for a distance of 10-feet on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.
4. For less than 36-inches cover from final earth grade, ductile iron pipe shall be specified. Ductile iron pipe or other pipe with proper bedding to develop design supporting strength shall be provided where sewers are subject to traffic bearing loads.
5. For all other separations, materials, testing methods and acceptability standards meeting water main standards (15A NCAC 18C).

1.11 RESTORATION OF DISTURBED AREAS

A. The Contractor will be required to complete all restoration to disturbed areas within a timely manner following work completion.

B. All restoration work shall conform to the CFPUA and NCDOT permits for replacement and/or restoration and shall equal or exceed pre-construction conditions.

C. Restorations include, but is not limited to, grading, seeding, mulching, pavement, sidewalks, driveways, storm drain pipes, curbs and gutters, fences, sign replacement and mailbox replacement.

D. Existing fences that are disturbed during construction shall be repaired or replaced to a condition equal to or better than the original unless a release is obtained in writing

from the property owner and submitted to the Engineer or CFPUA. All fences shall be replaced immediately after operations have cleared the fence line.

E. Restoration of affected areas shall begin immediately upon termination of operations in the area disturbed.

F. If the Contractor fails to adhere to this provision, all Work operations will be stopped until compliance is met.

G. Restoration will be performed by the Contractor to the satisfaction of the Engineer and State, City or local utility permitting authorities.

H. All costs for restoration shall be incidental to the contract.

1.12 REGULATORY ENFORCEMENT ACTIONS IMPOSED

A. The Contractor shall be fully responsible for any and all violations of regulatory permit conditions issued for the Work. In the event that a violation occurs or if a Notice of Violation (NOV) is received, the Contractor shall take immediate action to correct the violation as directed or required by State and Federal Agencies, Engineer or CFPUA. Any penalties and fines resulting from such violation shall be assessed to the Contractor. In the event that a violation resulting from the Contractor's activities results in a Cease Work Order by the U.S. Corps of Engineers or other responsible state or federal agency, the Contractor shall be held fully responsible for all damages resulting from such delay and any associated penalties.

PART 2 PRODUCTS – NOT USED

PART 3 EXECUTION – NOT USED

END OF SECTION 01101

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies administrative and procedural requirements for project meetings, including, but not limited to, the following:

1. Preconstruction conferences.
2. Progress meetings.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Coordination" for procedures for coordinating project meetings with other construction activities.
2. Division 1 Section "Submittals" for submitting the Contractor's Construction Schedule.

1.3 PRECONSTRUCTION CONFERENCE:

A. Schedule a preconstruction conference before starting construction, at a time convenient to the Owner and the Engineer, but no later than 15 days after execution of the Notice to Proceed. Hold the conference at the Project Site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments. The preconstruction conference shall be coordinated by the Engineer.

B. Attendees: Authorized representatives of the Owner, Engineer, and their consultants; State agencies; the Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

1.4 PREINSTALLATION CONFERENCES: (Not Applicable)

1.5 PROGRESS MEETINGS:

A. Conduct progress meetings at the Project Site at regular intervals not to exceed more than once a month. The Engineer shall set dates and coordinate the progress meeting.

B. Attendees: In addition to representatives of the Owner and the Engineer, each subcontractor, supplier, or other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the status of the Project.

1. Contractor's Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's Construction Schedule, whether on time or ahead or behind schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to insure that current and subsequent activities will be completed within the Contract Time.
2. Review the present and future needs of each entity present.

D. Schedule Updating: Revise the Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. The Contractor shall reissue the revised construction schedule as required.

1.6 COORDINATION MEETINGS: (Not Applicable)

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01200

SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work, including the following:

2. Contractor's construction schedule.
3. Submittal schedule.
4. Shop Drawings.
5. Product Data.
6. Samples.
7. Quality assurance submittals.

B. Administrative Submittals: Refer to other Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Permits.
2. Applications for Payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of subcontractors.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Applications for Payment" specifies requirements for submittal of the Schedule of Values.
2. Division 1 Section "Coordination" specifies requirements governing preparation and submittal of required Coordination Drawings.
3. Division 1 Section "Project Meetings" specifies requirements for submittal and distribution of meeting and conference minutes.
4. Division 1 Section "Quality Control" specifies requirements for submittal of inspection and test reports.
5. Division 1 Section "Contract Closeout" specifies requirements for submittal of Project Record Documents and warranties at project closeout.

1.3 DEFINITIONS:

A. Coordination Drawings show the relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in the space provided or to function as intended.

1. Preparation of Coordination Drawings is specified in Division 1 Section "Coordination" and may include components previously shown in detail on Shop Drawings or Product Data.

B. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.

C. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

1.4 SUBMITTAL PROCEDURES:

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

a) The Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

3. Processing: To avoid the need to delay installation as a result of the time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.

a) Allow 2 weeks for initial review. Allow additional time if the Engineer must delay processing to permit coordination with subsequent submittals.
b) If an intermediate submittal is necessary, process the same as the initial submittal.
c) Allow 2 weeks for reprocessing each submittal.
d) No extension of Contract Time will be authorized because of failure to transmit submittals to the Engineer sufficiently in advance of the Work to permit processing.

B. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.

1. Include the following information on the label for processing and recording action taken.

    a) Project name.
    b) Date.
    c) Name and address of the Engineer.
    d) Name and address of the Contractor.
    e) Name and address of the subcontractor.
    f) Name and address of the supplier.
    g) Name of the manufacturer.
    h) Number and title of appropriate Specification Section.
    i) Drawing number and detail references, as appropriate.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Engineer using a transmittal form. The Engineer will not accept submittals received from sources other than the Contractor.

1. On the transmittal, record relevant information and requests for data. On the form, or separate sheet, record deviations from Contract Document requirements, including variations and limitations. Include Contractor's certification that information complies with Contract Document requirements.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE:

A. Bar-Chart Schedule: Prepare a fully developed, horizontal bar-chart-type, contractor's construction schedule. Submit within 30 days after the date established for the "Agreement" or by the Preconstruction Conference.

1. Provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week. Use the same breakdown of units of the Work as indicated in the "Schedule of Values."
2. Within each time bar, indicate estimated completion percentage in 10 percent increments. As Work progresses, place a contrasting mark in each bar to indicate Actual Completion.
3. Prepare the schedule on a sheet, or series of sheets, of stable transparency, or other reproducible media, of sufficient width to show data for the entire construction period.
4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on the schedule with other construction activities; include minor elements involved in the sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.
5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other schedules.

6. Indicate completion in advance of the date established for Substantial Completion. Indicate Substantial Completion on the schedule to allow time for the Engineer's procedures necessary for certification of Substantial Completion.

B. Phasing: On the schedule, show how requirements for phased completion, if required, to permit Work by separate Contractors and partial occupancy by the Owner affect the sequence of Work.

C. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with scheduled dates. Post copies in the Project meeting room and temporary field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in construction activities.

D. Schedule Updating: Revise the schedule after each meeting, event, or activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

1.6 SUBMITTAL SCHEDULE:

A. After development and acceptance of the Contractor's Construction Schedule, prepare a complete schedule of submittals. Submit the schedule within 10 days of the date required for submittal of the Contractor's Construction Schedule.

1. Coordinate Submittal Schedule with the list of subcontracts, Schedule of Values, and the list of products as well as the Contractor's Construction Schedule.
2. Prepare the schedule in chronological order. Provide the following information:

a) Scheduled date for the first submittal.
b) Related Section number.
c) Submittal category (Shop Drawings, Product Data, or Samples).
d) Name of the subcontractor.
e) Description of the part of the Work covered.
f) Scheduled date for resubmittal.
g) Scheduled date for the Engineer's final release or approval.

B. Distribution: Following response to the initial submittal, print and distribute copies to the Engineer, Owner, subcontractors, and other parties required to comply with submittal dates indicated. Post copies in the Project meeting room and field office.

1. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have

completed their assigned portion of the Work and are no longer involved in construction activities.

C. Schedule Updating: Revise the schedule after each meeting or activity where revisions have been recognized or made and issue revised schedule to all parties.

1.7 DAILY CONSTRUCTION REPORTS: (Not Applicable)

1.8 SHOP DRAWINGS:

A. Submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

B. Shop Drawings include fabrication and installation Drawings, setting diagrams, schedules, patterns, templates and similar Drawings. Include the following information:

1. Dimensions.
2. Identification of products and materials included by sheet and detail number.
3. Compliance with specified standards.
4. Notation of coordination requirements.
5. Notation of dimensions established by field measurement.
6. Initial Submittal: If an initial submittal is required by the Contractor or Engineer, submit 4 blue- or black-line prints for the Engineer's review. The Engineer will return two prints.
7. Final Submittal: Submit 6 blue- or black-line prints as required by the Engineer for distribution. The Engineer will return 2 prints to the Contractor.
8. Do not use Shop Drawings without an appropriate final stamp indicating action taken.

1.9 PRODUCT DATA:

A. Collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information. Include the following information:

a) Manufacturer's printed recommendations.
b) Compliance with trade association standards.

c) Compliance with recognized testing agency standards.
d) Application of testing agency labels and seals.
e) Notation of dimensions verified by field measurement.
f) Notation of coordination requirements.

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.
3. Initial Submittal: If an initial submittal is required by the Contractor, Engineer, or Supplier, submit 4 copies of Product Data to the Engineer for review. The Engineer will return 2 copies to the Contractor.
4. Final Submittals: Submit 6 copies as required by the Engineer for distribution. The Engineer will return 2 copies to the Contractor.
5. Do not proceed with installation until a copy of Product Data is in the Installer's possession.
6. Do not permit use of unmarked copies of Product Data in connection with construction.

1.10 SAMPLES:

A. Submit full-size, fully fabricated Samples cured and finished as specified and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. Mount or display Samples in the manner to facilitate review of qualities indicated. Prepare Samples to match the Engineer's sample. Include the following:

a) Specification Section number and reference.
b) Generic description of the Sample.
c) Sample source.
d) Product name or name of the manufacturer.
e) Compliance with recognized standards.
f) Availability and delivery time.

2. Submit Samples for review of size, kind, color, pattern, and texture. Submit Samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a) Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least 3 multiple units that show approximate limits of the variations.
b) Refer to other Specification Sections for requirements for Samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.
c) Refer to other Sections for Samples to be returned to the Contractor for incorporation in the Work. Such Samples must be

undamaged at time of use. On the transmittal, indicate special requests regarding disposition of Sample submittals.

d) Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Submittals: Except for Samples illustrating assembly details, workmanship, fabrication techniques, connections, operation, and similar characteristics, submit 3 sets. The Engineer will return one set marked with the action taken.

4. Maintain sets of Samples, as returned, at the Project Site, for quality comparisons throughout the course of construction.

a) Unless noncompliance with Contract Document provisions is observed, the submittal may serve as the final submittal.

b) Sample sets may be used to obtain final acceptance of the construction associated with each set.

B. Distribution of Samples: Prepare and distribute additional sets to subcontractors, manufacturers, fabricators, suppliers, installers, and others as required for performance of the Work. Show distribution on transmittal forms.

1. Field samples are full-size examples erected on-site to illustrate finishes, coatings, or finish materials and to establish the Project standard.

a) Comply with submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

1.11 QUALITY ASSURANCE SUBMITTALS:

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

B. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the manufacturer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by an officer of the manufacturer or other individual authorized to sign documents on behalf of the company.

C. Inspection and Test Reports: Requirements for submittal of inspection and test reports from independent testing agencies are specified in Division 1 Section "Quality Control."

1.12 ENGINEER'S ACTION:

A. Except for submittals for the record or information, where action and return is required, the Engineer will review each submittal, mark to indicate action taken, and return promptly.

1. Compliance with specified characteristics is the Contractor's responsibility.

B. Action Stamp: The Engineer will stamp each submittal with a uniform, action stamp. The Engineer will mark the stamp appropriately to indicate the action taken, as follows:

1. Final Unrestricted Release: When the Engineer marks a submittal "No Exceptions Taken," the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
2. Final-But-Restricted Release: When the Engineer marks a submittal "Make Corrections Noted," the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
3. Returned for Resubmittal: When the Engineer marks a submittal "Amend and Resubmit" or "Rejected," do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.

a) Do not use, or allow others to use, submittals marked "Amend and Resubmit" or "Rejected" at the Project Site or elsewhere where Work is in progress.

4. Other Action: Where a submittal is for information or record purposes or special processing or other activity, the Engineer will return the submittal marked "Action Not Required."

C. Unsolicited Submittals: The Engineer will return unsolicited submittals to the sender without action.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

A. It shall be the Contractor's responsibility to check shop drawings for accuracy and conformity with the Specifications before submission to the Engineer. Each drawing shall be clearly marked "Approved" or "Approved Subject to Noted Corrections," dated and signed by the Contractor before it is submitted to the Engineer. Any drawings not so marked will be returned to the Contractor without the Engineer's approval. The Engineer's approval of such drawings or schedules shall not relieve the Contractor from

responsibility for deviations from plans or specifications, nor shall it relieve him from responsibility for errors of any sort on shop drawings or schedules.

B. Submissions at variance with the requirements of the specifications or contract drawings shall be accompanied with a letter setting forth such variations and the credit to be allowed where such variations are less expensive than contract requirements. If, in the opinion of the Engineer, such variations are of a minor nature, and comply with the intent of the Contract Documents, approval will be given in writing. When variations are such as to involve a credit to the Owner, approval will be given only upon receipt of a reasonable and proper credit. In the absence of such approvals, the Contractor shall comply with all specification and drawing requirements.

C. The Engineer's check of shop drawings cover general design only and will not include a quantity check or dimensional verifications. The Engineer will not undertake the determination of dimensions which, by their nature, must be established from field measurements. The determination of such dimensions shall be a part of the Contractor's checking and coordination of shop drawings. The approval of shop drawings shall not relieve the Contractor from the responsibility for conforming with drawings and specifications unless there is an accompanying letter from him which explicity states that a deviation is to be made and written approval is obtained for such deviation, nor shall approval of shop drawing relieve him of the responsibility for errors in coordination of his work.

D. Repairs, modifications, and corrections to other work due to lack of shop drawing data shall be the responsibility of the prime Contractor who failed to supply such data in sufficient time.

E. Where equipment or materials proposed in shop drawings differ from those as shown on the contract drawings as to orientation, alignment, etc., the contractor shall be held liable for providing incidental changes for access, useability, or functionality of such equipment or materials.

F. Shop drawings will be approved only to the extent of the information clearly shown and identified. Approval of an item of equipment or material shall not be construed to mean approval for components or materials of that kind for which the Contractor has provided no or insufficient information.

END OF SECTION 01300

SECTION 01310 – PROJECT SCHEDULES

PART 1 - GENERAL

1.1 DESCRIPTION:

A. Provide projected project schedules for entire work.

1. Have initial draft project schedule available to Engineer prior to preconstruction conference.

2. Revise monthly.

1.2 PROJECT SCHEDULES, FORM AND CONTENT:

A. Prepare in form of horizontal bar graph to include:

1. Provide separate horizontal bar column for each trade, operation, or construction activity.

2. Order – Chronological order or beginning and ending of each item of work.

3. Show Schedule of Payments.

B. Identify work of separate phases or other logically grouped activities in accordance with Special Conditions and time restraints.

C. Show projected percentage of completion for each item of work as of first of each month.

1.3 UPDATING:

A. Update at least monthly and submit with pay requisitions for review and approval by Engineer.

B. Show all changes occurring since previous submission of updated schedule, including progress of each activity and revised completion dates.

1. Include:

a) Major changes in scope.

b) Activities modified since previous updating.

c) Revised projections due to changes.

d) Other identifiable changes.

1.4 SUBMITTALS:

A. Submit Project Schedules prior to:

1. Preconstruction Meeting.

2. With each monthly payment.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 01310

SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section includes administrative and procedural requirements for quality-control services.

B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Engineer.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Document requirements.
3. Requirements for Contractor to provide quality-control services required by Engineer, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
2. Division 1 Section "Submittals" specifies requirements for development of a schedule of required tests and inspections.

1.3 RESPONSIBILITIES:

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.

1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services. The Contractor shall assist the Owner by providing men and equipment for excavation of test pits, excavation for test pads for density tests and moving testing equipment around the project site. The Owner shall retain the services of a testing laboratory to perform testing required at the project site for field density tests of fill and backfill material and concrete testing for slump, air entrainment, and strength.
3. Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless agreed to in writing by the Owner.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements. The cost to repair, rework, or replace material or work indicated noncompliance shall be born by the Contractor.

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following:

1. Provide access to the Work.
2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.

3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
4. Provide facilities for storage and curing of test samples.
5. Deliver samples to testing laboratories.
6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
7. Provide security and protection of samples and test equipment at the Project Site.

D. Duties of the Testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Engineer and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Engineer and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter, or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. The agency shall not perform any duties of the Contractor.

E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples, and similar activities.

1.4 SUBMITTALS:

A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, in duplicate, of each inspection, test, or similar service to the Engineer. If the Contractor is responsible for the service, submit a certified written report, in duplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:

a) Date of issue.
b) Project title and number.
c) Name, address, and telephone number of testing agency.
d) Dates and locations of samples and tests or inspections.
e) Names of individuals making the inspection or test.
f) Designation of the Work and test method.
g) Identification of product and Specification Section.

h) Complete inspection or test data.
i) Test results and an interpretation of test results.
j) Ambient conditions at the time of sample taking and testing.
k) Comments or professional opinion on whether inspected or tested Work complies with Contract Document requirements.
l) Name and signature of laboratory inspector.
m) Recommendations on retesting.

1.5 QUALITY ASSURANCE:

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are prequalified as complying with the American Council of Independent Laboratories' "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the Project is located.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION:

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01400

SECTION 01560 - EROSION AND SEDIMENTATION CONTROL

1.1 GENERAL

A. The contractor shall be responsible for erosion and sedimentation control within the construction limits; for prevention of sediment laden runoff leaving the construction limits or entering ditches, streams or water impoundments; and for implementation of necessary erosion and sedimentation control measures to meet the requirements of all local erosion and sedimentation control ordinances and/or North Carolina Department of Environment, Health, and Natural Resources. The contractor shall also be responsible for all damages or fines resulting from erosion or sediment laden runoff in the execution of his contract.

1.2 CONSTRUCTION SEQUENCE

A. While the use of erosion and sedimentation control devices is especially important on areas of steep topography, easily erodible soils and sites in close proximity to water courses throughout the construction period, the control measures should be installed prior to the commencement of land clearing and shall be fully maintained and periodically inspected until final restoration and stabilization is completed. Unrestored cleared areas shall be kept to a minimum. Disturbed areas ahead of construction shall only be accomplished on those segments for the shortest practical distance as required for continual progress.

B. Final restoration shall not be delayed until completion of the project but will be carried out in phases as the work proceeds**.** Under no circumstances will any areas be left denuded for more than (30) thirty calendar days without some form of stabilization until final restoration is complete.

1.3 SEDIMENTATION

A. Control Measures: The following are some of the sediment control devices or measures that may be required to prevent sedimentation of streams, water courses, or drainage structures:

1. Earth berms and/or diversion and intercept ditches.
2. Sediment traps
3. Filter berms
4. Filter inlets
5. Silt fences - not to be placed in streams or ditches perpendicular to flow.
6. Check dams gravel filter
7. Gravel construction exits

1.4 EROSION CONTROL MEASURES

A. Some of the soil erosion control measures which may be required in this contract are:

1. Earth slope protection
2. Diagonal water break diversion berms
3. Diversion channels
4. Preservation of existing vegetation
5. Storm inlet protection
6. Stream crossings
7. Energy dissipators
8. Matting of re-seeded areas

1.5 DETAIL DRAWING

A. Examples of sedimentation and erosion control details are shown in these plans for installation at locations designated in the plans or as otherwise required by the regulating agency, or the owner as work proceeds.

1.6 STREAM PROTECTION

A. Where construction activities are necessary in close proximity to streams, and other waterways, they shall be performed in a manner that does not contribute to degradation of or blockage of the stream-flow. In order to prevent possible degradation or blockages, the contractor shall be required to:

1. Keep all construction debris, excavated materials, brush, rocks, refuse and topsoil as far from these waterways as possible. Restrict machinery operation or stream crossings in waterways to the extent necessary for construction of utilities crossings.

2. If construction work areas are necessary in a waterway, they shall be protected as indicated on the plans.

3. If temporary roadways are essential for the construction activities, they shall be constructed of soils which are not highly erodible materials and must not span more than half way across the water course or wetland area at any one time unless otherwise approved by the Engineer. These temporary roadways shall be entirely removed as soon as their requirement is met. Work in these areas shall follow the requirements of the Corp of Engineers or CAMA permit, or plans as applicable**.**

1.7 CONSTRUCTION ACCESS

A. The travel of equipment to and from the construction areas shall be minimized not only to protect areas that will not be denuded, but also to prevent the spreading of sediment within and outside of the construction areas. Therefore, special construction equipment travel corridors will be established for this use and instructions shall be issued for their use. Use of these corridors must be fully enforced. Other non-essential traffic will be restricted or discouraged. Indiscriminate and convenience traffic shall not be allowed.

1.8 STOCKPILE/BARROW AREAS

A. The contractor shall be responsible for selecting, obtaining and maintaining stockpile or barrow areas which he may require to complete the contract. He is also required to design and incorporate all necessary sediment and erosion controls measures necessary to prevent erosion and contribution of sediment to adjacent areas. The contractor is responsible to obtain all necessary permits or approvals for barrow or spoil areas outside the construction limits.

1.9 DISPOSAL OF EXCESS WATER FROM EXCAVATIONS

A. The contractor shall practice management of excess water pumped from excavation to reduce the production and spreading of sediment. Pumped water shall be discharged onto stabilized surfaces and allowed to filter through existing vegetation if possible, otherwise, additional control measures may be necessary. If ditches are required to remove pumped water from construction excavations, they shall be given the same consideration as any other man-made waterway and they shall be stabilized as to not degrade and produce sediment.

1.10 EXCAVATION AND BACKFILL

A. Excavation shall be closely controlled and all the material removed from the excavation shall be selectively stockpiled in areas where a minimum of sediment will be generated and where other damage will not result from the piled material. Drainageways shall be protected at all times and the placement of material in drainageways for convenience shall not be allowed. Backfilling operations shall be performed in such a manner that remaining trees are not damaged. Temporary repaving shall be placed promptly after backfill operations are completed in improved areas.

1.11 FINAL GRADING AND SEEDING

A. Finish grading, topsoiling, seeding and/or sodding shall be performed as specified in Section 02900 Landscaping, of these specifications. After the construction phase is complete, permanent vegetation of the areas, that have been disturbed, shall be re-established as rapidly as possible. If the completion of the construction activities do not coincide with a season in which permanent vegetation can be generated, an interim or temporary program is required. This shall include soil conditioners and mulching as necessary for soil stabilization. In any case, sediment and erosion controls shall be installed promptly and their maintenance assured.

1.12 APPROVAL

A. The approved Erosion Control Plan will be provided by the engineer. Any standard conditions relating to soil erosion and sediment control issued to the contractor as a part of any permits shall be available at the job site at all times.

END OF SECTION 01560

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.

1. Multiple Prime Contracts: Provisions of this Section apply to the construction activities of each prime contractor.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Reference Standards and Definitions" specifies the applicability of industry standards to products specified.
2. Division 1 Section "Submittals" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
3. Division 1 Section "Substitutions" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.

1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

a) "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.

2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.

3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 SUBMITTALS

A. Provide submittals for Materials and Equipment as outlined in Division I, Section 01300, Submittals.

1.5 QUALITY ASSURANCE

A. All material and equipment shall be furnished by manufacturers who shall have at least 3 years experience in the design, production, assembly, and field service of the equipment of like type, size, and capacity. Where required by the Engineer, the Contractor shall supply a list of at least 3 successful installation in situations similar to those anticipated for this project. If experience requirements cannot be met, then manufacturers may post a bond or a cash deposit in such amount sufficient to allow replacement of the equipment with that shown on the Plans and specified herein, said bond or deposit to be applicable to any costs occasioned to the Owner in the event that the equipment supplied fails to meet performance standards specified herein. Said costs shall include purchase of replacement equipment, necessary demolition, structural and pipework modifications, controls replacement and rewiring, and other required appurtenances and incidentals necessary for the equipment replacement, including engineering costs for redesign and administration of construction and all required testing services, also including any increased operational or maintenance expenses that might have been incurred. The period for the bond shall be for 3 years less the manufacturer's actual experience.

B. It is the intent of the Contract Documents to procure the best equipment and services available for the intended duty. Only those manufacturers' products will be accepted, who, in the judgement of the Engineer, can provide:

1. the design services of an engineering staff in the manufacturer's employ (regularly and continuously on the manufacturer's payroll or with whom the manufacturer has and continues to have a contractual agreement to provide consulting engineering service), skilled in the application of the particular type of equipment required under the Contract;
2. shop facilities adequate for and personnel skilled in the fabrication and assembly of the equipment of the type and size required on this Project;
3. field service personnel in the manufacturer's employ, trained and skilled in the adjustment, servicing and repair of the equipment of like size, type, and capacity.

C. The Engineer may require, and Contractor shall furnish, if directed, the data required to demonstrate compliance with requirements of this item, and that stipulated in the Information for Bidders. The judgement of the Engineer shall be final in all cases.

D. Compatibility of Options: When the Contractor is given the option of selecting between 3 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected to the extent possible.

1. Each prime contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate contractors.
2. If a dispute arises between prime contractors over concurrently selectable, but incompatible products, the Engineer will determine which products shall be retained and which are incompatible and must be replaced.

E. Nameplates:

1. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface. The nameplate shall contain the following information and other essential operating data:

a) Name of product and manufacturer.
b) Model and serial number.
c) Capacity.
d) Speed.
e) Ratings.
f) Voltage.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.

1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. **Electrical equipment, including control panels, that is furnished by any prime contractor shall be properly labeled by a testing laboratory recognized and approved by the State of North Carolina.**

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:

1. Where Specifications specify products or manufacturers by name, accompanied by the term "or equal," comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
2. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
3. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements. Comply with the Contract Document provisions concerning “submittals” to obtain approval of products based on performance requirements.
4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.

a) Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.
b) Comply with the Contract Document provisions concerning “submittals” to obtain approval of products based on performance requirements.

5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
6. Visual Matching: Where Specifications require matching an established Sample, the Engineer's decision will be final on whether a proposed product matches satisfactorily.

a) Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.

7. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Engineer will select the color, pattern, and texture from the product line selected.
8. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. When equipment of any kind is to be installed in a building or structure and minor changes are necessary in the building or structure to accommodate the equipment, such changes shall be considered incidental to the proper completion of the work, and shall be made by the Contractor without additional compensation therefor.
2. Manufacturers furnishing equipment shall include in their quotation the services of a qualified field representative to inspect the equipment installation, make necessary adjustments and field test prior to the equipment being placed in service. He shall then place the equipment in permanent operation. Such representative shall be furnished and shall be present on the job site without delay, upon request of the Contractor and/or Engineer. The Contractor shall cause the representative to submit by letter to the Owner the results of the equipment inspection and attest

to proper installation and operation thereof or detail deficiencies and list remedies therefor.

3. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01600

SECTION 01620 - HANDLING, STORAGE AND PROTECTION

1.1 GENERAL

A. All materials shall be properly handled, stored and protected as to prevent damage.

1.2 PIPE

A. Pipe and accessories shall be handled in such a manner as to insure delivery on the work in sound, undamaged condition. Particular care shall be taken not to injure the pipe coating. No other pipe or material of any kind shall be placed inside of any pipe or fitting at any time after the coating has been applied.

1.3 MANHOLES

A. All precast manhole components shall be lifted and moved by use of suitable lifting slings and plugs that will not damage the precast manhole lip. All damage to precast sections shall be thoroughly repaired in the presence of the Engineer. Repair and patching of minor breaks shall be done by chipping and scarifying the defective area before application of grout. Precast sections shall be subject to rejection on account of failure to conform to any of the specification requirements. In addition, individual sections of manhole sections may be rejected because of fractures or cracks passing through the wall, except for a single end crack that does not exceed the depth of the joint; defects that indicate imperfect proportioning, mixing, and molding; surface defects indicating honey-combed or open texture; damaged or cracked end, where such damage would prevent making a satisfactory joint; and/or any continuous crack having a surface width of 0.01 inches or more for a length of 12 inches.

END OF SECTION 01620

SECTION 01700 - CONTRACT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout including, but not limited to, the following:

1. Inspection procedures.
2. Project record document submittal.
3. Operation and maintenance manual submittal.
4. Submittal of warranties.
5. Final cleaning.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 16.

1.3 SUBSTANTIAL COMPLETION

A. Substantial Completion shall be defined by all work to be complete and operation as approved by Engineer and Owner.

B. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete the following. List exceptions in the request.

1. In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete.

   a) Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

   b) If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

2. Advise the Owner of pending insurance changeover requirements.

3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

4. Obtain and submit releases enabling the Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

5. Submit record drawings, maintenance manuals, damage or settlement claims, and similar final record information.

6. Deliver tools, spare parts, extra stock, and similar items.

7. Make final changeover of permanent locks and transmit keys to the Owner. Advise the Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems and instruction of the Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from the site, along with mockups, construction tools, and similar elements.

9. Complete final cleanup requirements, including touchup painting.

10. Touch up and otherwise repair and restore marred, exposed finishes.

C. Inspection Procedures: On receipt of a request for inspection, the Engineer will either proceed with inspection or advise the Contractor of unfilled requirements. The Engineer will prepare the Certificate of Substantial Completion following inspection or advise the Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Engineer will repeat inspection when, in the Engineer’s opinion, the Work is substantially complete.

2. Results of the completed inspection will form the basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in the request.

1. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.

2. Submit an updated final statement, accounting for final additional changes to the Contract Sum.

3. Submit a certified copy of the Engineer's final inspection list of items to be completed or corrected. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

4. Submit final meter readings for utilities, a measured record of stored fuel, and similar data as of the date of Substantial Completion or when the Owner took possession of and assumed responsibility for corresponding elements of the Work.

5. Submit a final liquidated damages settlement statement.

6. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

7. Submit consent of surety to final payment.

8. Submit contractor’s and subcontractor’s Affidavit of Release of Liens

9. Submit contractor’s Affidavit of Payment of Debts and Claims

10. Submit Release of Liens from material and equipment suppliers.

B. Reinspection Procedure: The Engineer will reinspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except for items whose completion is delayed under circumstances acceptable to the Engineer.

1. Upon completion of reinspection, the Engineer will prepare a certificate of final acceptance. If the Work is incomplete, the Engineer will advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.

1.5 RECORD DOCUMENT SUBMITTALS

A. General: Do not use record documents for construction purposes. Protect record documents from deterioration and loss in a secure, fire-resistant location. Provide access to record documents for the Engineer's reference during normal working hours.

B. Record Drawings: Maintain a clean, undamaged set of blue or black line white-prints of Contract Drawings and Shop Drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark which drawing is most capable of showing conditions fully and accurately. Where Shop Drawings are used, record a cross-reference at the corresponding location on the Contract Drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil. Use other colors to distinguish between variations in separate categories of the Work.

2. Mark new information that is important to the Owner but was not shown on Contract Drawings or Shop Drawings.

3. Note related change-order numbers where applicable.

4. Organize record drawing sheets into manageable sets. Bind sets with durable-paper cover sheets; print suitable titles, dates, and other identification on the cover of each set.

C. Maintenance Manuals: Equipment manufacturers shall furnish 6 coipes of an operating and maintenance manual covering their equipment. Manuals shall be submitted within 60 days of final shop drawing approval. Organize operation and maintenance data into suitable sets of manageable size. Bind properly indexed data in individual, heavy-duty, 2-inch (51-mm), 3-ring, vinyl-covered binders, with pocket folders for folded sheet information. Mark appropriate identification on front and spine of each binder. Include the following types of information:

1. Emergency instructions.
2. Spare parts list.
3. Copies of warranties.
4. Wiring diagrams.
5. Recommended "turn-around" cycles.
6. Inspection procedures.
7. Shop Drawings and Product Data.
8. Fixture lamping schedule.
9. Manufacturer’s Name, Address and Phone Number.
10. Supplier’s Name, Address and Phone Number.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 CLOSEOUT PROCEDURES

A. Operation and Maintenance Instructions: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. Provide instruction by manufacturer's representatives if installers are not experienced in operation and maintenance procedures. Include a detailed review of the following items:

1. Maintenance manuals.
2. Record documents.
3. Spare parts and materials.
4. Tools.
5. Lubricants.
6. Fuels.
7. Identification systems.
8. Control sequences.
9. Hazards.
10. Cleaning.
11. Warranties and bonds.
12. Maintenance agreements and similar continuing commitments.

B. As part of instruction for operating equipment, demonstrate the following procedures:

1. Startup.
2. Shutdown.
3. Emergency operations.
4. Noise and vibration adjustments.
5. Safety procedures.
6. Economy and efficiency adjustments.
7. Effective energy utilization.

3.2 FINAL CLEANING

A. General: The General Conditions require general cleaning during construction.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to the condition expected in a normal, commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

1. Clean-up operations shall consistently be carried on by the Contractor at all time to keep the premises free from accumulation of waste materials and rubbish. Upon completion of the work, he shall remove all rubbish, tools, scaffolding, surplus materials, etc., from the building and shall leave his work in a condition satisfactory to the Engineer.

2. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion.

a) Remove labels that are not permanent labels.
b) Remove all surplus and discharded materials, excavated material and rubbish from the roadways, sidewalks, parking areas, lawns and all adjacent property; restore, in an acceptable manner, all property, both public and private, which has been disturbed or damaged during the prosecution of the work; and shall leave the whole site in a neat and presentable condition.
c) Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials.
d) Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films, and similar foreign substances. Restore reflective surfaces to their original condition. Leave concrete floors broom clean. Vacuum carpeted surfaces.
e) Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
f) Clean the site, including landscape development areas, of rubbish, litter, and other foreign substances. Sweep paved areas broom clean; remove stains, spills, and other foreign deposits.

Rake grounds that are neither paved nor planted to a smooth, even-textured surface.

C. Removal of Protection: Remove temporary protection and facilities installed for protection of the Work during construction.

D. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from the site and dispose of lawfully.

1. Where extra materials of value remain after completion of associated Work, they become the Owner's property. Dispose of these materials as directed by the Owner.

2. In case of dispute, the Owner may remove the rubbish and charge the cost to the several contractors as the Engineer shall determine to be just.

END OF SECTION 01700

SECTION 01720 – AS-BUILT DOCUMENTS

PART 1 - GENERAL

1.1 Certified, surveyed record drawings (“as-built” plans), sealed by a North Carolina licensed Professional Land Surveyor or Professional Engineer (engineer seal required for profiles), shall be furnished to the Cape Fear Public Utility Authority (Authority) by the Engineer of Record (or Developer where applicable) upon completion and acceptance of the infrastructure by the Authority.

The “as-built” plans shall include accurate information regarding pipe size, pipe material, pipe length, all valve locations (and turn direction), hydrant locations, fitting locations, services, and blow-off locations along with any relevant rights-of-way, property boundaries and easements. Pipe elevations shall be provided at minimum 100-ft intervals along the pipe alignment and at all fitting locations.

Digital “as-built” information shall be provided by the Engineer of Record in AutoCAD format and shall include all information required on the “as-built” drawings. No other digital formats will be accepted.

END OF SECTION 01720

SECTION 01740 - WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for warranties required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.

1. Refer to the General Conditions for terms of the Contractor's period for correction of the Work.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Submittals" specifies procedures for submitting warranties.
2. Division 1 Section "Contract Closeout" specifies contract closeout procedures.
3. Divisions 2 through 16 Sections for specific requirements for warranties on products and installations specified to be warranted.
4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.

C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

D. Separate Prime Contracts: Each prime contractor is responsible for warranties related to its own contract.

1.3 DEFINITIONS

A. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY REQUIREMENTS

A. Equipment Warranty: All equipment shall have a one-year warranty period from the date of substantial completion and acceptance by the Owner. The warranty period shall cover the full cost of repairs and replacement to include all labor, travel expenses, parts, taxes and freight so as to be no cost to the Owner. If the equipment in need of repair and replacement is critical to the function of the Owner's facility, then the Contractor shall expedite this replacement to include express freight charges and additional cost for labor.

B. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

C. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.

D. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the full cost **(including labor if straight time or overtime is required, travel expenses, parts, taxes and freight)** of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life. Equipment that the Owner or Engineer deem critical to the Work shall be replaced immediately or the Contractor shall be held responsible for the damaged caused by not replacing the equipment. Contractor shall expedite the replacement of critical items to include express freight charges and additional cost for labor.

E. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.

1. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

F. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.

1.5 SUBMITTALS

A. Submit written warranties to the Engineer prior to the date certified for Substantial Completion. If the Engineer's Certificate of Substantial Completion designates a commencement date for warranties other than the date of Substantial Completion for the Work, or a designated portion of the Work, submit written warranties upon request of the Engineer.

1. When a designated portion of the Work is completed and occupied or used by the Owner, by separate agreement with the Contractor during the construction period, submit properly executed warranties to the Engineer within 15 days of completion of that designated portion of the Work.

B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Engineer, for approval prior to final execution.

C. Refer to Divisions 2 through 16 Sections for specific content requirements and particular requirements for submitting special warranties.

D. Form of Submittal: At Final Completion compile 3 copies of each required warranty properly executed by the Contractor, or by the Contractor, subcontractor, supplier, or manufacturer.

E. Bind warranties and bonds in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (115-by-280-mm) paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark the tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product, and the name, address, and telephone number of the Installer.
2. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project title or name, and name of the Contractor.
3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01740

SECTION 02012 – STANDARD PENETRATION TESTS

PART 1 - GENERAL

1.1 COMPACTION AND TESTING

A. Backfill shall be thoroughly compacted over and around the pipe by use of vibratory tamping pads, if available. If not available, use a mechanical or hand tamp. Backfilling shall be completed as outlined in Section 02220. The optimum moisture content and the maximum density of each type of material used for trench backfill shall be determined by "Tests for Moisture-Density Relations of Soils, using 10-lb. Rammer and 18-inch Drop" (ASTM D1557 or ASSHTO T-180).

B. The field moisture content of materials being compacted shall be determined by "Laboratory Determination of Moisture Content of Soil" (ASTM D2216). The field density of compacted material shall be determined by "Test for Density of Soil in Place by the Sand-Cone Method" (ASTM D1556).

C. Compaction testing will be performed by a third-party hired by the Owner. Compaction testing will be performed at a minimum of every 300 linear feet. Additionally, nuclear gauge or cut core pavement testing will be performed at a minimum of every 1,000 linear feet. The Owner reserves the right to require re-tests or additional tests, if the initial compaction test fails. Costs associated with retests due to failed tests will be borne by the Contractor. The Contractor will be responsible for coordinating with the compaction and pavement testing third party and facilitating testing.

D. After testing is completed and reports are provided, all subgrades below the paving will be examined by the Engineer before any paving is authorized.

E. The responsibility of the soils engineering and testing laboratory is to the Engineer, to whom that firm must promptly, faithfully and accurately report the results of its tests and inspections. The firm must, in addition, work in coordination with the Contractor, making all tests required. The reports must state whether or not the reported results comply with contract requirements. The testing and control firm shall promptly type and deliver all its reports to the Engineer with a copy to the Contractor.

END OF SECTION 02012

SECTION 02050 - DEMOLITION AND REMOVAL

PART 1 - GENERAL

1.1 Work under this section includes furnishing labor, equipment and materials for demolition, removal and proper disposal of certain structures, piping, equipment, all stripping, trees, steps and existing asphalt and concrete surfaces, existing sidewalk and curb and gutter as indicated or specified. Do not begin demolition until authorization is received from the Engineer, refer to paragraph "Title to Materials", hereinafter. Remove rubbish and debris daily, unless otherwise directed; do not allow accumulations. Store materials that cannot be removed daily in areas approved by the Engineer. The demolition and removal of materials containing asbestos shall be in accordance with State and Federal regulations.

1.2 Structure demolition shall include removal of existing wooden, concrete and masonry structures, and cutting through or into existing reinforced concrete walls and masonry walls.

1.3 Pipe demolition shall consist of cutting, plugging, and removal of piping as required.

1.4 Pavement demolition shall consist of cutting and removing existing asphalt pavement, concrete pavement, and concrete curb and gutter.

1.5 Requirements:

A. Dust Control: Take appropriate action to check the spread of dust to occupied portions of any nearby buildings and avoid the creation of a nuisance in the surrounding area. Do not use water if it results in hazardous or objectionable conditions, such as ice, flooding, or pollution. Comply with all dust regulations imposed by local air pollution agencies.

B. Protection: Protect existing work which is to remain in place, that is to be reused, or which is to remain the property of Owner by temporary covers, shoring, bracing and supports. Items which are to remain and which are damaged during performance of the work shall be repaired to their original condition or replaced. Do not overload structural elements. Provide new supports and reinforcement for existing construction weakened by demolition or removal work.

C. Facilities: Protect all electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities.

D. Explosives: Use of explosives will not be permitted.

E. Burning: Burning will not be permitted.

F. Regulations: Comply with federal, state, and local hauling and disposal regulations.

1.6 Submittals: Submit proposed demolition and removal procedures to the Engineer for approval before work is started. Procedures shall provide for coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation of the sequence of operations.

PART 2 - EXECUTION

2.1 Existing Structures and Facilities to be Removed: Concrete and masonry structures which are in the way of new work shall be cut off to a point at least 12" below finished grade level and backfilled and covered with unclassified excavation. Compaction shall be 95% of Standard Proctor at optimum moisture content.

A. Existing concrete and masonry structures to be cut for installation of conduit and piping shall be neatly cut using core drills. After installation of conduit or pipe the annular space shall be filled with non-shrink grout.

B. Items such as concrete sidewalk, stairs, curb and gutter and asphalt pavements shall be removed as necessary to complete the project as shown on the plans. All concrete and asphalt items to be removed shall be saw cut with a neat clean line then removed. The Contractor shall take care as to not damage adjacent structures during removal. Any damage to adjacent facilities will be the Contractor's responsibility.

2.2 Utilities, Piping and Equipment to be Removed: Remove all existing utilities and related equipment uncovered by work and terminate in a manner conforming to the nationally recognized code covering the specific utility. Equipment to be removed shall be removed with as little damage to the equipment as possible. Any anchor bolts or plates shall be removed by cutting and holes shall be grouted over flush with surface. Remove lights and stanchion and related equipment and deliver to a location in accordance with instruction of the Owner or his representative without additional cost.

A. Piping shown on the plans to be removed shall be disassembled where possible (and cut where required) and removed. All piping stub-outs indicated to remain shall be blind flanged, covered with a threaded cap or closed with a permanent mechanical plug, as appropriate.

2.3 Disposition of Material: Title to Materials - Except where indicated otherwise or specifically specified otherwise in other sections or as indicated on the plans, all materials and equipment removed, and not reused, shall become the property of the Contractor and shall be removed from the property. Title to all materials resulting from demolition, and all materials and equipment to be removed, is vested in the Contractor upon approval by the demolition and removal procedures, and authorization by the Engineer to begin demolition. The Owner will not be responsible for the condition or loss of, or damage to, such property after Notice to Proceed. Materials and equipment shall not be viewed by prospective purchasers or sold on the site.

A. Reuse of materials and equipment - Carefully remove and store materials and equipment to be reused or relocated to prevent damage, and reinstall as the work progresses.

B. Salvaged materials and equipment as specified by the Owner - Carefully remove materials that are to be removed by the Contractor and that are to remain the property of the Owner, and deliver to a storage site as directed within 15 miles of the work site.

2.4 Cleanup: Remove and transport debris and rubbish in a manner that will prevent spillage on streets or adjacent areas. Cleanup any spillage from streets and adjacent areas that occur during transportation operations. The site shall have all debris removed and shall be graded to conform to the adjacent area in such a manner to provide proper drainage. The site shall be properly seeded and mulched after completion of demolition operations.

END OF SECTION 02050

SECTION 02110 – SITE CLEARING

PART 1 - GENERAL

Under this section, the contractor shall provide all labor, material and equipment required to complete all necessary clearing, grubbing and debris removal for the execution of the contract as shown on the plans and as specified in this section or related technical specifications of this contract.

1.1 TREES, SHRUBS AND BUSHES

A. Trees, Shrubs and Bushes: Existing trees, shrubs and bushes adjacent to easements and rights-of-way shall be protected by fencing, barricading or wrapping. Shallow-rooted plants shall be protected at ground surface under and, if required, outside of the spread of branches by fences, barricades or ground cover. If the trees, shrubs or branches on private and public property adjacent to easements or rights-of-way are inadvertently damaged or destroyed by the contractor under this contract, the contractor shall negotiate with the owner for replacement or payment for such damage without additional compensation by the owner under this contract.

1.2 CLEARING AND GRUBBING LIMITS

A. The limits of both clearing and grubbing shall be within the designated rights-of-way and/or the easements specifically obtained for this contract. Grubbing shall include the removal of all stumps, roots exceeding 4" in diameter, and root mat within the grubbing limits to a depth of 18 inches.

1.3 TREE TRIMMING

A. When required, trees interfering with the contract work shall be trimmed to remove branches or roots. The contractor shall cut branches and roots in excess of 2" diameter and will paint with suitable paint. Trimming of trees will not be undertaken prior to the contractor obtaining written approval of work from the engineer.

1.4 DISPOSAL

A. Burning of materials on the site will be permitted, with proper permits acquired by the contractor. Material to be removed shall be removed from the site daily as it accumulates. Should the contractor elect to continue work beyond normal working hours, material to be removed shall not be allowed to accumulate for more than 48 hours. The contractor shall dispose of material in a permitted site.

END OF SECTION 02110

SECTION 02140 – DEWATERING

PART 1 - GENERAL

1.1 All ground water which may be found in the trenches and any water which may get into them from any cause whatsoever shall be pumped or bailed out so that the trench shall be dry during pipe laying period. No water shall be permitted to reach concrete until it has set sufficiently. All water pumped from the trenches shall be disposed of in compliance with the applicable local regulations of the appropriate governing body. The Contractor shall provide a minimum of two pumps for each trench opened in wet ground, one operating and one standby. The standby pump shall be of a size that will replace the largest operating pump. The Contractor shall be required to well point, pump, or provide other measures necessary to keep the trench dry.

When groundwater is present in the work area, maintain water level below pipe bedding. Contractor shall ensure that the ground water is below the bottom of the cut at all times to prevent washout from behind sheeting. Groundwater shall be managed at all times in strict conformance with Geotechnical Report when provided.

The Contractor shall provide and place all necessary flumes or other channels of adequate size to carry temporarily all streams, brooks, stormwater or other water which may flow along or across the lines of the pipe line. All flumes or channels thus utilized shall be tight so as to prevent leakage into the trenches. Water pumped from trenches shall be led to a natural watercourse in accordance with the plan.

1.2 Payment: No separate payment will be made for Dewatering. All costs incurred by the contractor for this work should be included in the unit price or lump sum price for the item of work to which it pertains.

END OF SECTION 02140

SECTION 02458 - STEEL H PILES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes steel H piles.

1.3 UNIT PRICES

A. Contract Sum: Base Contract Sum on number and dimensions of piles indicated from tip to cutoff, plus not less than 12 inches (305 mm) of overlength for cutting piles at cutoff elevations.

B. Work of this Section is affected as follows:

1. Additional payment for pile lengths in excess of that indicated, and credit for pile lengths less than that indicated, is calculated at unit prices stated in the Contract, based on net addition or deduction to total pile length as indicated on drawings and measured to nearest 12 inches (305 mm).

a. Additional payment for splices required to extend pile lengths in excess of that indicated is calculated at unit prices stated in the Contract.

2. Additional payment for number of piles in excess of that indicated, and credit for number of piles less than that indicated, is calculated at unit prices stated in the Contract.

3. Unit prices include labor, materials, tools, equipment, and incidentals for furnishing, driving, cutting off, capping, and disposing of cutoffs.

4. Test piles that become part of permanent foundation system are considered as an integral part of the Work.

5. No payment is made for rejected piles, including piles driven out of tolerance, defective piles, or piles damaged during handling or driving.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at location to be determined.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For steel H piles. Show fabrication and installation details for piles, including details of driving points, splices, and pile caps.

1. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.

2. Include arrangement of static pile reaction frame, test and anchor piles, equipment, and instrumentation. Submit structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and testing agency.

B. Welding certificates.

C. Mill Test Reports: For steel H piles, signed by manufacturer.

D. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion.

E. Static Pile Test Reports: Submit within three days of completing each test.

F. Pile-Driving Records: Submit within three days of driving each pile.

G. Certified Piles Survey: Submit within seven days of pile driving completion.

H. Field quality-control reports.

I. Preconstruction Photographs: Photographs or video of existing conditions of adjacent construction. Submit before the Work begins.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Installer's responsibility includes engaging a qualified professional engineer to prepare pile-driving records.

B. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated and accredited by IAS or ILAC Mutual Recognition Arrangement as complying with ISO/IEC 17025.

C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 PRECONSTRUCTION TESTING

A. General: Static pile tests are used to verify driving criteria and pile lengths and to confirm allowable load of piles.

1. Furnish test piles 60 inches (1524 mm) longer than production piles.

2. Determination of actual length of piles is based on results of static pile tests.

B. Pile Tests: Arrange and perform the following pile tests:

1. Axial Compressive Static Load Test: ASTM D 1143/D 1143M. Procedure A, Quick Test and the following Procedure:

a. Procedure B, Maintained Test.

C. Equip each test pile with two telltale rods, according to ASTM D 1143/D 1143M, for measuring deformation during load test.

D. Provide pile reaction frame, anchor piles, equipment, and instrumentation with enough reaction capacity to perform tests. Notify Owner and Owner's construction representative at least 48 hours in advance of performing tests. On completion of testing, remove testing structure, anchor piles, equipment, and instrumentation.

1. Allow a minimum of seven days to elapse after driving test piles before starting pile testing.

2. Number of Test Piles: One pile per pipe support bent.

E. Drive test piles at locations indicated to the minimum penetration or driving resistance indicated. Use test piles identical to those required for Project, and drive with appropriate pile-driving equipment operating at rated driving energy to be used in driving permanent piles.

1. Pile Design Load: As indicated on drawings and project Geotechnical Report.

F. Approval Criteria: Allowable load shall be the load acting on the test pile when the lesser of the following criteria are met, divided by a factor of safety of 2:

1. Net settlement, after deducting rebound, of not more than 0.01 inch/ton (0.25 mm/907 kg) of test load.

2. Total settlement exceeds the pile elastic compression by 0.15 inch (4 mm), plus 1.0 percent of the tip diagonal dimension.

3. A plunging failure or sharp break in the load settlement curve.

G. Test Pile-Driving Records: Prepare driving records for each test pile, compiled and attested to by a qualified professional engineer. Include same data as required for driving records of permanent piles.

H. Test piles that comply with requirements, including location tolerances, may be used on Project.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver piles to Project site in such quantities and at such times to ensure continuity of installation. Handle and store piles at Project site to prevent buckling or physical damage.

1. Painted Piles: Protect finish and touch up paint damage before driving piles.

1.10 FIELD CONDITIONS

A. Protect structures, underground utilities, and other construction from damage caused by pile driving.

B. Site Information: A geotechnical report has been prepared for this Project and is included elsewhere in the Project Manual for information only.

C. Preconstruction Photographs: Inventory and record the condition of adjacent structures, underground utilities, and other construction. Document conditions that might be misconstrued as damage caused by pile driving. Comply with Section 01322 "Photographic Documentation" if applicable to project.

PART 2 - PRODUCTS

2.1 STEEL H PILES

A. High-Strength, Low-Alloy, Columbium-Vanadium Structural Steel: ASTM A 572/A 572M, Grade 50 (Grade 345).

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. None.

2.2 PILE ACCESSORIES

A. Driving Points: Manufacturer's standard one-piece driving point, fabricated from steel castings as follows to provide full bearing of web and flange of pile tip:

1. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 65-35 (Grade 450-240), heat treated or Grade N1.

2. High-Strength Steel Castings: ASTM A 148/A 148M, Grade 80-40 (Grade 550-275) or Grade 90-60 (Grade 620-415).

B. Splice Unit: Manufacturer's standard splice unit, fabricated from two connected steel plates, of same material as steel H pile or material of equal strength, shaped to encase web and part of each flange.

2.3 PAINT

A. Paint: SSPC-Paint 16; self-priming, two-component, coal-tar epoxy polyamide, manufacturer's standard color.

2.4 FABRICATION

A. Fabricate and assemble piles in shop to greatest extent possible.

B. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch (305-mm) intervals; label the distance from pile tip at 60-inch (1524-mm) intervals. Maintain markings on piles until driven.

C. Fabricate full-length piles to eliminate splicing during driving, with ends square.

D. Fabricate full-length piles by splicing lengths of steel H pile together. Accurately mill meeting ends of piles and bevel for welding. Maintain axial alignment of pile lengths. Maintain structural properties of pile across splice.

1. Splice Units: Notch web of pile, fit splice unit into position, and weld according to manufacturer's written instructions and AWS D1.1/D1.1M for procedures, appearance and quality of welds, and methods used in correcting welding work.

2. Continuously Welded Splices: Splice piles by continuously welding according to AWS D1.1/D1.1M for procedures, appearance and quality of welds, and methods used in correcting welding work.

3. Splice piles during fabrication or field installation.

E. Fit and weld driving points to tip of pile according to manufacturer's written instructions and AWS D1.1/D1.1M for procedures, appearance and quality of welds, and methods used in correcting welding work.

2.5 SHOP PAINTING

A. General: Shop paint steel pile surfaces, except for surfaces to be encased in concrete, as follows:

1. Extend painting to a depth of 60 inches (1524 mm) below finished grade to top of exposed pile.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and loose mill scale, spatter, slag, and flux deposits. Prepare surfaces according to SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."

C. Painting: Immediately after surface preparation, apply coat of paint according to manufacturer's written instructions to provide a dry film thickness of not less than 8 mils (0.2 mm).

1. Apply second coat to provide a dry film thickness of not less than 8 mils (0.2 mm), resulting in a two-coat paint system thickness of not less than 16 mils (0.4 mm).

2. Apply second and third coats with each coat having a dry film thickness of not less than 8 mils (0.2 mm), resulting in a three-coat paint system thickness of not less than 24 mils (0.6 mm).

3. Mark pile lengths after shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Site Conditions: Do not start pile-driving operations until earthwork fills have been completed or excavations have reached an elevation of 6 to 12 inches (152 to 305 mm) above bottom of footing or pile cap.

3.2 DRIVING EQUIPMENT

A. Pile Hammer: Air-, steam-, hydraulic-, or diesel-powered type capable of consistently delivering adequate peak-force duration and magnitude to develop the ultimate capacity required for type and size of pile driven and character of subsurface material anticipated.

B. Hammer Cushions and Driving Caps: Between hammer and top of pile, provide hammer cushion and steel driving cap as recommended by hammer manufacturer and as required to drive pile without damage.

C. Leads: Use fixed, semifixed, or hanging-type pile-driver leads that hold the full length of pile firmly in position and in axial alignment with hammer.

3.3 DRIVING PILES

A. General: Continuously drive piles to elevations or penetration resistance indicated or established by static load testing of piles. Establish and maintain axial alignment of leads and piles before and during driving.

B. Predrilling: Provide pre-excavated holes where indicated, to depths indicated. Drill holes with a diameter less than the largest cross-section dimension of pile.

1. Firmly seat pile in predrilled hole by driving with reduced energy before starting final driving.

C. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.

D. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:

1. Location: 4 inches (102 mm) from location indicated after initial driving, and 6 inches (152 mm) after pile driving is completed.

2. Plumb: Maintain 1 inch (25 mm) in 48 inches (1219 mm) from vertical, or a maximum of 4 inches (102 mm), measured when pile is aboveground in leads.

3. Batter Angle: Maximum 1 inch (25 mm) in 48 inches (1219 mm) from required angle, measured when pile is aboveground in leads.

E. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances.

1. Fill holes left by withdrawn piles using cohesionless soil material such as gravel, broken stone, and gravel-sand mixtures. Place and compact in lifts not exceeding 72 inches (1830 mm).

2. Fill holes left by withdrawn piles as directed by Architect.

F. Abandon and cut off rejected piles as directed by Architect. Leave rejected piles in place, and install new piles in locations as directed by Architect.

G. Cut off tops of driven piles square with pile axis and at elevations indicated.

H. Pile-Driving Records: Maintain accurate driving records for each pile, compiled and attested to by a qualified professional engineer. Include the following data:

1. Project name and number.

2. Name of Contractor.

3. Pile location in pile group and designation of pile group.

4. Sequence of driving in pile group.

5. Pile dimensions.

6. Ground elevation.

7. Elevation of tips after driving.

8. Final tip and cutoff elevations of piles after driving pile group.

9. Records of redriving.

10. Elevation of splices.

11. Type, make, model, and rated energy of hammer.

12. Weight and stroke of hammer.

13. Type of pile-driving cap used.

14. Cushion material and thickness.

15. Actual stroke and blow rate of hammer.

16. Pile-driving start and finish times, and total driving time.

17. Time, pile-tip elevation, and reason for interruptions.

18. Number of blows for every 12 inches (305 mm) of penetration, and number of blows per 1 inch (25 mm) for the last 6 inches (152 mm) of driving.

19. Pile deviations from location and plumb.

20. Preboring, jetting, or special procedures used.

21. Unusual occurrences during pile driving.

I. Certified Piles Survey: Engage a land surveyor to prepare a piles survey showing final location of piles in relation to the property survey and existing benchmarks.

1. Notify Owner and Owner’s construction representative when deviations from locations exceed allowable tolerances.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Pile foundations.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Tests and Inspections:

1. Dynamic Pile Testing: High-strain dynamic monitoring shall be performed and reported according to ASTM D 4945 during initial driving and during restriking on 3 percent of piles.

2. Weld Testing: In addition to visual inspection, welds shall be tested and inspected according to AWS D1.1/D1.1M and inspection procedures listed below, at testing agency's option. Correct deficiencies in Work that test reports and inspections indicate do not comply with the Contract Documents.

a. Liquid Penetrant Inspection: ASTM E 165.

b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.

c. Radiographic Inspection: ASTM E 94, minimum quality level "2-2T."

d. Ultrasonic Inspection: ASTM E 164.

D. Steel H piles will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 TOUCHUP PAINTING

A. Clean field welds, splices, and abraded painted areas and field-apply paint according to SSPC-PA 1. Use same paint and apply same number of coats as specified for shop painting.

1. Apply touchup paint before driving piles to surfaces that are immersed or inaccessible after driving.

3.6 DISPOSAL

A. Remove withdrawn piles and cutoff sections of piles from site, and legally dispose of them off Owner's property.

END OF SECTION 02458

SECTION 02520 – CONCRETE CURBS, GUTTERS, DRIVEWAYS, SIDEWALKS AND CATCH BASINS

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Under this section of the specifications, it shall be the contractor's responsibility to furnish all plant, labor, equipment and materials and for performing all related activities necessary for the construction and/or replacement of concrete curbs, gutters, sidewalks and driveways, and other related concrete structure shown on the contract drawing or as removed by the contractor during utility installation.

1.2 MATERIALS

A. Concrete: All concrete used shall be "Class A".

B. Reinforcement: Reinforcing will generally not be required unless the concrete structure being removed is reinforced or the plans for new structures so designate. In these situations reinforcement shall conform to Section 03200, "Concrete Reinforcement".

1.3 ALIGNMENT & GRADE

A. Alignment and grades for replacement structures shall conform to the adjacent structures unless otherwise specified by the engineer or NCDOT. Alignment and grades for new concrete structures shall conform to the plans and details designated on the drawings. Alignments and grades will be established by means of offset stakes set by the contractor and the completed work shall accordingly conform thereto. In the event any of the concrete structures placed are damaged from any cause or proves defective in any way, or is out of alignment or grade, the contractor shall remove such sections and replace at his own expense.

1.4 EXCAVATION AND SUBGRADE PREPARATION

A. Excavation and subgrade preparation for all concrete structures shall be in strict compliance with Division 5 NCDOT Standards

1.5 SECTIONS

A. Replacement concrete structures shall conform to the dimensions and shape of the existing remaining structures except as otherwise stated herein. New structures shall conform to the design and dimensions shown in the standard details of these specifications and the accompanying drawings.

1.6 SIDEWALKS AND DRIVEWAYS

A. All sidewalks shall be constructed or reconstructed to a minimum uniform thickness of four (4) inches to the width of the sections being replaced or, for new sidewalks to the width designated on the drawing. All driveways shall be constructed to a minimum uniform thickness of six (6) inches including that section which crosses sidewalk areas, unless otherwise directed by the engineer. The replaced driveway widths flared sections at the road shall conform to the exact dimensions and shape of that which was removed.

1.7 FORMS

A. Concrete Curb and Gutter Forms: Wooden or steel forms, satisfactory to the Engineer, shall be used for the construction of curb and gutter. They shall be set true to alignment and grade as required by the Engineer, and substantially braced. Metal templates, not more than three-sixteenth (3/16") inch in thickness, and manufactured in accordance with the curb and gutter section, shall be set in the places provided in the forms not more than ten (10') feet apart, as directed by the Engineer. The forms and templates shall be thoroughly cleaned and oiled after each operation. Templates shall be adjusted under the supervision of the Engineer so as to prevent short sections (less than 5 feet).

B. When back and front forms have been set to exact grade and secured, the dividing plates shall be inserted and trued up. With these forms as templates, fine grading to exact subgrade elevation shall be completed by hand. Face forms shall then be set. The Contractor shall use every effort to observe any possible misalignments in grades and shall call such to the attention of the Engineer promptly.

C. Sidewalks and Driveways Forms: Forms shall be of wood or metal, straight and free from warp, and of sufficient strength to resist springing during the process of depositing and consolidation of the concrete. The width of the forms for sidewalk and driveways shall be equal to the full depth of the sidewalk or driveway. Forms shall be securely staked and braced true to the line and grade set by the Engineer. Suitable metal or wooden division plates shall be provided to completely separate adjacent slabs during construction. Forms shall be clean and well oiled before being set. Sidewalks shall be marked in sections with a proper lining tool to form squares the size of which will depend upon the width of the walks. The edges of driveways will be worked with an edging tool and will be sectioned into squares or marked as directed by the Engineer.

D. Driveway construction joints shall not be spaced less than five (5) feet apart. In no case shall the next expansion joint on the remaining drive be closer than 5 feet from the new construction joint.

1.8 CONSTRUCTION

A. Concrete shall not be placed in any forms until the forms and subgrade have been tested, inspected and approved by the Engineer.

B. Concrete Curb and Gutter Construction: All materials incorporated shall conform to the provisions as set out hereinbefore and shall be mixes and deposited in accordance with the requirements of section 03300, “Cast-In-Place Concrete”. The forms for curb and gutter shall be placed in accordance with the proper alignment and grade as directed by the Engineer, and all attachments, templates, stakes, bracings, etc., shall be securely set in place prior to depositing of concrete.

1. Careful check will be made of all forms prior to pouring and the Contractor shall obtain a visual inspection and approval of all forms prior to deposition concrete therein. Such approval, however, shall not be grounds for claims by the contractor for additional work in replacing any faulty work poured in forms approved by the Engineer or his authorized assistants.

2. When sufficient concrete has been placed in the forms, it shall be well spaded along areas in contact with the forms in order to eliminate all honeycombing and floated to the proper alignment and grade, after which it shall be trowelled smooth and very lightly brushed. Templates shall be removed by stages, but not entirely until the concrete has become thoroughly hard. After removal of the templates, there must be a clear division throughout between these sections. Edging tools will be used to form an edge along the back and front form and at each template.

3. All concrete pours shall terminate at a template. If pouring is to be resumed within one hour or less, any excess concrete that exists after the template has been reached may be spread in the bottom 2" of the gutter form adjoining the completed curb or disposed of, as directed by the Engineer.

4. At catch basins, there will be a short section of gutter only, the curbing being replaced by the casting. The catch basin casting shall be parallel with, and on the grade of the back form of the curb and gutter section. The gutter area shall be so shaped and sloped as to increase in slope toward the curbing to an extent that when opposite the catch basin casting, it will provide a minimum of eight (8") inch clear opening below the casting top. This warped section at, and adjacent to, each catch basin shall have the exact same finish texture as that of the other curbing present and shall be poured at the same time where possible. A double ply of 30-pound building felt shall be inserted on all sides of catch basin casting covers that come in contact with any concrete. No felt shall be placed against catch basin leg castings.

5. The use of excessive grout (mud) continuously along the curb and gutter section will not be tolerated. The use of "mules" shall be limited to obtaining the desired finish - they should not be allowed to alter the section of the curb. No floating and little trowelling should be necessary against the curb face in order to obtain a true and proper section. Such section should be obtained with the curb face form board, the alignment of which must be extremely good.

6. The curb and gutter at street corners shall be constructed on a thirty-five (35) foot radius unless otherwise instructed. At driveways the curb and gutter shall be constructed on a four and one-half (4 ½) foot radius unless otherwise directed by the Engineer.

C. Sidewalks and Driveway Construction: After the forms have been set, the Engineer shall inspect the form for proper line and grade and shall check the subgrade for proper compaction before allowing any concrete to be placed. All materials incorporated in this concrete shall conform to the provisions as set out hereinbefore and shall be mixed and deposited in accordance with the requirements of these specifications. When sufficient concrete has been deposited in the forms it shall be well "spaded" along all areas in contact with the forms in order to eliminate all "honeycombing". Sidewalks shall be "scored" (1" deep) in sections six feet or less in width. If sidewalk is greater than six feet in width scoring shall be as directed by the Engineer. All "scores" shall be straight and rounded at the surface with the proper edging tool, or as directed by the Engineer. Expansion joints shall be installed for every 30 linear feet of sidewalk, against all structures, pavement and curbs, and at such other places as shown on the plans and details, or as directed by the Engineer. All concrete pours shall terminate at a template. If pouring is to be resumed within one hour or less, any excess concrete that exists after the template has been reached may be spread in the bottom two (2) inches of the adjoining sidewalk section, or disposed of as directed by the Engineer. All driveways shall be repoured to previous widths and also with equal radii or angles at the street.

1.9 BACKFILLING DRESSING UP OF DISTURBED AREAS

A. Backfilling around completed concrete structures shall be in strict compliance with 2018 NCDOT Standards and Specifications. After the concrete structures have been completed, the adjacent areas shall be cleared of all construction debris and neatly graded.

END OF SECTION 02520

SECTION 02720 – STORM WATER DRAINAGE SYSTEM

PART 1 - GENERAL

The Contractor under this section is responsible for the removal, re-installation and/or installation of all storm water drainage pipes, manholes, headwalls, and other related structures per the plans. Re-installation and/or installation will conform to the requirement as specified in the North Carolina Department of Transportation (NCDOT) "Standard Specifications for Roads and Structures."

1.1 REUSE AND REPLACEMENT OF DRAINAGE PIPE AND STRUCTURES

A. The contract shall be required to exercise extreme care in the removal and handling of existing drainage structures to prevent damage to the pipe sections or to bells and spigots. The pipe removed shall be temporarily clean and properly stored for re-installation upon completion of the contracted work. The contractor is to replace all damaged drainpipe with new re-enforced pipe and shall dispose of damaged pipe. Drain pipe removed as a result of construction activities that is in acceptable condition must be reused in the restoration of drainage facilities. Existing drainage pipe that is not suitable for reuse as determined by the Engineer shall be replaced for the price of material only, as indicated by the unit price found on the Bid Form. If the replacement drainage pipe is not of the sizes or material found in the Bid Form, the Contractor shall replace the pipe for price of material only. Contractor is to provide invoices to satisfaction of Engineer for the cost of material. Any drain pipe damaged as a result of Contractor's actions shall be replaced at Contractor's expense.

B. All pipe shall be replaced as nearly as possible to the original grade and alignment, however, the grade and alignment shall be uniform. The covers and frames from displaced manholes and structure shall also be removed and stored for use on replacement manhole and structure.

PART 2 - PRODUCTS:

2.1 REPLACEMENT PIPE:

A. Replacement pipe for damaged sections shall be of size and grade of that is being replaced except that all replaced pipe shall be reinforced.

B. Reinforced Concrete Pipe: ASTM C76, Class III with tongue and groove joints and preformed mastic joint filler.

C. Corrugated Steel Pipe and Pipe-Arch: ASTM A760, fully asphalt lined and coated. Joints shall be corrugated coupling band, hugger type with one annular corrugation at each outside edge, or bands with projections where new pipe is joined to existing pipe. Coupling bands shall be fastened with a minimum of two ½ inch bolts. Wall thickness

to meet AASHTO M36 for H20 live load. Corrugated Aluminum Pipe and Pipe-Arch: AASHTO M196 with one or two piece lap type coupling bands for annular or helical pipe. Bands shall be fastened with a minimum of two ½ inch bolts. Wall thickness to meet AASHTO M196 for H20 live load.

2.2 DRAINAGE STRUCTURES: REPLACED MANHOLE AND INLET STRUCTURES SHALL BE PRECAST CONCRETE WITH PREFORMED HOLES OR KNOCKOUT PANELS UNLESS OTHERWISE APPROVED. SPECIFICATIONS FOR REPLACEMENT ITEM SHALL BE AS FOLLOWS:

A. Precast Concrete Manholes: ASTM 478 with eccentric cone tops and precast base sections, unless shown otherwise. Manholes less than 4 feet deep shall have flat slab top. Minimum inside diameter of base section shall be 4 feet, with actual diameter to be determined by the Contractor and manhole supplier based on the number, size, and angle of pipe connections for each manhole.

B. Precast Concrete Inlet Boxes: Boxes shall be constructed in accordance with ACI 318, designed for H20 live loads, with knockout panels all four sides. Minimum inside area of box shall be 5 square feet.

C. Steps: ASTM C478, polypropylene encapsulated Grade 60 steel bars.

D. Frames, Grates, and Covers: Cast Iron conforming to ASTM A48, Class 30B. Dimensions shall conform to the Drawings in essential details.

2.3 FLARED END SECTIONS:

A. Concrete: reinforced concrete AASHTO M170.

B. Corrugated Steel: Applicable requirements of ASTM A760.

C. Corrugated Aluminum: Applicable requirements of AASHTO M196.

2.4 FILTER FABRIC:

A. Filter fabric shall be non-woven synthetic fabric conforming to NCDOT Section 956-1.

PART 3 - EXECUTION:

3.1 RELATED WORK:

A. Excavated, trenching, backfilling, and compaction shall be in compliance with Section 02220, "Excavation, Grading, Trenching, and Backfilling". Proper clearance of water, sewer and other utilities shall be provided.

B. Pipe: Replacement pipe shall be new pipe, free of defects. Store in an acceptable manner until ready for installation. The pipe shall be installed from the lowest point of

the system, true to line and grade, with bell or groove and facing upstream. The trench shall be maintained free of surface or ground water. Installation shall conform to the respective recommendations of the pipe manufacturers or trade association) except as modified hereafter.

C. Concrete Pipe: ACPA "Concrete Pipe Installation Manual."

D. Corrugated Steel Pipe: NCSPA "Installation Manual for Corrugated Steel Drainage Structures."

E. Corrugated Aluminum Pipe: Same requirements as corrugated steel pipe except as modified by manufacturer and herein.

F. Clean pipe of all debris and soil as a result of construction.

3.2 STRUCTURES:

A. Bedding: Provide 6 inches Class 1 gravel beneath structures to 6 inches outside of structure.

B. Precast structures shall be set plumb, with pipes centered within knockout panels. Provide opening of minimum size to accommodate pipe. Grout pipe in place with non-shrink grout.

C. Inverts shall be performed or formed with concrete or brick and concrete. Provide minimum 1 inch per foot slope to the flow line of the structure.

D. Steps: For structures greater than 3 feet deep, provide steps 12 inches apart with alternate steps offset 6 inches horizontally, beginning two feet below top of frame. Install in conformance with manufacturers recommendations.

E. Frames and Grates: Center frame castings above structure opening. Adjust to grade with precast concrete grade rings, brick, or mortar for a maximum adjustment of 12 inches.

END OF SECTION 02720

SECTION 02900 – LANDSCAPING

PART 1 - GENERAL

1.1 The contractor shall be responsible for providing all labor, materials, tools, equipment, topsoil, fertilizer, lime and seed necessary for restoration and stabilization of areas disturbed under this contract. All areas disturbed, whether in street rights-of-way, permanent easements or temporary construction easements shall be restored by the contractor upon completion of backfilling. Within temporary construction easements, the contractor may be required to restore original structures, decorative vegetation, grass seed and shrubbery removed to as near the original condition as possible and to the approval of the engineer.

1.2 Submittals: The contractor shall submit the names and composition of the fertilizers, sod and seed mixtures and mulch type to the Engineer prior to initiation of restoration activities for review and approval.

1.3 Materials: The contractor shall use the following materials on the project unless otherwise approved by the engineer.

A. Topsoil: Top soil shall be a natural, fertile, friable, productive soil from naturally well drained areas in the immediate vicinity with a PH between 5 and 9. It shall not contain any substances that may be harmful to grass growth. Topsoil which has been stockpiled from trenching or excavations may be used provided it meets the above requirements. Topsoil delivered to the site in a frozen or muddy condition shall be rejected.

B. Seed: The seed shall have 97% purity and 90% germination guarantee. All seed must meet the requirements of the North Carolina Department of Agriculture. Bags shall be labeled to describe the composition, purity, germination, and the presence of restrictive or prohibited agents. Damp or moldy seed will be rejected.

The contractor shall be required to either seed or sod disturbed areas as to provide a grass stand equivalent to that existing prior to the disturbing activities without additional compensation.

C. Fertilizers: Fertilizer shall be 10-10-10 or equivalent of uniform, free-flowing granules. The fertilizer shall be delivered to the site in the original containers labeled with contents and producer's name. The Engineer may require additional or a different fertilizer based on seed performance or soil test.

D. Lime: The dolomitic lime shall consist of ground agriculture limestone containing not less than 85% of combined calcium and magnesium carbonates with 60% passing a #60 mesh sieve and 95% passing a #10 mesh sieve.

E. Mulch: Mulch shall consist of small grain straw or other acceptable material, and shall have been approved by the Engineer before being used. All mulch shall be reasonably free from mature seedbearing stalks, roots, or bulblets of Johnson Grass, Nutgrass, Sandbur, Wild Garlic, Wild Onion, Bermuda Grass, Crotalaria,

and Witchweed, and free from an excessive amount of restricted noxious weeds as defined by the North Carolina Board of Agriculture at the time of use of the mulch, and also there shall be compliance with all applicable State and Federal domestic plant quarantines. Straw mulch that is matted or lumpy shall be loosened and separated before being used.

F. Jute Netting and Staples: Jute mat shall be cloth of a uniform plain weave of undyed and unbleached single jute yard, 48 inch in width plus or minus 1 inch and weighing an average of 1.2 pounds per linear yard of cloth with a tolerance of plus or minus five percent (5%), with approximately 78 warp ends per width of cloth and 41 weft ends per linear yard of cloth. The yard shall be of a loosely twisted construction having an average twist of not less than 1.6 turns per inch and shall not vary in thickness by more than one-half of its normal diameter. Staples for anchoring soil stabilization matting shall be made of 12 to 20 inch lengths of No. 8 plain wire.

G. Asphalt Binding Material: The asphalt binding material for anchoring mulch shall consist of emulsified asphalt per North Carolina Department of Transportation specifications.

H. Water: Water shall be potable, free of contents which could retard grass growth.

1.4 **Uncultivated Areas:** All uncultivated areas that are disturbed by the pipe laying operation shall be restored to good condition with similar materials as original. Restoration includes, but is not limited to, asphalt, paint stripes, concrete, curbs, culvert pipe, mailboxes and signs. Areas shall be cleaned and surplus materials removed.

Natural areas shall be graded to final grade, limed, fertilized, seeded and mulched as required and as described in 02900 Part 4.2 Cultivated Areas, except no topsoil application is required. Wetland areas are to be restored with original vegetation or with plants of same species as specified by the regulating authority. Topsoil will not be required on road shoulder adjacent to uncultivated areas except in those areas where suitable erosion ground cover is unattainable through seeding.

1.5 **Cultivated Areas:** Existing seeded and/or planted areas disturbed by construction shall be dressed with topsoil, fertilized and seeded.

Furnish and apply soil conditioners and seed as specified.

Excess stone from construction activities left on private property or rights-of-way shall be removed by the Contractor, at his expense, to prevent damage to maintenance equipment and operations.

A. **Topsoil:** After approval of rough grading, the Contractor shall place the topsoil on all cultivated areas damaged by his operations, except for road shoulders adjacent to undeveloped and uncultivated areas. Topsoil shall be at least twelve (12) inches deep. All topsoil from stripping which is not used at the job site shall be removed from the site and deposited as requested by Owner.

B. **Soil Conditioners**: Lime and fertilizer shall be spread and thoroughly worked into the top 4 inches of soil at the rates of 3,000 lbs/acre and 1,000 lbs/acre, respectively. Then the soil shall be raked until the surface is finely pulverized and smooth and shall be compacted with rollers, weighing not over 100 pounds per linear foot of tread, to an even surface conforming to the prescribed lines and grades.

C. **Seeding:** Seeding shall be done when weather conditions are approved as suitable. If there is a delay in seeding, during which weeds grow or soil is washed out, the Contractor shall remove the weeds or replace the soil before sowing the seed, without additional compensation. Immediately before seeding is started, the soil shall be lightly raked.

Seed shall be sown during the following dates at the following pound per acre rates. On a calm day and preferably by machine, but if by hand, only by experienced workmen. Hydroseeding may be permitted.

1. For soils with good moisture retention from February 15 to April 30 or September 1 to October 31. Seed with 80 lbs. tall Fescue, 50 lbs. unhulled Common Bermuda Grass, 40 lbs. Kobe Lespedeza.

2. For soils with poor moisture retention from April 1 - July 15, seed with 50 lbs. unhulled Common Bermuda Grass, 5 lbs. Centipede Grass and 10 lbs. German Millet.

3. Temporarily seeding all other times (to be reseeded at the first available date listed in 1 or 2 above), 120 lbs. rye (grain), 50 lbs. Kobe Lespedeza.

Seed shall be raked lightly into the soil to a depth of 1/4 inch and rolled with a roller weighing not more than 100 pounds per linear foot of tread.

Wherever poor germination occurs in areas larger than three (3) square feet, the Contractor shall reseed, roll, and water as necessary to obtain proper germination. The Contractor shall water, weed, cut and otherwise maintain and protect seeded areas as necessary to produce a dense, healthy growth of perennial lawn grass.

D. **Mulch:** All seeded areas shall be mulched unless otherwise indicated in the Special Provisions or directed by the Engineer.

Grain straw may be used as mulch at any time of the year. If permission to use material other than grain straw is requested by the Contractor and the use of such material is approved by the Engineer, the seasonal limitations, the methods and rates of application, the type of binding material, or other conditions governing the use of such material will be established by the Engineer at the time of approval. Mulch shall be applied within 36 hours after the completion of seeding unless otherwise permitted by the Engineer. Care shall be exercised to prevent displacement of soil or seed, or other damage to the seeded area during the mulching operations.

Mulch shall be uniformly spread by hand or by approved mechanical spreaders or blowers which will provide an acceptable application. An acceptable application will be that which will allow some sunlight to penetrate and air to circulate, but also partially shade the ground, reduce erosion, and conserve soil moisture. Mulch rate shall be 2 tons per acre. When there are seasonal limitations on seeding or when other weather or erosion conditions make it desirable to mulch in advance of seeding, the Engineer may direct that mulch be applied after the application and incorporation of limestone into the seedbed, and the fertilizer and seed then applied later through the mulch in proper season or under more favorable weather conditions.

Mulch shall be held in place by applying a sufficient amount of asphalt or other approved binding material to assure that the mulch is properly held in place. The rate and method of application of binding material shall meet the approval of the Engineer. Where the binding material is not applied directly with the mulch, it shall be applied immediately following the mulch application. During the application of asphalt binding material, or other approved binding materials which may cause damage, adequate precautions shall be taken to prevent damage to traffic, structures, guardrails, traffic control devices, or any other appurtenances. The Contractor shall either provide adequate covering or change methods of application as required to avoid such damage. When such damage occurs, the Contractor shall repair it, including any cleaning that may be necessary.

The Contractor shall take sufficient precautions to prevent mulch from entering drainage structures through displacement by wind, water, or other causes and shall promptly remove any blockage to drainage facilities which may occur.

1.6 **Jute Netting**

A. Site Preparation:

Jute netting shall be required on all slopes greater than 2 to 1 slope, and wherever specified on drawings.

Shape and grade the waterway, channel, ditch, or area to be protected as required by the drawings and specifications. Remove rocks, clods over 1-1/2 inches in diameter, sticks and other material that will prevent contact of the matting with the soil surface.

B. Lime, Fertilizer and Seed:

Lime, fertilize and seed in accordance with the applicable seeding standard (Part 4.2 C&D) except when placing jute-matting one-half of the seed may be applied prior to laying the matting and the remaining seed applied after laying the matting.

C. Installing Netting:

The Contractor shall start laying the matting from the top of the channel or slope and unroll downgrade so that one edge of the strip coincides with the channel

center. Lay a second strip parallel to the first on the other side of the channel and allow at least a 2-inch overlap for jute matting. If one roll of matting does not extend the length of the channel, continue downhill with additional rolls.
The Contractor shall secure the matting by burying the top end of jute strips in a trench 4 inches or more deep. Tamp the trench full of soil. Reinforce with a row of staples driven through the jute about 4 inches downhill from the trench. These staples should be about 10 inches apart. Then staple the overlap in the channel center. These staples should be 3 to 4 feet apart. The outside edges may be stapled similarly at any time after the center has been stapled. Closer stapling along the sides is required where concentrated water may flow into the channel.

Succeeding strips of matting, farther down the channel or slope, are secured in a similar manner. Strips of matting on the swale slopes should be laid and secured as above to a height of 3 feet above base of swale.

Where one roll of jute matting ends and another roll begins, the end of the top strip overlaps the trench where the upper end of the lower strip is buried. Make the overlap at least 4 inches and staple securely.

D. Erosion Stops:

All ground water which may be found in the trenches and any water which may get into them from any cause whatsoever shall be pumped or bailed out so that the trench shall be dry during pipe laying period. No water shall be permitted to reach concrete until it has set sufficiently. All water pumped from the trenches shall be disposed of in compliance with the applicable local regulations of the appropriate governing body. The Contractor shall provide a minimum of two pumps for each trench opened in wet ground, one operating and one standby. The standby pump shall be of a size that will replace the largest operating pump. The Contractor shall be required to well point, pump, or provide other measures necessary to keep the trench dry.

At any point, jute matting may be folded for burying in slit trenches and secured as were the upper ends. This checks water flow and erosion that may begin under the matting. It also gives improved tie-down. The procedure is recommended on the steeper slopes of sandy soil and gentler slopes subject to seepage. Spacings vary from 25 to 100 feet as required by the Engineer.

E. Diversions:

Where diversions outlet into the waterway, the outlet should be protected with matting used in the same manner as in the main channel. The matting for the outlet is laid first so that matting in the main channel will overlap the outlet strip.

F. Matting Soil Contact:

The Contractor shall assure that between matting and soil is obtained by rolling after laying, stapling and seeding are complete. Perfect contact is vital to keep water flow over, not under, the matting.

G. Inspection:

After job completion, the Contractor shall make sure the matting is in contact with the soil at all places and that critical areas are securely stapled down.

1.7 **Inspection and Acceptance**: At the beginning of the next planting season after that in which the permanent grass crop is sown, the seeded areas will be inspected. Any section not showing dense, vigorous growth at that time shall be promptly reseeded by the Contractor at his own expense.

Restoration shall be acceptable when the grass has grown at least 1" high with 85% coverage; provided that no bare spots larger than 10 square feet exist.

1.8 **Payment:** No separate payment will be made for Landscaping. All costs incurred by the contractor for this work shall be included in the unit price or lump sum price for the item of work to which it pertains.

END OF SECTION 02900

SECTION 03300 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. This Section specifies cast-in place concrete, including formwork, reinforcing, mix design, placement procedures, and finishes.

1. Cast-in-place concrete includes the following:

a) Foundations and footings.
b) Slabs-on-grade.
c) Tank walls.
d) Elevated slabs.
e) Equipment pads and bases.

1.3 SUBMITTALS:

A. General: Submit the following according to Conditions of the Contract and Division 1 Specification Sections.

1. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, dry-shake finish materials, and others if requested by Engineer.

2. Shop drawings for reinforcement detailing fabricating, bending, and placing concrete reinforcement. Shop drawings to show proposed location of all construction joints. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, bent bar diagrams, and arrangement of concrete reinforcement. Include special reinforcing required for openings through concrete structures. Engineer’s review is for general compliance only. The Contractor will be responsible for size, number and lengths of reinforcing.

3. Shop drawings for formwork indicating fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joints or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually. Engineer's review is for general applications and features only. Designing formwork for structural stability and efficiency is Contractor's responsibility.

4. The testing laboratory shall submit three copies of results of concrete cylinder tests to Engineer together with one copy each to Owner, Contractor, and Concrete Supplier.

5. Ready-mixed concrete delivered shall be accompanied by delivery tickets showing the following:

   a) Date and time leaving the plant
   b) Type of cement and weight
   c) Quanity of water and time added
   d) Admixtures and weight
   e) Site arrival time
   f) Site leaving time
   g) Type of fly ash and weight

6. Laboratory test reports for concrete materials and mix design test. Contractor shall submit three (3) copies.

7. Material certificates in lieu of material laboratory test reports when permitted by Engineer. Material certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

8. Hot weather and cold weather concreting plan shall include curing method and specific curing plan, ready mixed supplier plan, contingency plans, and materials list as a minimum. All hot weather plans shall meet requirements of ACI 305. All cold weather plans shall meet requirements of ACI 306.

9. A pouring plan will be submitted by the Contractor to the Engineer for approval showing the location of all construction joints.

1.4 QUALITY ASSURANCE:

A. Codes and Standards: Comply with provisions of the latest revision of the following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. American Concrete Institute (ACI) 211 “Proportions for Normal, Heavyweight and Mass Concrete.”
2. American Concrete Institute (ACI) 301, "Specifications for Structural Concrete for Buildings."
3. ACI 318, "Building Code Requirements for Reinforced Concrete."
4. ACI 347 “Recommended Practice for Concrete Formwork.”
5. ACI 350 “Environmental Engineering Concrete Structures.”
6. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."
7. ASTM C 94 Standard Specifications for Ready-Mix Concrete
8. North Carolina State Building Code

B. Concrete Testing Service: Owner will engage a testing agency to perform material evaluation tests.

C. Materials and installed work may require testing and retesting at any time during progress of Work. Any retesting of rejected materials for installed Work, shall be done at Contractor's expense.

D. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Require representatives of each entity directly concerned with cast-in-place concrete to attend conference, including, but not limited to, the following:

1. Contractor's superintendent.
2. Agency responsible for concrete design mixes.
3. Agency responsible for field quality control.
4. Ready-mix concrete producer.
5. Concrete subcontractor.
6. Primary admixture manufacturers.

PART 2 - PRODUCTS

2.1 FORM MATERIALS:

A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings.

B. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.

C. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or another acceptable material. Provide lumber dressed on at least two edges and one side for tight fit.

D. Forms for Cylindrical Columns and Supports: Metal, glass-fiber-reinforced plastic, or paper or fiber tubes that will produce smooth surfaces without joint indications. Provide units with sufficient wall thickness to resist wet concrete loads without deformation.

E. Form Release Agent: Provide commercial formulation form release agent with a maximum of 350 g/L volatile organic compounds (VOCs) that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

F. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties designed to prevent form deflection and to prevent spalling of concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to the plane of the exposed concrete surface.

G. Provide ties that, when removed, will leave holes not larger than 1 inch and no smaller than ½ inch in diameter in the concrete surface. Form ties for exposed concrete shall be of the cone-washer type. The cones shall be made of approved wood or plastic. Ties for liquid containment structures shall have an integral waterstop that is tightly welded to the tie. Common wire will not be allowed for form ties.

2.2 REINFORCING MATERIALS:

A. Reinforcing Bars: ASTM A 615 Grade 60 deformed.

B. Steel Wire: ASTM A 82, plain, cold-drawn steel.

C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

D. Supports for Reinforcement: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Use wire bar-type supports complying with CRSI specifications.

E. For slabs-on-grade, use supports with sand plates or horizontal runners where base material will not support chair legs.

F. For exposed-to-view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI, Class 1) or stainless steel (CRSI, Class 2).

2.3 CONCRETE MATERIALS:

A. Portland Cement: ASTM C 150, Type II.

B. Fly Ash: ASTM C 618, Type F

1. Use one brand of cement and fly ash throughout Project unless otherwise acceptable to Engineer.

C. Normal-Weight Aggregates: ASTM C 33 and as specified. Provide aggregates from a single source for exposed concrete.

D. For exposed exterior surfaces, do not use fine or coarse aggregates that contain substances that cause spalling.

2.4 WATER:

A. Potable.

2.5 Admixtures, General: Provide concrete admixtures that contain not more than 0.1 percent chloride ions.

A. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a) Monex Air or Monex NVR, Monex Resources, Inc.
    b) Air-Tite, Cormix Construction Chemicals.
    c) Air-Mix or Perma-Air, Euclid Chemical Co.
    d) Darex AEA or Daravair, W.R. Grace & Co.
    e) MB-VR or Micro-Air, Master Builders, Inc.
    f) Sealtight AEA, W.R. Meadows, Inc.
    g) Sika AER, Sika Corp.

B. Water-Reducing Admixture: ASTM C 494, Type A or D.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following

    a) Monex Resources, Inc
    b) Chemtard, ChemMasters Corp.
    c) PSI N, Cormix Construction Chemicals.
    d) Eucon WR-75, Euclid Chemical Co.
    e) WRDA, W.R. Grace & Co.
    f) Pozzolith Normal or Polyheed, Master Builders, Inc.
    g) Metco W.R., Metalcrete Industries.
    h) Prokrete-N, Prokrete Industries.
    i) Plastocrete 161, Sika Corp.

C. High-Range Water-Reducing Admixture: ASTM C 494, Type F or Type G.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

    a) Monex SP or Mighty RD, Monex Resources, Inc.
    b) Super P, Anti-Hydro Company, Inc.
    c) Eucon 37, Euclid Chemical Company.
    d) WRDA 19 or Daracem, W.R. Grace and Company.
    e) Rheobuild or Polyheed, Master Builders, Inc.
    f) Superslump, Metalcrete Industries.
    g) PSP, Prokrete Industries
    h) Sikament 300, Sika Corp.

2.6 CALCIUM CHLORIDE:

A. The use of calcium chloride will not be permitted.

2.7 RELATED MATERIALS:

A. Reglets: Where sheet flashing or bituminous membranes are terminated in reglets, provide reglets of not less than 0.0217- inch-thick galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.

B. Dovetail Anchor Slots: Hot-dip galvanized sheet steel, not less than 0.0336 inch thick with bent tab anchors. Fill slot with temporary filler or cover face opening to prevent intrusion of concrete or debris.

C. Waterstops: Provide ribbed or dumbbell-type waterstops at construction joints exposed to water pressure, including groundwater pressure, and other joints as indicated. Provide ribbed or dumbbell type with centerbulb waterstops at expansion joints. All waterstops shall be a minimum of 3/8" thick x 9" wide. All waterstops shall be provided with either metal grommets or intergal tie wires located along the top and bottom of the waterstop spaced at 12". Other styles or sizes of waterstops may be considered based on their specific application.

D. Polyvinyl Chloride Waterstops: Corps of Engineers CRD-C 572.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the Work include, but are not limited to, the following:

a) The Burke Co.
b) Greenstreak Plastic Products Co.
c) Meadows, Inc.
d) Progress Unlimited.
e) Schlegel Corp.
f) Vinylex Corp.

E. Sand Cushion: Clean, manufactured or natural sand.

F. Vapor Retarder: Provide vapor retarder that is resistant to deterioration when tested according to ASTM E 154, as follows:

1. Polyethylene sheet not less than 8 mils thick.

G. Water-resistant barrier consisting of heavy kraft papers laminated together with glass-fiber reinforcement and overcoated with black polyethylene on each side.

H. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd., complying with AASHTO M 182, Class 2.

I. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.

1. Waterproof paper.
2. Polyethylene film.
3. Polyethylene-coated burlap.

J. Epoxy Adhesive: ASTM C 881, two-component material suitable for use on dry or damp surfaces. Provide material type, grade, and class to suit Project requirements.

1. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:

a) Burke Epoxy M.V., The Burke Co.

b) Spec-Bond 100, Conspec Marketing and Mfg. Co.
c) Resi-Bond (J-58), Dayton Superior.
d) Euco Epoxy System #452 or #620, Euclid Chemical Co.
e) Epoxtite Binder 2390, A.C. Horn, Inc.
f) Epabond, L&M Construction Chemicals, Inc.
g) Concresive Standard Liquid, Master Builders, Inc.
h) Rezi-Weld 1000, W.R. Meadows, Inc.
i) Metco Hi-Mod Epoxy, Metalcrete Industries.
j) Sikadur 32 Hi-Mod, Sika Corp.
k) Stonset LV5, Stonhard, Inc.
l) Series, Symons Corp.

2.8 PROPORTIONING AND DESIGNING MIXES:

A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301, ACI 211, and ACI 350. For the trial batch method, use an independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.

B. Do not use the same testing agency for field quality control testing.

C. Limit use of fly ash to not exceed 25 percent of the total cementitious content by weight. Fly ash shall be used as an admixture and will not be allowed to replace cement. Fly ash shall be used in all structural concrete.

D. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of Work. Do not begin concrete production until proposed mix designs have been reviewed by Engineer.

2.9 Design mixes to provide concrete with the following properties as indicated on schedules:

CLASS	7 DAY	28 DAY	MAXIMUM WATER - CEMENTITIOUS RATIO	MINIMUM CEMENTITIOUS MATERIAL (LBS/CY)
Structural	2670	4000	0.44	611
Non-Structural	2000	3000	0.50	508
Structural, High Density	2670	4000	0.40	658

2.10 Structural, High Density Concrete shall be used in all structures where concrete is intended to be watertight in service.

2.11 Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

A. Ramps, slabs, and sloping surfaces: Not more than 3 inches.
B. Reinforced foundation systems: Not less than 1 inch and not more than 3 inches.
C. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches after adding admixture to site-verified 2 - 3 inch slump concrete.

2.12 Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in Work.

2.13 ADMIXTURES:

A. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, concrete required to be watertight, and concrete with water-cement ratios below 0.50.

B. Use air-entraining admixture in exterior exposed concrete unless otherwise indicated. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content of 4% with a tolerance of plus or minus 1.0 percent.

2.14 Ready-Mixed Concrete: Comply with requirements of ASTM C 94, and as specified.

A. When air temperature is between 85 deg F and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 GENERAL:

A. Coordinate the installation of joint materials, vapor retarder/barrier, and other related materials with placement of forms and reinforcing steel.

B. FORMS

1. General: Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits:

a) Provide Class A tolerances for concrete surfaces exposed to view.
b) Provide Class C tolerances for other concrete surfaces.

C. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in the Work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent cement paste from leaking.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is

too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like for easy removal.

E. Provide temporary openings for clean-outs and inspections where interior area of formwork is inaccessible before and during concrete placement. Securely brace temporary openings and set tightly to forms to prevent losing concrete mortar. Locate temporary openings in forms at inconspicuous locations.

F. Chamfer all exposed corners and edges, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints. Chamfer edges to be ¾" unless otherwise approved by Engineer.

G. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.

H. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

3.2 PLACING REINFORCEMENT:

A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as specified.

B. Avoiding cutting or puncturing vapor retarder/barrier during reinforcement placement and concreting operations. Repair damages before placing concrete.

C. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.

D. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as approved by Engineer.

E. Place reinforcement to maintain minimum coverages as indicated for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.

F. Install welded wire fabric in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.3 JOINTS:

A. Construction Joints: Locate and install construction joints so they do not impair strength or appearance of the structure, as acceptable to Engineer.

B. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as indicated otherwise. Do not continue reinforcement through sides of strip placements.

C. Use bonding agent on existing concrete surfaces that will be joined with fresh concrete.

D. Waterstops: Provide waterstops in construction joints as indicated. Install waterstops to form continuous diaphragm in each joint. Support and protect exposed waterstops during progress of Work. Field-fabricate joints in waterstops according to manufacturer's printed instructions.

E. Isolation Joints in Slabs-on-Grade: Construct isolation joints in slabs-on-grade at points of contact between slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

F. Joint fillers and sealants shall be as follows:

1. Joint Fillers

a) Self-expanding Cork Joint Filler: Preformed strips complying with ASTM D 1752 for Type III.

b) Cork Joint Filler: Preformed strips complying with ASTM D 1752 for Type II.

c) Sponge Rubber Joint Filler: Preformed strips complying with ASTM D 1752 for Type I.

d) Bituminous Fiber Joint Filler: Performed strips complying with ASTM D 1751: Granulated cork with asphalt binder encased between 2 layers of saturated felt of glass-fiber felt of width and thickness indicated.

2. Joint Sealers shall be appropriate for their intended use and installations. Follow manufactures instruction for use and installation. All joint sealants shall be in accordance with ACI 504R.

3.4 INSTALLING EMBEDDED ITEMS:

1. General: Set and build into formwork anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached.

2. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

3.5 PREPARING FORM SURFACES:

A. General: Coat contact surfaces of forms with an approved, non-residual, low-VOC, form-coating compound before placing reinforcement.

B. Do not allow excess form-coating material to accumulate in forms or come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply according to manufacturer's instructions.

C. Coat steel forms with a non-staining, rust-preventative material. Rust-stained steel formwork is not acceptable.

3.6 CONCRETE PLACEMENT:

A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

E. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.

F. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate. A spare vibrator will be on-site for emergency use at all times.

G. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints or expansion joints, until completing placement of a panel or section.

H. Consolidate concrete during placement operations so that concrete is thoroughly worked around reinforcement, other embedded items and into corners.

I. Bring slab surfaces to correct level with a straightedge and strike off. Use bull floats or darbies to smooth surface free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

J. Maintain reinforcing in proper position on chairs during concrete placement.

K. Cold-Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

L. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F) at point of placement.

M. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

N. Do not use salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs. Calcium chloride will not be allowed.

O. Hot-Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

P. Cool ingredients before mixing to maintain concrete temperature at time of placement to be in accordance with ACI. Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

Q. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.

R. Fog spray forms, reinforcing steel, and subgrade just before placing concrete. Keep subgrade moisture uniform without puddles or dry areas.

S. Use water-reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineer.

3.7 FINISHING FORMED SURFACES:

A. Rough-Formed Finish: Provide a rough-formed finish on formed concrete surfaces not exposed to view in the finished Work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off. Finish shall be a Class C in accordance with ACI 347.

B. Smooth-Formed Finish: Provide a smooth-formed finish on formed concrete surfaces exposed to view or to be covered with a coating material applied directly

to concrete, or a covering material applied directly to concrete, such as waterproofing, dampproofing, veneer plaster, painting, or another similar system. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed. Finish shall be a Class A in accordance with ACI 347.

C. Grout-Cleaned Finish: Provide grout-cleaned finish on scheduled concrete surfaces that have received smooth-formed finish treatment.

1. Combine one part portland cement to one and one-half parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to form the consistency of thick paint. Blend standard portland cement and white portland cement in amounts determined by trial patches so that final color of dry grout will match adjacent surfaces.

2. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

E. Float Finish: Apply float finish to monolithic slab surfaces to receive trowel finish and other finishes as specified; slab surfaces to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo; and where indicated.

1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, or when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Finish surfaces to tolerances of F(F) 25 (floor flatness) and F(L) 20 (floor levelness) measured according to ASTM E 1155 (ASTM E 1155M). Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture. Class of surface shall be a class C surface in accordance with 347 R.

F. Non-slip Broom Finish: Apply a nonslip light broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Engineer before application.

G. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other

trades is in place. Mix, place, and cure concrete as specified to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete Work. All grout shall be non-shrinking.

H. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

I. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

J. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in safety inserts and accessories as shown on drawings. Screed, tamp, and non-slip broom concrete surfaces.

3.8 CONCRETE CURING AND PROTECTION:

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply according to manufacturer's instructions after screeding and bull floating, but before power floating and troweling.

B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Keep continuously moist for not less than 14 days as required due to weather.

C. Curing Methods: Cure concrete by moist curing, by moisture-retaining cover curing, or by combining these methods, as specified.

1. Provide moisture curing by the following methods:

a) Keep concrete surface continuously wet by covering with water.
b) Use continuous water-fog spray.
c) Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with a 4 inch lap over adjacent absorptive covers.

2. Provide moisture-retaining cover curing as follows:

a) Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

3. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces, by moist curing with forms in place for the full curing period or until forms are removed. As soon as initial set has occurred, place a soil soaker hose

along the tops of all walls to keep concrete forms wet during the curing period. If forms are removed, continue curing by methods specified above, as applicable, for the remainder of the curing period. If forms are removed before the end of the curing period, then the concrete shall be continuously moist for the remainder of the curing period by fog spraying or covering with moist burlap.

4. Curing Unformed Surfaces: Cure unformed surfaces, including slabs, floor topping, and other flat surfaces, by applying the appropriate curing method.

5. Final cure concrete surfaces to receive finish flooring with a moisture-retaining cover, unless otherwise directed.

3.9 SHORES AND SUPPORTS:

A. General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as specified.

B. Extend shoring from ground to roof for structures four stories or less, unless otherwise permitted.

C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.

D. Keep reshores in place a minimum of 15 days after placing upper tier, or longer, if required, until concrete has attained its required 28-day strength and heavy loads due to construction operations have been removed.

3.10 REMOVING FORMS:

A. Formwork, such as beam soffits, joists, walls, and other structural elements, may not be removed until concrete has attained at least seventy percent (70%) of design minimum compressive strength at 28 days. No earth loads or live loads will be structurally placed against or on any poured structurally reinforced concrete until the concrete has reached its 28 day compressive strength or otherwise approved by the Engineer. Determine potential compressive strength of in-place concrete by testing field-cured specimens representative of concrete location or members.

B. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.

3.11 REUSING FORMS:

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use patched forms for exposed concrete surfaces except as acceptable to Engineer.

3.12 CONCRETE SURFACE REPAIRS:

A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removing forms, when acceptable to Engineer.

B. Repairing Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Engineer. Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes and fill with dry-pack mortar or precast cement cone plugs secured in place with bonding agent.

C. Repair concealed formed surfaces, where possible, containing defects that affect the concrete's durability. If defects cannot be repaired, remove and replace the concrete.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface tolerances specified for each surface and finish. Correct low and high areas as specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having the required slope.

E. Repair finished unformed surfaces containing defects that affect the concrete's durability. Surface defects include crazing and cracks in excess of 0.01 inch wide or that penetrate to the reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycombs, rock pockets, and other objectionable conditions.

F. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.

G. Correct low areas in unformed surfaces during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete. Proprietary underlayment compounds may be used when acceptable to Engineer.

H. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

3.13 QUALITY CONTROL TESTING DURING CONSTRUCTION:

A. General: The Owner will employ a testing agency to perform tests and to submit test reports. The testing agency shall be approved by the Engineer. Any retesting due to non-acceptable work or materials shall be at the Contractors expense.

B. Sampling and testing for quality control during concrete placement may include the following, as directed by Engineer.

C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

D. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed or as directed by the Engineer.

E. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.

F. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below, when 90 deg F and above, and one test for each set of compressive-strength specimens.

G. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens except when field-cured test specimens are required.

H. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one specimen retained in reserve for later testing if required.

I. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.

J. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

K. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

L. Test results will be reported in writing to Engineer, ready-mix producer, and Owner within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix

proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

M. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

N. Additional Tests: The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. These additional tests shall be at the Contractor's expense.

END OF SECTION 03300

SECTION 03301 - PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. Work under this section consists of furnishing and installing precast concrete structures as detailed on the plans and specified herein. It shall include all labor, materials, site grading, structures, excavation, sheeting, backfill, reinforced concrete, yard piping, miscellaneous piping, equipment, incidental painting, and all other items or material as specifically defined herein, and work required to construct structures and furnish and install equipment for a complete installation as hereinafter specified.

PART 2 - QUALITY ASSURANCE

2.1 STANDARDS:

A. American Association of State Highway Transportation Officials

1. AASHTO T99

B. American National Standards Institute

1. ANSI A21.10 gray iron and ductile cast iron pipe
2. ANSI A21.50 and A21.51 ductile cast iron pipe

C. American Society for Testing and Materials

1. ASTM D-399 Ductile Iron Fittings
2. ASTM D-1869 Pipe Testing
3. ASTM D-2321 Pipe Installation
4. ASTM D-2412 Pipe Testing
5. ASTM D-2444 Pipe Testing
6. ASTM C-478 Precast Structures

D. Submittals

1. Submit manufacturers literature and certification on the following (electronic copies):

a) Structures

PART 3 - PUMP STATION CONSTRUCTION

3.1 GENERAL:

A. The Contractor shall furnish and install the following structures and equipment where shown on the plans, complete with all incidentals and appurtenances required for a complete, finished installation. All equipment components and structures shall be adequately sized to carry all loads and stresses occurring during fabrication and erection and resulting from normal and emergency operation in the installation shown on the plans and under the conditions specified and/or implied.

3.2 PRECAST CONCRETE STRUCTURES:

A. Meter vaults, air releave valve manholes, and access manway manhole structure material shall consist of precast concrete in accordance with the following requirements. All material shall be approved by the Engineer prior to use.

B. Precast concrete structures shall consist of precast reinforced concrete sections with top and base sections conforming in general to the details shown on the plans. Precast concrete sections shall be manufactured in accordance with ASTM specifications C-478, C-913, C-890, and C-891. The minimum compressive strength of the concrete for all sections shall be 5,000 psi. The maximum allowable absorption of the concrete shall not exceed eight percent of the dry weight. Reinforcing steel fabric shall be ASTM A-615 grade 60 deformed bar, ASTM A-82 wire, or ASTM A-185 welded wire fabric.

C. Joints between precast sections shall be sealed with one-inch diameter butyl rubber sealant conforming to Federal Specifications Number SS-5-00210-A and AASHTO-198. The material shall be compounded of 100 percent solids. Asphaltic or petrochemical based materials shall not be used. Joints shall be purged inside and outside with a cement grout material.

D. The tops of the structures shall be designed for a live load of 150 psf and appropriate dead loads for the intended use.

E. Wall pipes, access hatches, and sluice gate frames shall be cast in the structure at the appropriate elevation as indicated on the plans.

F. Structures shall be manufactured by Tindall Concrete Products, Inc., Sta-Right Tank Co., D&M Products Co., Carolina Precast Concrete, Inc., or equal.

PART 4 - EXECUTION

4.1 The Contractor shall install all structures, etc. specified herein in accordance with the plans and as recommended by the manufacturer. Precast base sections shall be installed on firm stabilized foundations so prepared to prevent settlement and misalignment. Pipe openings shall be exactly aligned to that of the pipe entering and leaving the structure. Pipes shall be installed to the wall pipes provided in the sections and properly aligned and set to grade.

Any leakage in the structures shall be promptly repaired, and structures shall be watertight.

4.2 PAINTING:

All metal components shall receive a minimum of a two-coat epoxy-polymide paint system with a minimum of 9 mil dry thickness.

END OF SECTION 03301

SECTION 05500 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY:

A. Work under this section includes metal stairs and all items of miscellaneous structural steel and other miscellaneous metal items shown on the drawings, specified herein or otherwise inferred or required for construction.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Handrails and Railings Section 05720

1.3 SUBMITTALS:

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for nonslip aggregates and nonslip aggregate surface finishes, prefabricated building columns, cast nosings, treads and thresholds, steel floor plate, paint products, and grout.

C. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.

D. Samples representative of materials and finished products as may be requested by Engineer.

E. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project name, addresses, names of Engineers and owners, and other information specified.

1.4 QUALITY ASSURANCE:

A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service

performance, and with sufficient production capacity to produce required units without delaying the Work.

B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

C. Codes and Standards: Comply with provisions of the latest revision of the following codes, specifications, and standards, except where more stringent requirements are shown or specified.

1. North Carolina Building Code.
2. AISC “Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings”.
3. AISC “Code of Standard Practice for Steel Buildings and Bridges” and commentary.

1.5 PROJECT CONDITIONS:

A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METALS:

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

B. Steel Channel Sections, Angles, Plates, and Bars: ASTM A 36 (ASTM A 36M).

C. Steel Wide Flange Sections: ASTM A992 or ASTM A572 Grade 50.

D. Steel Tubing: Cold-Formed Steel Tubing: ASTM A 500. Grade B 46 ksi.

E. Steel Pipe: ASTM A 53, standard weight (schedule 40), unless otherwise indicated, or another weight required by structural loads.

1. Black finish, unless otherwise indicated.

2. Galvanized finish where indicated.

F. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Stainless steel anchors shall conform to ASTM A276 or ASTM A493 with a chemical composition of either AISI 304 or AISI 306 stainless steel. Nuts shall conform to ASTM F594 with a chemical composition meeting that of the anchors. Washers shall be AISI 304 or AISI 316 stainless steel conforming to ASTM A240.
2. Carbon steel anchors shall conform to ASTM A307. Nuts shall conform to ASTM 563. Washer shall conform to ASTM F436. All anchorage material shall be galvanized in accordance with A153.

G. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 ALUMINUM:

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy 6061-T6. Reference Section 05720 for rail and post requirements.

B. Aluminum-Alloy Rolled Tread Plate: ASTM B 632 (ASTM B 632M) Pattern 1, alloy 6061-T6. Reference construction drawings for additional plate and sheet requirements.

C. Castings: Reference construction drawings.

2.3 PAINT:

A. Shop Primer for Ferrous Metal.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in galvanized steel, with dry film containing not less than 98 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers.

2.4 FASTENERS:

A. High Strength Bolts: Threaded fasteners assemblies for structural steel in conformance with ASTM A325 or ASTM A490 as indicated on drawings.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568, Property Class 4.6), with hex nuts, ASTM A 563 (ASTM A 563M), and, where indicated, flat washers. Reference construction drawings for stainless steel bolt requirements.

C. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M).

D. Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.

E. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Material: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Stainless steel shall conform to ASTM A276 or ASTM A493 with a chemical composition of either AISI 304 or AISI 316. Nuts shall conform to ASTM F594 with a chemical composition meeting that of the anchors. Washers shall be AISI 304 or AISI 316 stainless steel conforming to ASTM A240.
3. Threaded or wedge type; galvanized ferrous castings, either ASTM A 47 (ASTM A 47M) malleable iron or ASTM A 27 (ASTM A 27M) cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A 153.

2.5 GALVANIZING:

A. ASTM A153 for galvanizing iron and steel hardware.

B. ASTM A123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8” thick and heavier.

C. ASTM A386 for galvanizing assembled steel products.

2.6 FABRICATION, GENERAL:

A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 100 deg F (55.5 deg C).

D. Shear and punch metals cleanly and accurately. Remove burrs.

E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Remove sharp or rough areas on exposed traffic surfaces.

G. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.

H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.7 FINISHES, GENERAL:

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designing finishes.

B. Finish metal fabrications after assembly.

2.8 STEEL AND IRON FINISHES:

A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:

1. ASTM A 153 for galvanizing iron and steel hardware.
2. ASTM A 123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors and Interiors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."

C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting.

2.9 ALUMINUM FINISHES:

A. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

PART 3 - EXECUTION

3.1 PREPARATION:

A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL:

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete, through-bolts, and other connectors as required. Provide setting drawings, templates, instructions and directions for installation or anchorage devices. Coordinate delivery with other work to avoid delay.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop-welded because of shipping size limitations. Do not weld, cut, or abrade the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended

for bolted field connections. Use only materials which are smooth and free of surface blemishes, including pitting, seam marks, roller marks, rolled trade names, and roughness.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
5. Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
6. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32” unless otherwise shown. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
7. Weld corners and seams continuously, complying with AWS recommendations. Grind exposed welds smooth and flush, to match and blend with adjoining surfaces.
8. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type shown, or, if not shown, use Phillips flat-head (countersunk) screws or bolts.
9. Cut, reinforce, drill and tap miscellaneous metal work as required to receive finish hardware and similar items.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 ADJUSTING AND CLEANING:

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metals.

B. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A 780.

END OF SECTION 05500

SECTION 05720 - HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 WORK INCLUDED:

A. Furnish and install railing and components.

1.2 RELATED WORK IN OTHER SECTIONS:

A. Metal Fabrications Section 05500

1.3 REFERENCES:

A. Aluminum Association (AA).

B. ABH-21 aluminum brazing handbook.

C. ASD-1 aluminum standards and data.

D. DAF-45 designation system for aluminum finishes.

E. SAA-46 standards for anodized architectural aluminum.

1.4 American Architectural Manufacturers Association (AAMA)

A. AAMA 605.1 specification for high performance organic coatings on architectural extrusions and panels.

B. AAMA 606.1 voluntary guide specifications and inspection methods of integral color anodic finished for architectural aluminum.

C. AAMA 607.1 voluntary guide specifications and inspection methods for clear anodic finishes for architectural aluminum.

D. AAMA 608.1 voluntary guide specification and inspection methods for electrolytically deposited color anodic finishes for architectural aluminum.

1.5 American National Standards Institute (ANSI)

A. A21.1 safety requirements for floor and wall openings, railings and toe boards.

1.6 American Society for Testing and Materials (ASTM)

A. A276 specification for stainless and heat-resisting steel bars and shapes.

B. B210 specification for aluminum alloy drawn seamless pipe.

C. B221 specification for aluminum alloy bars, rods, wires, shapes and tubes.

D. E894 standard test methods for anchorage of permanent metal railing systems and rails for buildings.

E. E935 standard test methods for performance of permanent metal railing systems and rails for buildings.

F. E985 specification for permanent metal railing systems and rails for buildings.

1.7 General Service Administration (GSA), Federal Specifications (FS) DD-G-1403 glass, plate (float), sheet, figured, and spandrel (heat strengthened and fully tempered).

A. Aluminum alloy, bar, rod, shapes, tube and wire, extruded and structural shapes, general specification for

1.8 National Association of Architectural Metal Manufacturers (NAAMM)

A. Metal Finishes Manual

B. Pipe Railing Manual

1.9 SUBMITTALS:

A. Submit shop drawings and product data.

B. Indicate component details, materials, finishes, connection, and joining methods, and the relationship to adjoining work.

1.10 DELIVERY, STORAGE AND HANDLING:

A. Deliver materials to the job site in good conditions and properly protected against damage to finished surfaces.

B. Storage on Site:

1. Store material in locations and in a manner to avoid damage. Stacking shall be done in a way which will prevent bending.

2. Store material in a clean, dry location away from uncured concrete and masonry. Cover with waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.

3. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of material.

PART 2 - PRODUCTS

2.1 MATERIALS AND FINISHES:

A. Aluminum:

1. Extruded Handrail Pipe: As indicated on drawings.

2. Drawn Handrail Pipe: As indicated on drawings.

3. Reinforcing Bars: Alloy 6061-T6 meeting ASTM B221.

4. Extruded Bars, Shapes and Moldings: Alloy 6063-T52 meeting ASTM B221.

5. Castings: Almag 35 meeting ASTM B26.

6. Extruded Toe Board: Alloy 6063-T52 meeting ASTM B221. Shall conform to the safety requirements of ANSI A21.1.

7. Finish (refer to NAAMM Metal Finishes Manual).

2.2 RAILING SYSTEM

A. Material shall be as herein specified.

1. Rails and Posts: Fabricate rails and posts from extruded or drawn, seamless pipe or tube sections of specified aluminum alloy to support, the aforementioned specified loading. Section size shall conform to the construction drawings.

2. Mounting Flanges: Facial flanges shall be of aluminum or stainless steel.

B. Fabrication:

1. Form rail-to-end post connection and changes on rail direction by mitered joints.

2. Cut material square and remove burrs from all exposed edges, with no chamfer.

3. Make exposed joints butt tight, flush, and hairline.

4. Close exposed ends of handrail by use of appropriate end cap.

5. Verify dimensions on site prior to shop fabrication.

PART 3 – EXECUTION

3.1 DISSIMILAR METALS:

A. When bronze and aluminum components come into contact with dissimilar metals, surfaces shall be kept from direct contact by painting the dissimilar metal with a heavy coat of a proper primer (asphalt paint).

3.2 INSTALLATION:

A. Install in accordance with shop drawings and manufacturer's instructions.

B. Erect work horizontal or parallel to rake of steps or ramps, free from distortion or defects detrimental to appearance or performance.

C. Expansion joints shall be provided as needed to allow for thermal expansion or contraction.

3.3 CLEANING:

A. As installation is completed, wash thoroughly using clean water and soap, rinse with clean water.

B. Do not use acid solution, steel wool or other harsh abrasives.

C. If stain remains after washing, remove finish an restore in accordance with NAAMM Metal Finishes Manual. Finish must not be removed from anodized aluminum. Reanodizing can only be done by removing railing and returning it to the anodizer.

3.4 REPAIR OF DEFECTIVE WORK:

A. Remove stained or otherwise defective work and replace with material that meets specification requirements.

END OF SECTION 05720

SECTION 11400 - METERING EQUIPMENT

PART 1 - GENERAL

1.1 Description of Work:

A. Work under this section consists of furnishing all plant, labor, materials and equipment for the complete installation of all flow metering equipment in accordance with these specifications and as indicated on the contract documents.

1.2 General Requirements:

A. One copy of all instruction sheets giving the proper field handling and installation requirements of the manufacturer shall accompany each instrument.

1.3 Related Work in Other Sections:

A. Basic Electrical Work: Supplemental Specifications

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division I Specification Sections, apply to this Section.

1.4 Submittals

A. Manufacturer Literature and Data shall be submitted to the Engineer for all flow measuring equipment (6 copies required).

B. Certified test reports for all flow measuring equipment shall be submitted to the Engineer (6 copies required). Cost for any test shall be borne by the Contractor.

PART 2 - PRODUCTS

2.1 V-CONE METER

A. Metering primary element shall be of the pressure differential production type and sense true static pressure at the inlet and the cone.

B. Inlet section that incorporates the high-pressure tap shall be a cylindrical section of the same diameter as the pipe. The low-pressure tap shall be installed through a cone that is suspended in a cylindrical section the same diameter as the inlet section.

C. Meter body shall be of cast iron per ASTM A 126, Grade B, 304 stainless steel or carbon steel that is coated with an epoxy that is approved for potable water service by NSF.

D. Cone section shall be 304 stainless steel per ASTM A 240.

E. The meters shall have plain ends for sleeve-type coupling, grooved-ends for mechanical type couplings, or flanged ends per ANSI/AWWA C115/A21.15, or AWWA C207, Class D, as indicated on contract documents.

F. Flow meters shall be self-draining and shall be capable of being cleaned in place.

G. Flow meters shall meet the following minimum performance requirements:

Accuracy: +/-0.5% of full scale over range 10:1

F. The flow element shall be the V-Cone, as manufactured by McCrometer, or approved equal.

2.2 DIFFERENTIAL PRESSURE INDICATING TRANSMITTERS

A. Differential pressure transmitters shall be of the capacitance type with a process-isolated diaphragm with silicone oil fill, microprocessor-based "smart" electronics, and a field adjustable rangeability of 100:1 input range. Span and zero shall be continuously adjustable externally over the entire range. Span and zero adjustments shall be capable of being disabled internally. Transmitters shall be NEMA 4X weatherproof and corrosion resistant construction with low-copper aluminum body and 316 stainless steel process wetted parts. Differential pressure units shall be furnished with close coupled stainless steel three valve manifold assembly. Manifold assembly shall be HEX Products Model HM, or equal. Accuracy, including nonlinearity, hysteresis and repeatability errors shall be plus or minus 0.065 percent of calibrated span, zero based. The maximum zero elevation and maximum zero suppression shall be adjustable to anywhere within sensor limits. Output shall be linear isolated 4-20 milliamperes 24 VDC. Power supply shall be 24 VDC, two-wire design. Each transmitter shall be furnished with a 4-digit LCD indicator capable of displaying engineering units and/or milliamps and mounting hardware as required. Overload capacity shall be rated at a minimum of 25 MPa. Environmental limits shall be -40 to 85 degrees Celsius at 0-100% relative humidity. Each transmitter shall have a stainless steel tag with calibration data attached to body.

B. The electronics sections of differential pressure transmitters shall contain user-selectable square root extractors to provide a linear 4-20 mA DC output proportional to flow, when activated. Square root extractor circuitry shall be activated only for incompressible fluid flow applications (i.e., water). Flow rates for compressible fluids (i.e., air) shall be calculated externally using line temperature and static pressure corrections as specified elsewhere in Division 17. In addition, each flow transmitter shall be furnished with laminated flow versus differential pressure curves wall mounted adjacent to the transmitter.

C. The piezoresistive silicon pressure sensor shall be mechanically, electrically, and thermally isolated from the process and the environment, shall include an integral temperature compensation sensor, and shall provide a digital signal to the transmitter's electronics for further processing. Factory set correction coefficients shall be stored in the sensor's non-volatile memory for correction and linearization of the sensor output in the electronics section. The electronics section shall correct the digital signal from the sensor and convert it into a 4-20 mA analog signal for transmission to receiving devices. The electronics section shall contain configuration parameters and diagnostic data in non-volatile EEPROM memory and shall be capable of communicating, via a digital

signal superimposed on the 4-20Ma output signal, with a remote interface device. Output signal damping shall be provided, with an adjustable time constant of 0-36 seconds. Total long term stability (frequency of calibration) shall be not less than 0.125% for five years.

D. Differential pressure indicating transmitters shall be Model 3051C as manufactured by Rosemount, or equal.

2.3 FLOW COMPUTER

A. Flow computer shall be capable of accepting and calculating flow from multiple differential pressure transmitters over flow ranges specified on contract documents.

B. Power supply shall be 120VAC 60Hz with power consumption not in excess of 10 Watts.

C. Accuracy: 0.02% of full scale.

D. Flow computer shall be provided in a NEMA-4X enclosure with access to operator keypad and LCD display.

E. Multi-function flow computer shall be Supertrol II as manufactured by KEP or approved equal.

PART 3 - INSTALLATION

3.1 All meters and recorders shall be installed as specified by the manufacturer. All instrument loops to be surge protected on both power source and signal wiring.

3.2 The Contractor shall install the metering equipment specified herein in accordance with the plans and as recommended by the manufacturer.

3.3 The manufacturer's field engineer or representative shall inspect, check the installation and calibrate units after erection prior to start-up and shall certify that the completed installation is ready for start-up.

END OF SECTION 11400

SECTION 13000 – INSTRUMENTATION AND CONTROLS, CONTROL ENCLOSURES

PART 1 - GENERAL

1.1 REQUIREMENT SUMMARY

A. Contractor shall provide the services of a Control Systems Integrator (CSI) as qualified by the Owner to shall furnish, modify, test, install and place into satisfactory operation all control enclosures (i.e. field panels, control panels, cabinets, consoles, boxes, etc.) required to provide a complete and operable Instrumentation and Control System (ICS) as specified herein and as shown on the Contract Documents, even if each needed item is not specifically specified or shown.

B. CSI shall also be responsible to provide modifications to existing control panels as described herein or as indicated on the Contract Documents.

C. New control enclosures and/or subpanels shall be assembled, wired and tested in the CSI facility, unless specified otherwise.

D. All components and all necessary accessories (e.g. mounting hardware, conditioning equipment, SPDs, fuses, circuit breakers, terminals, ground bars, relays, contactors, starters, indicators, control operators, power supplies, signal conditioning, connectors, digital hardware, etc.) that may be required to complete the system shall be provided.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. In addition to the requirements specified in this Section and those Contract Documents referenced herein shall be applied.

B. Related Specification Sections include but not limited to:

1. Division 0 – PROCUREMENT AND CONTRACTING REQUIREMENTS
2. Division 1 – GENERAL CONDITIONS
3. Division 2 – SITE CONTRUCTION
4. Division 16 – ELECTRICAL

1.3 ENVIRONMENTAL CONDITIONS

A. Outdoor locations may contain wet and corrosive areas:

1. Corrosive areas are identified on the Contract Documents. Areas not identified as such shall be considered wet.

1.4 DEFINITIONS

A. Outdoor Areas:

1. Locations on the Project site where the equipment is normally exposed to wind, dust, rain, snow, etc. Outdoor areas include areas protected by a roof or rain/sun shields but not enclosed within a structure.

1.5 REFERENCES

A. Codes and Standards:

1. Factory Mutual System (FM):

a. A Guide to Equipment, Materials and Services.

2. Institute of Electrical and Electronics Engineers (IEEE)

3. National Electrical Contractors Association (NECA):

a. NECA 1, Good Workmanship in Electrical Construction

4. National Electrical Manufacturers Association (NEMA):

a. ICS 6, Enclosures for Industrial Control and Systems

5. National Fire Protection Association (NFPA):

a. 79, Electrical Standard for Industrial Machinery

6. Underwriters Laboratories, Inc (UL):

a. 508, Industrial Control Equipment

b. 508A, Industrial Control

1.6 SUBMITTALS

A. Contractor shall reference and provide all documentation for all Division 16 Sections as required per Specification Sections:

1. 01330 – SUBMITTAL PROCEDURES

B. Shop Drawings:

1. Shop drawings shall be arranged and labeled according to Specification Section and Contract Documents.

2. Submit shop drawings prior to purchase or fabrication of equipment. Reference Division 16 Sections for additional specific requirements.

3. Prior to submittals of shop drawings, coordinate electrical equipment, particularly motor control equipment, control panels, and instrumentation, with all applicable equipment and systems interfacing with that equipment.

4. Control cabinet sizing calculations to include but limited to heat dissipation and cooling/heating system sizing calculations shall be submitted for all cabinets containing PLC, UPS, VFD, SCR and, at the request of the Engineer, for all cabinets containing sensitive electronic equipment or chemicals.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall unload and handle materials using methods, rigging, and equipment that will prevent damage to the materials. Care shall be used to prevent damage to painted and galvanized surfaces.

1. Bare wire rope slings shall not be used for unloading and handling materials and equipment, except with the specific written permission of the Engineer.

B. Equipment and materials, in accordance with the manufacturer's recommendations, shall be stored, supported and protected to prevent damage.

1. Stored materials and equipment shall not be allowed to contact the ground.

2. Equipment and materials which incorporate electrical equipment or which have finished painted surfaces, and other items which would be damaged by outdoor exposure, shall be stored indoors.

a. Provide covering and shielding for all equipment to protect from damage.

b. When such storage would present an unreasonable building space or volume requirement, the equipment or materials may, when acceptable to the Engineer, be stored under weatherproof coverings on shoring or platforms.

3. All small loose items that could be easily lost, stolen, broken, or misused shall not be stored on open platforms or shoring.

4. All storage methods and schedules shall be acceptable to the Engineer.

C. Ensure that equipment is not used as steps, ladders, scaffolds, platforms, or for storage either inside or on top of enclosures.

D. Protect nameplates on electrical equipment to prevent defacing.

E. Repair, restore or replace damaged, corroded and rejected items at no additional cost to the Owner.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS:

A. Either manufacturer-standard or custom enclosures may be furnished, subject to the requirements of the Contract Documents and favorable review by the Engineer.

B. Enclosures shall fit within the allocated space as shown on the Contract Documents. Contractor shall examine plans and/or field inspect new and existing structures as required to determine installation requirements and shall coordinate the installation of all enclosures with the CSI, Owner and affected Contractors. Contractor shall be responsible for all costs associated with installation of enclosures, including repair of damage to structures (incidental, accidental or unavoidable).

C. Enclosures are shown on the Contract Documents with minimal sizes; CSI shall furnish enclosures of the proper size and quantity as required to mount equipment supplied and all other electrical components installed within in the enclosure.

1. In addition to the Control cabinet sizing calculations, CSI shall provide useful space for future expandability to a minimum of one (1) item per item type installed or twenty percent (20%) of quantity of each type item installed, whichever yields the greater spare space.

D. Enclosures (cabinets, panels, boxes, etc.) shall be formed or welded construction, reinforced with metallic strut-channel to facilitate mounting of internal components or equipment. Sufficient access plates and doors shall be provided to facilitate maintenance and testing of the supplier's equipment. Doors shall be removable. Enclosures with any dimension thirty-six (36) inches or greater shall be provided with removable lifting lugs designed to facilitate safe moving and lifting of the panel during installation. No screws or bolts shall protrude through from the interior enclosure.

E. All steel enclosures shall be free from dirt, grease and burrs, and shall be treated with a phosphatizing metal conditioner (phosphate conversion coating) before painting. All surfaces shall be filled, sanded, and finish coated by spraying a 2-mil epoxy prime coat and smooth, level, high grade textured finish between flat and semi-gloss shine. Colors shall be selected by the Owner from a minimum of six (6) color samples provided. All stainless-steel enclosures shall be polished to a No. 4 finish.

F. Enclosures shall be prefabricated cabinets and panels by Hoffman, Rittal, Vynckier or Engineer approved. CSI may optionally provide enclosures custom fabricated by a reputable panel fabrication shop acceptable to the Engineer.

G. Each panel shall incorporate a removable back panel on which control components shall be mounted. Back panels shall be secured to the enclosures with collar studs. Components shall be of the highest industrial quality and securely mounted to the removable back panels with screw and lock washers. Back panels shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any component.

H. Enclosures with any dimension twenty-four (24) inches or larger shall be provided with drawing pockets for as-built panel drawings. One (1) laminated copy of the appropriate panel as-built drawings shall be furnished and left in the pocket of each panel.

I. All metallic enclosures with door mounted equipment shall have the door grounded by means of flexible ground strap.

J. Enclosure and all interior and exterior equipment shall be identified with nameplates. Equipment shall be mounted such that service can occur without removal of other equipment. Panel mounted equipment shall be flush or semi-flush mounted with flat black escutcheons. All equipment shall be accessible such that adjustments can be made while the equipment is in service and operating. All enclosures shall fit within the allocated space as shown on the Contract Documents.

K. Enclosures shall provide mounting for UPS, power supplies, control equipment, input / output sub-systems, panel mounted equipment and appurtenances. Ample space shall be provided between equipment to facilitate servicing and cooling. Enclosures shall be sized to adequately dissipate heat generated by equipment mounted inside the panel. Louvered openings fitted with dust filters near the bottom and top of the cabinet shall be provided for NEMA-12 enclosures. If required, cabinets shall be provided with filtered fans, heat exchangers or air conditioners. Only closed loop cooling systems shall be provided for NEMA-4X/SS cabinets. Cooling systems shall be by the cabinet fabricator, McLean Midwest, Noren Products, or Engineer approved.

L. Enclosures shall be provided with a main circuit breaker and a circuit breaker on each individual branch circuit distributed from the panel. Main breaker and branch breaker sizes shall be coordinated such that an overload in a branch circuit will trip only the branch breaker but not the main breaker. Circuit breakers shall be provided for the following internal branch circuits distributed within the panel:

1. Receptacles and power strips

2. Lighting

3. UPS

4. Cooling/Heating equipment

M. Enclosures shall be provided with a minimum of one (1) 120VAC/20A GFCI duplex receptacle for service equipment and fluorescent service lights. Control panel loads not requiring SPD/TVSS (e.g. receptacles, lighting, HVAC, branch circuits to remote equipment, etc.) shall be connected ahead of the enclosure SPD/TVSS device.

N. Locate equipment, devices, hardware, power supplies, instrumentation and controls, electrical equipment and wiring to be installed inside the enclosures and/or as facial features on the enclosures, so that connections can be easily made and so that there is ample room for servicing each item. Every component

in and on the enclosures shall be able to be removed individually without affecting the other components and without the need to move other components. Support and restrain all internally, as well as panel mounted components to prevent any movement.

O. Cabinets and/or Enclosures shall be NEMA-4X/SS rated unless otherwise noted in the Contract Documents.

P. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.

Q. Control panels shall be built in accordance with UL508A Industrial Control Panels and NEC Article 409 Industrial Control Panels. Control panels for areas classified as Hazardous shall be built in accordance with UL698 Industrial Control Equipment for Use in Hazardous Locations. Control panels shall be UL508A and/or UL698 labeled and marked as defined in NEC 409.110 with the following:

1. Manufacturer's name and contact information (i.e. address, phone, website, email, etc.).

2. Supply voltage, phase, frequency and full-load current.

    a. Short-circuit current rating of the industrial panel based on one of the following:

    b. Short-circuit current rating of a listed and labeled assembly

3. Short-circuit current rating established utilizing an approved method

4. Electrical wiring diagram numbers or the index sheet to the electrical wiring diagrams.

5. Enclosure type number (i.e. NEMA 1A, 3R, 12, 4X, 7, 9, etc.)

6. If the industrial control panel is intended as service equipment, it shall be marked to identify it as being suitable for use as service equipment.

2.2 TOOLS, SUPPLIES, AND SPARE PARTS

A. Tools, supplies and spare parts shall be provided as per CSI recommendations and as specified for each equipment item. In addition, the following items shall be provided:

1. One (1) of each type of panel mounted equipment (e.g., indicators, signal converters, etc.) provided under this Contract. This does not include large LCD display electronic operator interface devices.

2. Three (3) of each type of interposing relay provided under this Contract.

3. Two (2) of each type of power SPD/TVSS device used

4. Ten (10) of each type of signal SPD/TVSS device used

5. Two (2) of each type of communication SPD/TVSS device used.

2.3 OUTDOOR ENCLOSURES

A. Outdoor enclosures shall be rated NEMA 4X/SS, constructed of 316 stainless steel with a white powder epoxy coating finish unless specified otherwise. Outdoor enclosures shall have a hinged and gasketed door. Door latches shall be all stainless-steel, fast operating clamp assemblies (quick release), which do not require bolts or screws to secure. Gaskets shall be polyurethane.

B. Outdoor panels shall be fitted with pad-lockable latch kits.

C. Outdoor enclosures with internal digital electronics, exterior indicators or exterior indicator lights shall have external sun shields or sun shades, constructed of the same materials as the associated enclosure, unless otherwise specified.

D. Outdoor enclosures shall be designed for ambient conditions of -15 to 50°C and twenty to ninety-five percent (20% - 95%) relative humidity, unless otherwise specified. Outdoor enclosures shall be provided with thermostatically controlled space heaters to provide condensation protection.

2.4 TERMINALS

A. Wiring which enters or leaves the enclosure shall be terminated to large lug type terminal strips, designed to accommodate minimum 16AWG wiring, and permanently numbered consistent with the component schematic. These wiring termination strips shall be located with ample room to allow field wiring to be terminated in a neat and workmanlike manner.

B. Terminal blocks shall be assembled on non-current carrying aluminum DIN mounting rails, securely bolted to the cabinet sub-panel. Terminals shall be of the screw-cage type as manufactured by Phoenix Contact, Wieland, Square D, or equal. Power terminal blocks shall be single tier with a minimum rating of 600VAC/30A. Signal terminal blocks shall be single tier with a minimum rating of 600VAC/20A.

C. Fused terminal blocks or miniature thermal circuit breaker terminal blocks shall be supplied for protection and isolation of enclosed equipment, or as specified in the Contract documents. Blown fuse indicators shall be provided and/or tripped breaker status shall be clearly visible. Fused or miniature thermal circuit breaker terminal blocks shall be provided for, but not limited to each of the following:

1. Each piece of equipment provided with a power supply (integral, internal or external) with the exception of devices with internal fusing plugged into a receptacle.

2. Each PLC module requiring external power

D. Terminals shall be marked with a black waterproof, permanent, continuous marking strip. One side of each terminal shall be reserved exclusively for field

incoming conductors. Common connections and jumpers required for internal wiring shall not be made on the field side of the terminal.

2.5 WIRING

A. All wiring shall be bundled and run open or enclosed in vented plastic wireway, as required. All conductors run open shall be bundled and bound with nylon cable ties, at regular intervals, with intervals not to exceed twelve (12) inches. Adequately support and restrain all wiring runs to prevent sagging or other movement. Care shall be taken to separate communication, network, electronic signal, AC discrete signal, DC discrete signal and power wiring. Wiring to equipment mounted on doors or where movement of the equipment will take place shall be installed in nylon spiral wrapping sheaths.

B. Wires shall be color coded as follows:

1. Equipment Ground - GREEN

2. 120 VAC Power Distribution - BLACK

3. 120 VAC Power Neutral - WHITE

4. 120 VAC Control (Internally Powered) - RED

5. 120 VAC Control (Externally Powered) - YELLOW

6. 24 VAC Control - ORANGE

7. DC Power (+) - RED

8. DC Power (-) - BLACK

9. DC Control - BLUE

10. Analog Signal (+) - BLACK

11. Analog Signal (-) - WHITE

C. All wiring shall comply with accepted standard instrumentation and electrical practices. Field wiring for power, control and signal wires shall comply with Division 16 of the specifications. For each pair of parallel terminal blocks, the field wiring shall be between the blocks.

D. Internal panel wiring shall be as follows:

1. AC Power: 1AWG minimum, stranded copper conductors, THHN/THHW wire rated for 600V and 90 °C. For wiring carrying more than 15A, use sizes required by NEC.

2. AC Control and DC Power and Control: 16AWG minimum, stranded copper conductors, THHN/THHW wire rated for 600V and 90 °C.

3. Instrument Signals: 18AWG stranded conductors, tinned copper, twisted pair or triad, overall one hundred percent (100%) aluminum foil shield with 20AWG stranded drain wire, plenum rated 300V and 60°C FEP insulated wire with FEP jacket, equal to Belden 88760.

4. All stranded wire shall have a minimum of sixteen (16) strands, except for drain wires.

2.6 INDENTIFICATION

A. Provide a laminated black nameplate with beveled edges and 1/2-inch white letters to identify each console, panel or cabinet on the front of the enclosure.

B. Provide laminated, beveled edge, plastic legend plates and nameplates, with 1/4-inch letters, for each front panel mounted device as shown on the Contract Documents. Legend plates and nameplates shall be the size as shown on the Contract Documents. Color shall be black lettering on white background except caution/warning nameplates which shall be white lettering on a red background. Attach front panel nameplates with both a permanent adhesive and stainless-steel machine screws into tapped holes.

C. Tag all interior instruments and other components with engraved, laminated plastic nameplates with 1/8-inch, minimum, lettering. Legends shall be consistent with wiring and layout drawings. Nameplates shall be attached with permanent adhesive to the panel, near the device or on the device itself or as otherwise approved by the Engineer.

D. Number and label each wire in the systems. Every unique wiring node shall have its own individual unique number. Numbers shall be shown on all submitted drawings. All wires shall be labeled at each termination and junction of the wire and at 30-inch intervals along the wire. All multi-conductor cables shall be labeled at each end and at 30-inch intervals with CBL-XXX and also label each conductor at both ends. Labeling shall be self- laminating white/transparent self-extinguishing vinyl strips (Brady DAT 7 292 or equal) with clear heat shrink tubing over the markers. Length shall be sufficient to provide at least two and one-half (2 1/2) wraps. All labels shall be machine-printed with wire and/or cable numbers.

2.7 ACCESSORIES

A. Control operators such as push-buttons (PB), selector switches (SS), and pilot lights (PL) shall be Allen Bradley 800H, Square-D Company Type SK or equal. Control operators shall be 30.5mm, round, heavy-duty, oil tight NEMA 4X corrosion resistant.

B. Push-buttons and selector switches shall be non-illuminated, spring release type. Push-buttons shall include a full guard. Panic stop/alarm pushbuttons shall be RED mushroom type with manual-pull release. Pilot lights shall be of the proper control voltage, LED type.

C. Control operators shall have legend plates as specified herein, indicated on the Contract Documents, or otherwise directed by the Engineer. Legend plates shall

be plastic, white field (background) with black lettering. Engraved nameplates shall be securely fastened above each control operator. If adequate space is not available, the nameplate shall be mounted below the operator.

D. Control operators for all equipment shall be as specified herein and of the same type and manufacturer unless otherwise specified or indicated on the Contract Documents. Modifications to existing panels using control operators and indicators of the same type and manufacturer shall be allowed with Engineer's approval.

E. Where required to interface between motor control centers, equipment controls, and control panels, interposing relays and associated control wiring circuitry shall be furnished and installed to provide the monitoring and/or control functions specified herein. Interposing relays shall be miniature type with DPDT contacts rated a minimum 120VAC/20A, push-to-test button, and status indicator. Relay coils shall be 120/240VAC or 24VDC as required. Relays shall be as manufactured by Idec, Square D, Omron, Allen-Bradley or approved equal.

2.8 POWER SUPPLIES

A. Power supplies shall be enclosed and sized per the guidelines of UL508 and UL508A. Power supplies shall be Phoenix Contact, Model Quint-PS-X, or approved equal.

B. External PLC power supplies provided for loop and/or PLC power shall be redundant and alarm to the PLC upon failure.

2.9 SIGNAL CONVERTERS

A. Signal converters shall be provided as required to provide control functions and to interface instrumentation and controls, equipment panels, motor control centers and other instrumentation and controls supplied under other Divisions to the controls provided herein.

B. General Requirements – Signal isolators/boosters/converters shall be 24VDC powered, solid state electronic type with RFI protection.

C. Signal isolators/boosters/converters shall accept a current, voltage, frequency, temperature, or resistance and provide current or voltage dual outputs as shown on the drawings and specified herein.

D. Signal isolators/boosters/converters shall have complete isolation between input circuitry, output circuitry, and power supply, and with provisions for DIN rail mount inside the control panel enclosure.

E. Current to Current Isolators – Current to current isolators shall be furnished where necessary to provide an isolated current loop, calculations or signal amplification between the plant process control system and instrumentation and control loops. Isolators shall provide dual outputs and be sized such that resistance of existing loops shall not exceed maximum rated resistance.

F. Signal isolators/boosters/converters shall be Phoenix Contact, Acromag, or approved equal.

2.10 SURGE PROTECTIVE DEVICE (SPD) AND TRANSIENT VOLTAGE SURGE SUPPRESSION (TVSS)

A. Transient voltage surge suppressors shall be provided at the following minimum locations:

1. Any connections between AC power and electrical and electronic equipment, including panels, assemblies and field mounted instruments.

2. Both ends of all analog signal circuits that have any portion of the circuit extending outside of a protecting building.

3. At the control panel end of all discrete signal circuits that have any portion of the circuit extending outside of a protecting building.

4. Both ends of all copper-based communications cables that extend outside of a building.

5. All specified spare analog inputs and outputs in PLC and RTU cabinets.

B. SPD/TVSS devices shall be external to and installed in addition to any protective devices built into the equipment. Power and signal protection shall be installed either in a NEMA 4X enclosure or in the enclosure that houses the equipment to be protected.

C. SPD/TVSS devices shall be mounted and wired per the manufacturer's recommendations including local grounding for surge energy dissipation. For in-coming power SPD/TVSS devices use #8AWG cable for ground connection.

D. Panel-mounted power circuit protectors shall be provided in all enclosures powered by 120VAC. The protector shall be a 3-stage hybrid, solid-state power line protector with noise filtering, common mode and normal mode suppression and nanosecond reaction time. The unit shall include a replaceable fuse to remove the load (protected equipment) from the line if the unit is either overloaded or the internal protection fails. TVSS devices shall be EDCO HSP-121BT-1RU or approved equal.

E. Panel-mounted signal circuit protectors shall be made for mounting on a terminal block rail. Each SPD/TVSS device shall include a moveable grounding link to allow each signal cable shield to be individually grounded to the panel via the mounting rail through the SPD/TVSS device for that cable without the use of any additional grounding wire or to be isolated from ground at the SPD/TVSS. Each mounting rail shall be grounded to the panel by the use of rail mounting screws at approximately one-foot intervals. Protection shall be from line to line and from each line to ground. Protection shall also be from shield to ground where the shield is not grounded at the protector. SPD/TVSS devices shall have the ability to protect against surge currents greater than 10kA. SPD/TVSS devices shall add no more than 22OHM per signal wire to the total signal loop resistance of the

analog signal loop in which it is installed. SPD/TVSS devices shall not introduce error-producing ground loop currents into the instrumentation signal circuits. SPD/TVSS devices shall be EDCO DRS-036, Phoenix Contact or approved equal.

F. Signal circuit SPD/TVSS devices for 2-Wire field instruments shall be a conduit connected/pipe nipple type and shall have characteristics equal to the panel mounted devices. Units shall be mounted to a transmitter conduit entry point where available. When not available or practical, then these devices shall be mounted in NEMA 4X enclosures located at the field devices. SPD/TVSS devices shall be EDCO SS65-036, Phoenix Contact or approved equal.

G. Signal circuit SPD/TVSS devices for 4-Wire field instruments shall be a separate enclosure unit capable of providing protection on both the power and signal side. The unit shall contain the characteristics of the line power protector and signal circuit protectors discussed above. Units shall be enclosed in a manufacturer assembled NEMA 4X stainless-steel enclosure and cover. SPD/TVSS devices shall be EDCO SLAC-12036, Phoenix Contact or approved equal.

H. SPD/TVSS devices for antenna cable signal protection shall be an in-line panel mount type unit rated for 50OHM with DC blocking. Unit shall be rated for the appropriate frequency range and have an insertion loss of 0.1dB. SPD/TVSS device shall be a Polyphaser IS-50 series or approved equal.

I. SPD/TVSS device specifications and ratings for signal or communications types not defined herein shall be as specified elsewhere or of a type recommended by the manufacturer of the device being protected. SPD/TVSS devices shall be Phoenix Contact, EDCO, Polyphaser or Innovative Technology.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Instrumentation and Control System (ICS) shall be furnished and installed as shown in the Contract Documents and as recommended by the equipment manufacturer.

B. Control Panels, Enclosures and Equipment shall be set true and plumb in all locations as shown in the Contract Documents. Top of Enclosures shall not exceed 6FT above finished floor or grade elevation.

C. Control Panels, Enclosures and Equipment installed outdoors shall not be mounted to hand-rail or safety rail.

D. All conduits used in conjunction with control panels or instrumentation of any kind shall be sealed using a suitable duct-sealing compound to minimize the possible damage caused by vapors or wetness. It shall be the responsibility of the CSI to verify that this is accomplished early in the project, so that corrosion damage does not occur during the time of construction.

E. Control Panels, Enclosures and Equipment shall not be fastened to concrete or masonry surfaces with wooden plugs, conical plastic anchors. Appropriate cadmium plated or galvanized steel bolts shall be used with expansion shields or other metallic type concrete insert for mounting on concrete or solid masonry walls. Cadmium plated or galvanized steel toggle bolts shall be used for mounting on concrete block or other hollow masonry walls. Bolt diameter shall be as required considering the size and weight of the completed assembly(ies) and to provide adequate structural support.

3.2 WIRING AND GROUNDING

A. The following wiring practice guidelines shall be used in order to minimize ground loops, minimize the effects of electromagnetic interference/radio frequency interference (EMI/RFI) and to provide maximum practical immunity from damage resulting from lightning-induced transients.

B. Common wires or conductors shall not be utilized (either within panels or external to panels, or for grounding of field devices) for signal shielding, signal grounding, or safety grounds.

C. Exposed wire lengths extending from within shielded signal cables shall be minimized to reduce pick-up of EMI/RFI by signal circuits. Exposed lengths of less than one inch is preferred with a maximum exposed length of two inches only permitted where necessary. No splicing of signal wires shall be permitted.

D. All signal wiring shall be shielded, both within panels and external to panels. Unless otherwise specified, all signal wiring shall be 16AWG stranded tinned two-conductor twisted pair with 100% coverage of aluminized Mylar or aluminized polyester shield and tinned copper drain wire.

E. The shield on each process instrumentation cable shall be continuous from source to destination, and grounded at one end only. In general, grounding of signal cable shields shall be done at the control panel end. No signal cable shall share a common cable shield grounding wire with any other signal cable or other circuit. The exposed length of cable shield grounding wires shall not exceed two inches prior to termination with less than one-inch maximum length preferred.

F. All outdoor instruments and all outdoor enclosures shall be grounded using the practice defined in Section 800.40 of the National Electric Code.

3.3 PROJECT CLOSE OUT

A. All exterior and interior surfaces of the Control Panels, Enclosures and Equipment shall be cleaned thoroughly, and all scratches and abrasions shall be retouched with the same paint coating as approved by the manufacturer for touch-up work.

B. Interiors of the Control Panels and Enclosures shall be free of debris to include cleaning of wire/cable pulling compounds. The use of compressed air systems is not acceptable.

END OF SECTION 13000

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SPECIAL PROVISIONS SECTION 1 – BORING AND JACKING UNDER RAILROADS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, equipment, materials and incidentals required and install casing pipe by jacking under the International Paper Railroad tracks at the location shown on the Drawings. The work shall be done in strict accordance with the requirements of the AREMA Manual for Railway Engineering as shown on the Drawings and as specified herein.

B. Trenchless crossings shall not impede the flow of traffic along the railroad being crossed.

C. The Contractor shall familiarize himself/herself with the conditions under which the work will be performed and with all necessary details as to the orderly prosecution of the work. The omission of any details for the satisfactory installation of the work in its entirety, which may not appear herein, shall not relieve the Contractor of full responsibility.

D. If any movement or settlement occurs which causes or might cause damage to an existing structure over, along or adjacent to the work, immediately stop any or all work except that which assists in making the work secure and in preventing further movement, settlement or damage. Resume jacking only after all necessary precautions have been taken to prevent further movement, settlement or damage, and repair the damage, at the Contractor's own cost and to the satisfaction of the Engineer.

E. Follow all OSHA regulations regarding confined space for casing installation. Obtain all permits required associated with OSHA regulations and requirements for confined space entry.

F. Conform with all requirements of International Paper for work within the railroad rights-of-way.

G. Contractor shall provide pre and post survey including at a minimum: edge of pavement, center of pavement, top of bank, toe of bank, and top of rail elevations.

H. No rescue shafts shall be allowed.

1.2 SUBMITTALS

A. Shop Drawings: Submit shop drawings and product data for materials to be used for boring and jacking operations.

B. Design Calculations: Submit design calculations detailing equipment and construction methods to be used for jacking operations as specified herein and as shown on the contract drawings. The submittal shall specifically include the following and shall be signed and sealed by the Contractor's Engineer:

1. Control of groundwater and surface drainage.
2. Method of soil stabilization and/or groundwater control at the face.
3. Method of face excavation.
4. Method of excavation removal.
5. Maintenance of alignment and grade.
6. Materials and installation of casing pipe.
7. Grouting outside of casing pipe.
8. Grouting between casing pipe and carrier pipe.
9. Bulkheads.
10. Schedule.
11. Lubricant for decreased jacking friction and pumping system.

The design calculations are to be submitted for informational purposes.

C. Submit the Contractor's qualifications as described herein.

D. Submit the Contractor's Engineer's qualifications as described herein.

E. Daily surveyor reports of casing pipe position, conducted by the Contractor's surveyor, shall be provided in writing to the Engineer.

1.3 QUALITY ASSURANCE

A. Regulations: Perform all work in accordance with current applicable regulations and codes of all Federal, State and local agencies.

B. The Contractor shall have at least five (5) years experience with compatible work to the Work shown and specified, employing labor and supervisory personnel who are similarly experienced in this type of work. Compatible work shall include pipe jacking of at least 72-inch diameter casing pipe at least 100-feet long below railroads and/or highways.

C. The Contractor's engineer shall be a Professional Engineer, registered in the State of North Carolina, and shall have at least (5) year experience in the design of pipe jacking, excavation support, dewatering, grouting and soil stabilization.

1.4 DEFINITIONS

A. Casing pipe shall mean the outer sleeve that is installed by jacking method.

B. Carrier pipe shall mean the pipe inserted within the casing pipe and which acts as the conveyor for water.

C. Boring pit shall mean the pit in which the jacking equipment is installed and from which both the casing pipe and carrier pipe are launched.

D. Receiving pit shall mean the shaft at the point where the carrier pipe emerges from the casing pipe.

PART 2 - PRODUCTS

2.1 MATERIALS

A. 72-in O.D. steel casing pipe shall have a minimum yield strength of 35,000 psi, have a 1.0-in minimum thickness for the railway crossing and be equipped with grout holes as specified herein. The casing pipe shall be designed to withstand Cooper's E-80 railroad loading where it crosses under railroad tracks. The casing pipe shall conform to AWWA C200 and ASTM A53.

B. Steel pipe casing shall be furnished in lengths of the Contractor’s choice. The casing shall have beveled ends with a single or double v-groove and shall be field joined by full-penetration butt welding all around prior to jacking.

C. Pipe shall have 2-inch grout holes at 4.5-ft maximum intervals along the length of the pipe circumferentially placed at 120 degrees on centers (three holes at each interval) orientated with one hole at the crown. 2-inch steel pipe half-couplings shall be welded over the holes in the pipe and shall have threaded steel plugs. Holes shall be used for lubricant injections if needed. The shield shall have appropriate configuration to allow for the installation of louvered doors or breasting system to fully control the loss of face. The doors or breasting system shall be readily removable and replaceable to facilitate the removal of rock, stumps, and buried materials that impede the progress or direction of the casing pipe.

D. The jacking shield shall be of steel construction, designed to support all applicable surcharge loading as specified in the Contract Documents in addition to other loadings imposed. The advancing face shall be provided with a hood, extending no less than 24 inches beyond the face and extending around no less than 240 degrees of the total circumference. The shield shall conform to and not exceed the outside dimension of the casing pipe being placed by more than 1 inch at any point on the periphery unless approved by the Engineer.

E. Grout for pressure injection between the casing and the earth shall be a mixture of portland cement and bentonite or similar commercial product that shall harden to a minimum compressive strength of 1,000 psi. The grout shall be readily pumpable.

F. Cement grout used to fill the space between the casing and the carrier pipes shall consist of a mixture of about 1 part cement to 6 parts sand which shall be subject to increase or decrease in the amount of cement necessary or as permitted, to provide good flowing characteristics.

G. Lubricant for decreasing jacking friction between the jacked casing pipe and earth shall be bentonite slurry or similar commercial product.

H. Bulkheads shall be provided to seal the space between the carrier pipe and casing pipe at each end of the casing pipe for grout containment. Bulkheads may be of masonry (minimum 8 inches thick).

PART 3 - EXECUTION

3.1 BORING & RECEIVING PITS

A. Refer to Support of Excavation specification for pit requirements.

B. Steel rails or beams embedded in the concrete slab shall be used in the sending pit for placement and alignment of each piece of casing pipe during installation operations.

3.2 JACKING OPERATIONS

A. Casing pipes under existing railroads where so shown shall be installed by trenchless methods to the limits shown and in every case to at least 5 feet beyond the traveled way of the road or greater as required by the owner of the roadway or railroad.

B. The Contractor shall provide all material, equipment, and facilities required for installing, positioning, and jacking the casing pipe.

C. The casing pipe at each location shown on the Drawings shall be jacked in one continuous 24-hour-per-day operation. In no event shall jacking or lubricant injection be discontinued for sufficient period to cause the partially jacked sleeve to "freeze" in place.

D. Proper alignment and elevation of the casing shall be consistently maintained throughout the jacking operation. Tolerances for installation of the casing pipes shall be as follows:

1. Vertical - plus or minus 0.50 foot.
2. Horizontal - plus or minus 0.50 foot.

E. Jacking shall not commence until the Contractor’s surveyor has verified in writing to the Engineer that the first pipe casing segment is at the correct location and elevation and is oriented at the correct horizontal and vertical direction. After the first segment has been jacked forward, the Contractor’s surveyor shall again verify in writing to the Engineer that alignment is correct. If alignment is not correct at this point or any successive point, the jacked casing operation shall be stopped and shall not resume until the Contractor has modified the jacking operation as required to maintain proper alignment at no additional cost to the Owner.

F. Jacking shall not commence until the Contractor has installed, initialized, is prepared to **record** readings from all geotechnical instrumentation as required by the Geotechnical Instrumentation and Monitoring specification.

G. The Contractor shall be fully responsible for preventing the occurrence of voids outside the casing pipe and, if they occur, fill them with cement grout.

H. Removal of material from the casing face shall be by hand mining.

I. The Contractor shall excavate only from within the shield to minimize the volume of the voids outside the jacked casing pipe and shall constantly exercise care in the removal of the excavation.

J. Blasting shall not be allowed.

K. Groundwater shall be controlled at all times. If groundwater is expected to be above or within the casing level, a groundwater control system consisting of wells or well points shall be installed and operated such that the groundwater level is lowered to at least the casing invert level at the face. Groundwater control along and at the face of the tunnel liner shall include grout stabilization as required.

L. The Contractor shall use a jacking ring consisting of either steel or concrete construction. This jacking ring will allow the jacking pressure to be distributed evenly around the wall of the casing pipe.

M. The Contractor shall also use a jacking frame. The frame shall be fabricated from structural steel members and shall be designed to distribute the stresses from the jacks evenly to the jacking ring.

N. The Contractor shall use thrust blocks adequately designed to carry the thrust of the jacks to the soil without excessive soil deflection and in such a manner as to avoid any disturbance of adjacent structures or utilities and to jack the casing reliably in the correct alignment. Refer to Support of Excavation Specification for design requirements of the thrust blocks.

O. Jacking pressures used shall be uniformly distributed through the jacking frame and parallel to the axis of the pipe. Extreme care shall be taken so that crushing or other damage to the joints of the casing pipe will not occur.

P. The Contractor shall have a redundant lubricant injection system connected for immediate use in the event the primary system fails during the jacking operation. Lubricant injection shall be continuous until the casing is fully installed.

Q. The alignment of the casing pipe shall be checked at least daily by the Contractor's Surveyor as the casing progresses and daily written reports provided to the Engineer. Adjustments shall be made immediately if any misalignment occurs.

R. If work is stopped for any reason, the exposed face of the excavation shall be fully protected with a bulkhead satisfactory to the Engineer.

S. The carrier pipe shall not be direct jacked.

T. The carrier pipe shall not be installed until leakage into the casing pipe, after removal of all dewatering pumping systems, does not exceed 20 gal/hour/100 lin. ft. of finished casing pipe.

U. The Contractor shall be responsible for damages resulting from subsidence, collapsed casings, or ground losses into the jacked pipe casing and for the refilling of voids resulting there from with grout. Where such ground losses are so severe that they result in damage to underground or surface pavement, existing utilities or structures, the Contractor shall be solely responsible for remedying such damage. Where the filling of voids cannot be effectively carried out from below, the Engineer reserves the right to order the Contractor, at no additional cost to the Owner, to make openings from the surface for the purpose of backfilling the voids. If in the judgment of the Engineer, a portion of the casing and/or pipe requires reinforcing because of such collapse, the Engineer may direct the Contractor to furnish and place such reinforcement at no additional cost to the Owner. Reinforcement may also be directed when the stability of the soil adjacent to the casing and/or pipe has been affected by the loss of ground.

V. The Contractor shall be responsible for all effects on rail and/or road traffic resulting from such ground loss, including all costs and all coordination with and meeting traffic control requirements International Paper and the required traffic control, permit acquisition, fees, fines, etc.

X. Maximum allowable deflection of the inside diameter of the casing in any direction from a true circle shall be 5.0 percent of the inside diameter.

3.3 GROUTING

A. Immediately following the jacking operation, pressure grout the jacked section to fill all voids existing outside of the casing pipe. Grouting shall be from the interior of the casing pipe through grouting holes. Lubricant shall be displaced by the grout. Grouting shall be started in the lowest connections and shall proceed until grout begins to flow from upper connections. The void shall be completely filled by pressure grout injection through the grout holes in the casing pipe.

B. Grout pressure shall not exceed one-half of the existing overburden pressure.

C. Apparatus for mixing and placing grout shall be capable of mixing effectively and stirring the grout and then forcing it into the grout connections in a continuous uninterrupted flow.

D. After grouting is complete, pressure shall be maintained by means of stopcocks or other suitable devices until the grout has set sufficiently. After the grout is set, grout holes shall be completely filled with dense concrete and finished neatly without evidence of voids or projections.

3.4 PIPELINE INSTALLATION IN CASING AND FILLING

A. After casing installation is complete and found acceptable by the Engineer, the Contractor shall prepare for installation of the carrier pipe in the casing by placing rails embedded in concrete in the invert to the specified grade of the pipeline. Two steel channel rails of suitable size and shape shall be positioned accurately by a welded steel support system and then partially embedded in the concrete to support the pipe. Rails shall have top flanges at least 1.5 inches wide and shall weigh at

least 5.0 lbs per foot. Rails shall be lubricated to minimize sliding friction. The rails shall in no way be connected to or touching the casing pipe.

B. The pipes shall be supported securely on wood or steel cribbing in such a manner that the pipe is supported on each end by the cribbing and does not slide directly on the rails. The cribbing shall remain in place and shall be securely fastened to the pipe by steel cables or banding. Each segment of pipe shall be pulled or winched through the casing supported on the cribbing which shall slide along the lubricated rails until it mates with the previously installed pipe segment. Under no conditions will pipe transport equipment that places any load on the interior of the preceding pipe section be allowed, nor will sliding the pipe directly on the rails be allowed.

C. Each pipe segment shall be blocked against the casing on the top and both sides to prevent displacement during grouting. Use CCA treated wood for blocking. Adjust the elevation and alignment of each pipe with wood shims if necessary before blocking. Pipe alignment tolerance shall be as specified for general pipe installation.

D. The only acceptable alternate to the rail system described in paragraphs A, B, and C shall be casing spacers designed and certified by the Manufacturer as capable of withstanding the forces to pull the pipe sections into the casing and to support the full weight of the pipe. The casing spacers shall prevent any movement or displacement of the pipe during grouting.

E. After the carrier pipe has been installed in the casing, shimmed, blocked, and tested, seal the ends of the casing around the pipeline with a bulkhead and completely fill the space between the casing and the pipeline with cement grout. Cement grout shall be pumped through 2-inch minimum PVC pipes extending through one bulkhead into the top of the casing at maximum 50-foot intervals. This operation may be performed in stages if desired to help prevent flotation. To ensure that the casing is completely full, a 1 1/2-inch PVC pipe shall be installed near the crown of the casing from the midpoint of the casing to one end, and 1 1/2-inch openings shall be provided in the crown of each bulkhead. Grout shall be pumped into the casing until it flows from the top of the casing in the PVC pipe and bulkhead openings at both ends. Leave the PVC pipe in place and cut off at the end of the casing.

3.5 RESTORATION

A. All areas disturbed by construction shall be restored to existing or better condition and prepared, seeded, and maintained until accepted by the Engineer, International Paper and/or NCDOT.

END OF SECTION SP 1

SPECICAL PROVISIONS SECTION 2

CORROSION CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION

A. Installation of corrosion control components shall be in accordance with the following specifications and the details contained in the Contract Documents. All installation practices and components shall be approved by the ENGINEER.

B. The corrosion control for all steel and ductile iron pipe (this includes all piping, joints, valves, fittings, etc.) will include an external protective coating in accordance with the below specifications, electrical continuity (joint bonding), electrical isolation (insulating flanges, linked rubber seals, and insulating corporation valves), sacrificial (magnesium and zinc) prepackaged anodes, sacrificial zinc ribbon anodes, and corrosion control test facilities.

C. Upon completion of the work, the CONTRACTOR shall test, operate, inspect, and survey the installed work. Any and all repairs or replacement of defective or improperly installed corrosion control/corrosion monitoring systems shall be corrected by the CONTRACTOR at no additional cost to the OWNER. ENGINEER shall approve all work.

1.02 REFERENCES

The following is a list of the Standards referenced in this Section.

A. American Society for Testing and Materials (ASTM)

1. ASTM A48: Specification for Gray Iron Castings

2. ASTM B418: Specification for Cast and Wrought Galvanic Zinc Anodes

3. ASTM D149: Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Solid Electrical Insulating Materials at Commercial Power Frequencies

4. ASTM D257: Test Methods for D-C Resistance or Conductance of Insulating Materials

5. ASTM D570: Test Method for Water Absorption of Plastics

6. ASTM D638: Test Method for Tensile Properties of Plastics

7. ASTM D1000: Test Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications

8. ASTM D1505: Test Method for Density of Plastics by the Density-Gradient Technique

9. ASTM D4542: Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

10. ASTM E96: Test Methods for Water Vapor Transmission of Materials

11. ASTM F1249: Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor

12. ASTM G8: Test Method for Cathodic Disbonding of Pipeline Coatings

13. ASTM G14: Test Method for Impact Resistance of Pipeline Coatings (Falling Weight Test)

14. ASTN G17: Test Method for Penetration Resistance of Pipeline Coatings (Blunt Rod)

15. ASTM G95: Test Method for Cathodic Disbonding of Pipeline Coatings (Attached Cell Method)

B. Society for Protective Coatings (SSPC)

1. SSPC SP3: Surface Preparation Specification No. 3, Power Tool Cleaning

C. NACE International (NACE)

1. RP0274: High-Voltage Electrical Inspection of Pipeline Coatings Prior to Installation

2. SP0188: Discontinuity (Holiday) Testing of Protective Coatings

D. American Water Works Association (AWWA)

1. AWWA C209: Cold-Applied Tape Coating for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines

2. AWWA C214: Tape Coating Systems for the Exterior of Steel Water Pipelines

3. AWWA C216: Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines

4. AWWA C222: Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings

E. NSF International

1. NSF 61 Drinking Water System Components - Health Effects

F. US Department of Transportation

1. US DOT H-20: Roadway Delineation Practices Handbook

1.03 SUBMITTALS

A. Catalog cuts of all materials to be installed shall be required and shall be submitted for approval.

B. Pipe coating, handling and testing procedures, and quality assurance procedures shall be required and shall be submitted for approval.

C. Test procedures for verifying electrical isolation at insulating flanges and insulating corporation valves shall be required and submitted for approval.

PART 2 - EXTERNAL COATING SYSTEMS FOR STEEL AND DUCTILE IRON PIPE

2.01 GENERAL

A. External pipe surfaces (including all piping, joints, valves, fittings, hydrant piping, etc.) shall be coated. Predominant method to be shop application. The piping shall receive an exterior coating in the pipe manufacturer's shop or at a separate applicator's facility.

B. All components of the coating system shall be manufactured by a single supplier to assure compatibility of individual components.

C. Field applied coatings to be limited to repairing damage to shop coating; coating exposed metal at joints, fittings, valves, bond and test wire connections; and other appurtenances that are not shop coated.

D. Extent of piping to be shop coated and extent to be field coated shall be clearly identified in CONTRACTOR'S material and quality assurance submittals. Quality assurance submittals shall include pipe coating, handling and testing procedures.

E. All coatings used on project shall be as specified herein, unless otherwise approved by the ENGINEER prior to bidding. All products comprising completed coating system to be compatible and the same products to be used throughout the project. Pipe surfaces that will come in contact with potable water inside the pipeline (e.g. spigot ends of bell and spigot joints) to be coated with materials having NSF-61 certification.

2.02 SHOP APPLIED MATERIALS FOR STEEL AND DUCTILE IRON PIPE

The external coating for steel and ductile iron pipe shall comply with one of the following coating systems:

A. 100 percent solids polyurethane in accordance with AWWA C222, with the following minimum properties:

1. Adhesion to steel (ASTM D4541): >2,500 psi.

2. Cathodic disbondment (ASTM G95): <7 mm rad. after 30 days @ 75^0F

3. Permeability (ASTM E96) 60 mil dry film thickness: 0.0078 U.S. perms. maximum.

4. Dielectric strength (ASTM D149): > 400 volts per mil.

5. Impact resistance (ASTM G14 – 15 mm ball): >125 in-lbs.

6. Solids Content (Solids by Volume): 100%.

7. Volatile Organic Compounds (VOC's): 0.0 lbs. per US gallon.

8. Final coating shall have a nominal dry film thickness of 35 mils with a minimum dry film thickness of 30 mils.

9. Coating shall be Corropipe II TX-15 as manufactured by Madison Chemical Industries or approved equal.

B. Three layer tape wrap system with the following minimum properties:

1. Primer: A liquid primer composed of butyl, tackifiers, and other ingredients to protect against soil oxidation and bacteria growth. Total solids shall be 20% (plus or minus 2%) by weight.

2. Innerwrap: A two component extruded black tape consisting of polyethylene and butyl rubber adhesive specially designed to conform to the particular pipe material being coated. The innerwrap shall have the following properties:

   a. Thickness: 20 mils (9 mils polyethylene backing, 11 mils butyl rubber adhesive).
   b. Adhesion to primed steel: 20 oz/in width (ASTM D1000).
   c. Tensile strength: 30 lbs/in width (ASTM D1000).
   d. Water vapor transmission rate: <0.2 gm/100 in^2/24 hr.
   e. Dielectric strength: 21 kV (ASTM D149).
   f. Tape width: As recommended by coating manufacturer.

3. Middlewrap: A two component extruded grey tape consisting of polyethylene and butyl rubber adhesive. The middlewrap shall contain stabilizers and inhibitors to resist the destructive effects of ultra-violet light. The middlewrap

shall have the following properties:

a. Thickness: 30 mils (25 mils polyethylene backing, 5 mils butyl rubber adhesive).
b. Adhesion to backing: 45 oz/in width.
c. Tensile strength: 60 lbs/in width (ASTM D1000).
d. Abrasion resistance: Excellent (ASTM D1000).
e. Water vapor transmission rate: <0.2 gm/100 in^2/24 hr.
f. Dielectric strength: 23 kV (ASTM D149).
g. Tape width: As recommended by coating manufacturer.

4. Outerwrap: A two component extruded white tape consisting of polyethylene and butyl rubber adhesive. The outerwrap shall contain stabilizers and inhibitors to resist the destructive effects of ultra-violet light. The outerwrap shall have the following properties:

a. Thickness: 30 mils (25 mils polyethylene backing, 5 mils butyl rubber adhesive).
b. Adhesion to backing: 45 oz/in width.
c. Tensile strength: 60 lbs/in width (ASTM D1000).
d. Abrasion resistance: Excellent (ASTM D1000).
e. Water vapor transmission rate: <0.2 gm/100 in^2/24 hr.
f. Dielectric strength: 23 kV (ASTM D149).
g. Tape width: As recommended by coating manufacturer.

5. Coating system shall be YGIII as manufactured by Polyken Technologies or approved equal. YGIII 80 Mils System Properties:

a. Peel adhesion to primed steel: 300 oz/in (ASTM D1000).
b. Cathodic disbondment: 0.25 in radius (ASTM G8).
c. Water vapor transmission: 0.07 perms (ASTM E96).
d. Water vapor transmission rate: 0.03g/100 in (ASTM F1249)
e. Volume resistivity: 10^{15} ohm-cm (D257).
f. Dielectric breakdown: 650 volts/mil (D1000).
g. Dielectric strength: 20-23 kV (ASTM D149).
h. Impact resistance: 90 in-lbs (ASTM G14).
i. Penetration resistance: 11-15% (ASTM G17).

C. Polyolefin (extruded butyl rubber adhesive with polyethylene top coat) system with the following minimum properties:

1. Compounded butyl rubber adhesive coating with less than 0.1% water absorption. Nominal thickness 10 mils.

2. Top coat: High density polyethylene resin top coat that is spirally extruded onto adhesive coating in multiple layers to form a seamless bonded coating. The polyethylene top coat shall have the following properties:

a. Nominal thickness: 40 mils.
b. Density: >0.95 (ASTM D1505).
c. Elongation: >600% (ASTM D638).
d. Tensile strength: <2800 psi (ASTM D638).

3. Total coating system shall have the following properties:

a. Thickness: 50 mils (40 mils polyethylene top coat, 10 mils butyl rubber adhesive).
b. Impact resistance: >60 inch lbs (ASTM G14).
c. Cathodic disbondment: 6 mm radius (ASTM G8 OR G95).
d. Water absorption: 0.06% (ASTM D570).

4. Coating system shall be Pritec as manufactured by Bredero Price Company or approved equal.

2.03 APPLICATION OF SHOP APPLIED MATERIALS TO PIPE

The coating applicator, regardless of the location where the coating is applied, shall be certified as qualified by the coating manufacturer. The coating applicator must abide by and follow all manufacturer's application specifications for the coating system. All components of the coating system shall be manufactured by a single supplier to assure compatibility of individual components.

2.04 SURFACE PREPARATION PRIOR TO COATING

The exterior surface of the piping shall be cleaned in accordance with the coating manufacturer's recommendations.

2.05 CERTIFICATION OF EXTERNAL COATING

The pipe or fitting manufacturer or coating applicators, as appropriate, will test and certify the exterior coating prior to shipping to the project site. When the pipe or fitting arrives at the job site, the CONTRACTOR shall visually inspect the pipe or fitting, and repair any and all damage as directed by the coating manufacturer and in accordance with these specifications.

2.06 FIELD APPLIED MATERIALS FOR COATING REPAIRS

Shop applied coatings that are damaged in transit or during handling shall be repaired prior to backfilling. The field applied repair coatings shall be as recommended by the shop applied coating manufacturer and shall be entirely compatible with the original coating system. The field coating repairs shall be performed in accordance with all recommendations of the coating manufacturer.

2.07 FIELD APPLIED MATERIALS FOR COATING STEEL AND DUCTILE IRON JOINTS

A. The field applied materials for coating ductile iron pipe joints shall be one of the following coating systems:

1. Joint Wrap and Repair Tape: A two component extruded tape consisting of polyethylene and butyl rubber adhesive in accordance with AWWA C209. The tape shall contain stabilizers and inhibitors to resist the destructive effects of ultra-violet light. The jointwrap and repair tape shall have the following properties:

    a. Thickness: 35 mils (7 mils polyethylene backing, 28 mils butyl rubber adhesive).

    b. Adhesion: 225 oz/in width (ASTM D1000).

    c. Tensile strength: 15 lbs/in width (ASTM D1000).

    d. Water vapor transmission rate: 0.05 gm/100 in^2/24 hr.

    e. Dielectric strength: 23 kV (ASTM D149).

    f. Insulation resistance: 1.4 x 107 M Ohms (ASTM D257).

    g. Tape width: As recommended by the coating manufacturer.

    h. The filler tape (Polyken 939 or approved equal) recommended by the jointwrap tape manufacturer shall be used to fill uneven areas at the pipe joint to assure a smooth application of the jointwrap tape. The primer (Polyken 1027 or approved equal) recommended by the jointwrap tape manufacturer shall be used. The outer protective tape layer (Polyken #954 or approved equal) as recommended by the jointwrap tape manufacturer shall be used.

2. Heat-shrinkable sleeves specifically designed for corrosion protection of water pipelines that utilize a crosslinked polyolefin backing coated with a protective, heat activated adhesive for bonding to metallic substrates and pipeline coatings in accordance with AWWA C216. The heat-shrinkable sleeves shall have the following minimum properties:

    a. Tensile strength: 2,200 psi

    b. Elongation: 400 %

    c. Volume resistivity: 1014 ohm-cm

    d. Dielectric strength: 400 V/mil

    e. Water vapor transmission: 0.05 gm/h/m2 max.

    f. Adhesion to steel: 8 lbs/linear inch

g. Lap shear: 12 psi

h. Impact: 25 in.-lbs

i. The filler material recommended by the heat-shrink sleeve manufacturer shall be used to fill uneven areas at the pipe joint to assure a smooth application of the heat-shrink sleeve.

2.08 PROTECTION OF COATING SYSTEMS DURING CONSTRUCTION

A. At all times during construction of the pipeline, the CONTRACTOR shall take every precaution to prevent damage to the protective coating. No metal tools or heavy objects shall be permitted to come into contact unnecessarily with the finished coating. Workmen shall not be permitted to walk on the coating, except when absolutely necessary and approved by the ENGINEER, in which case, they shall wear shoes with rubber or composition soles and heels or other suitable footwear which will not damage the coating.

B. Externally coated pipe shall be hoisted from the trench side to the trench by means of a minimum of two 18-inch wide belt slings of sufficient strength to handle the weight of the piping safely.

C. Any and all coating damage shall be repaired with specified coating repair materials prior to installation.

2.09 TRANSPORTATION, HANDLING AND STORAGE OF COATED PIPE

A. Pipe shall be handled in accordance with AWWA C214 and in such a manner as to protect the pipe and the coating from damage.

B. At the pipe coating plant, if forklifts are used, all bearing surfaces of a forklift apparatus shall be padded with suitable padding material. Web slings may also be used at the pipe manufacturer's plant.

C. At the project site, the pipe shall only be handled with slings. Metal chains, cables, tongs, forklifts or other equipment likely to cause damage to the coating, will not be permitted. Web slings shall be a type that will not damage the coating. When pipe is handled with slings, there shall be a minimum of two slings. Slings shall be a minimum of 18 inches wide and of sufficient strength to handle the weight of the pipe safely. Slings shall not pass through the pipe. Hooks on the end of the pipe shall not be allowed. Handling equipment, materials, and procedures shall be submitted to the ENGINEER for approval. If possible, the pipe should be handled from cutback ends.

D. Storing of the coated pipe shall be on padded 12-inch wide (minimum) skids or select loamy or sand dirt berms, or suspended from cutback ends, where possible. In urban areas, the pipe shall be suspended on padded skids or skids placed at cutback areas. Where skid chucks are used in contact with coated pipe, they shall be padded with several layers of carpeting. Padded chucks shall be placed such that coated pipe is

nested on the skid rather than the chuck. Coated pipe shall not be laid on pavement without benefit of padding at contact points. In preparation for transporting pipe, the use of web slings is necessary for tie downs.

E. If cables or chains are used during transportation, they shall be properly padded with approved, suitable material as required to protect the coating from damage while in transit. Use of a padded horizontal separator strip between successive rows of pipe is necessary to prevent damage to the pipe coating, i.e.: strips of rug material over all contact areas where pipe will rest.

PART 3 – CORROSION CONTROL MATERIALS

3.01 PREPACKAGED MAGNESIUM ANODES

A. Each anode shall have a nominal weight of 32 pounds, excluding backfill. The anode shall be 20 inches long by 5.75 inches wide by 5.5 inches high.

B. Composition of the anode shall be as follows:

Aluminum	0.010% Maximum
Manganese	0.50 to 1.30%
Copper	0.02% Maximum
Nickel	0.001% Maximum
Iron	0.03% Maximum
Silicon	0.05% Maximum
Other	0.05% Each
Magnesium	Remainder

C. The 32 pound anodes shall be vibratory packaged in permeable cardboard boxes that shall be 28 inches long by 8 inches wide by 8 inches tall.

D. The cardboard box shall contain a minimum of 40 pounds of backfill for 32 pound anodes. The backfill material shall have the following composition:

Hydrated Gypsum	75%
Bentonite	20%
Sodium Sulfate	5%

A. The anode and backfill shall be prepackaged into a single unit, in a vibrated cardboard box as described above. The box shall contain centering devices to maintain the anode in a centered position surrounded fully by the special backfill. A minimum of 10 feet of AWG No. 12 solid copper wire with TW insulation shall be attached to the anode. Wire to anode attachment shall be by silver solder and sealed to prevent any moisture penetration.

3.02 PREPACKAGED ZINC ANODES

A. Each anode shall have a nominal weight of 30 pounds, excluding backfill. The anode

shall be 30 inches long by 2 inches wide by 2 inches tall.

B. The zinc alloy shall meet the requirements of ASTM B418 95A, Type II with a minimum potential of 1.10 volts to a copper/copper sulfate reference electrode. The anode shall conform to the following composition:

Aluminum	0.005% Maximum
Cadmium	0.003% Maximum
Copper	0.002% Maximum
Iron	0.0014% Maximum
Lead	0.003% Maximum
Other	0.001% Maximum total for all others
Zinc	Remainder

C. The anode shall be vibratory packaged in a permeable cardboard box (minimum 58 inches long by 6 inches on each side) containing a minimum of 50 pounds of backfill of the following composition:

Hydrated Gypsum	75%
Bentonite	20%
Sodium Sulfate	5%

D. The anode and backfill shall be prepackaged into a single unit, in a vibrated cardboard box. Suitable centering devices shall be utilized to maintain the anode in the center of the package. A minimum of 10 feet of AWG No. 12 solid copper wire with THWN insulation shall be attached to the anode. Wire to anode attachment shall be by silver solder and sealed to prevent any moisture penetration.

E. Anodes shall be properly protected for shipping. During shipment, handling, and storage, the anode, lead wires and cardboard boxes must remain dry and undamaged.

3.03 ZINC RIBBON ANODES

A. Zinc ribbon anodes shall have an approximate weight of 0.6 lbs/ft and shall be 1/2 inch by 9/16 inch in cross section. The anode shall be continuously extruded over a steel wire core of 0.13 inch centrally located in the zinc alloy.

B. The zinc alloy shall meet the requirements of ASTM B418, Type II with a minimum potential of 1.10 volts to a copper/copper sulfate reference electrode. The anode shall conform to the following composition:

Aluminum	0.005% Maximum
Cadmium	0.003% Maximum
Copper	0.002% Maximum
Iron	0.0014% Maximum
Lead	0.003% Maximum
Other	0.001% Maximum total for all others
Zinc	Remainder

3.04 TEST BOXES

The post mounted above grade test box shall consist of a weatherproof enclosure and a rigid galvanized steel conduit. The enclosure shall be made of cast aluminum, galvanized steel, or high cimpact plastic, Lexan, Gyrlyn or equal. The terminal block shall be made of phenolic resin, plastic, micarta, Lexan, or Bakelite high dielectric material, with 7 terminals unless otherwise shown on Drawings. Terminal heads shall have special heads to keep them from turning or shall be easily accessible from both sides of the terminal block without requiring its removal. The enclosure shall be equipped with locking waterproof cover. Terminal studs, washers, and nuts shall be nickel plated brass. The mounting post shall be made of rigid galvanized steel conduit with 3-inch in diameter.

3.05 TEST STATION CONCRETE

Concrete for the test station slabs shall have specified compressive strength (28 day) of at least 3000 psi.

3.06 TEST STATION TERMINAL LUGS

Test station terminal lugs shall be one-hole, compression terminal lugs for 0.25 inch bolt size.

3.06 CURRENT MEASURING SHUNT

Test station shunts shall be constructed to fit the terminal posts for the specified test station. The resistance shall be 0.01 ohm with a current capacity of 8 amperes. The shunt shall be as manufactured by Cott Manufacturing Company Model "Yellow" or approved equal.

3.07 REFERENCE ELECTRODES

The reference electrode shall be a permanent copper/copper sulfate reference electrode designed for a minimum life of 20 years. The electrode shall have a 2-inch diameter by 8 inches long, schedule 80 PVC body or a 2-inch diameter by 7 inches long, high impact resistant Lexan tube, and a minimum overall package size of 6-inch diameter by 10 inches long. The reference electrode shall be prepackaged in a permeable cloth bag with special copper/copper sulfate reference electrode backfill. Lead wire shall be of sufficient length to reach the test station terminals without splicing. The lead wire shall be AWG No. 14 stranded copper wire with either HMWPE or RHH-RHW insulation. The lead wire shall be attached to the electrode core with the manufacturer's standard connection. The connection shall be stronger than the wire. Splicing of the reference electrode lead wire shall not be permitted under any circumstances.

3.08 WIRE

A. All wiring, excluding wire provided with the magnesium and zinc anodes or reference electrodes, shall be stranded copper wire of the AWG wire size, insulation, and color shown in the Details.

B. Wire for bonded joints shall be single conductor, stranded copper with high molecular weight polyethylene (HMWPE) insulation. Wire size shall be AWG No. 2 for piping larger than 36-inch, AWG No. 4 for 16-inch through 36-inch piping, and AWG No. 6 for piping smaller than 16-inch.

C. Wire for test stations shall be single conductor, stranded copper wire with 600-volt HMWPE or THWN insulation as required (colors as shown on the Details).

D. Anode header cables shall be single conductor, stranded copper with high molecular weight polyethylene (HMWPE) insulation. Wire size shall be AWG No. 8.

3.09 THERMITE WELD EQUIPMENT

Thermite weld molds and charges shall be suitable for the sizes and types of materials and shapes encountered. Adapter sleeves shall be utilized for thermite welds as recommended by the thermite weld manufacturer. Pin brazing shall not be used to attach bond wires and/or test wires to the piping.

3.10 COATING FOR THERMITE WELDS

A. Thermite welds to steel and ductile iron pipe are to be coated with a prefabricated assembly specially designed for covering cathodic protection wire connections to piping and fittings. The prefabricated assembly shall consist of the following components:

1. Top plastic sheet formed with an igloo shaped dome and entry tunnel for the lead wire;

2. A special elastomeric compound in the plastic dome firm enough to resist flow at normally encountered application and operating temperatures, but soft enough to mold itself around and completely cover the irregular welded profile;

3. A double row of parallel, flexible serrations on either side of the dome to assist with conforming around small diameter pipe;

4. A base of black unbacked elastomeric tape with exceptional adhesive properties for bonding firmly to a surface when used with the appropriate primer.

5. The appropriate primer as required by the elastomeric cap manufacturer shall be used.

3.11 INSULATING FLANGE COMPONENTS

Insulating materials shall include an insulating gasket, insulating sleeves and insulating washers. The insulating gasket shall be "Linebacker" Type "E" with a G-10 retainer and nitrile "quad" ring seal. The insulating sleeves shall be G-10. The insulating washers shall be G-10

and installed on both sides of the flange. Steel washers shall also be used between the insulating washers and the bolts and nuts and between the insulating washers and the flange. The pressure rating for the insulating flange materials shall be greater than the design pressure of the piping.

3.12 EXTERNAL COATING SYSTEM FOR INSULATING FLANGES AND INSULATING CORPORATION VALVES

A. Insulating flanges and insulating corporation valves shall receive an exterior tape wrapping in the field. The coating applicator must abide by and follow all manufacturer's application specifications for the coating system. All components of the coating system shall be manufactured by a single supplier to assure compatibility of individual components.

B. Materials

1. Primer: A blend of microcrystalline wax, plasticizer, and corrosion inhibitors having a paste-like consistency, designed to displace moisture, penetrate rust and wet the surface, ensuring adhesion of the tape. The primer shall be Trenton Wax-Tape Primer or approved equal.

2. Filler Putty: A cold applied anti-corrosive moldable filler material used to even the contours of irregular fittings and surfaces. The filler putty shall have the following properties:

   a. Specific gravity: 1.15.
   b. Density: 24 cu in/lb.
   c. The filler putty shall be Trenton Fill-Putty or approved equal. Filler putty shall be used at all irregular surfaces to provide a smooth surface for the application of the innerwrap and outerwrap.

3. Innerwrap: A non-woven, non-stitch bonded synthetic fabric saturated with a blend of microcrystalline wax, plasticizer, and corrosion inhibitor (no clay fillers). The inner tape shall have the following properties:

   a. Thickness: 70 to 90 mils.
   b. Dielectric strength: 170 volt/mil.
   c. The innerwrap shall be Trenton #1 Wax-Tape or approved equal.

4. Outerwrap: A white, resin coated, woven fiberglass fabric. The outerwrap shall have the following properties:

   a. Thickness: 0.005 inch.
   b. Tensile strength (per one inch width): 85 lb min.
   c. Tape width: 6 inches.
   d. The outerwrap shall be Trenton Glas-Wrap or approved equal.

3.13 POLYETHYLENE MESH SEPARATOR PAD

The mesh separator pad shall be a medium density flexible polyethylene mesh pattern webbing pad, nominal thickness 160 mils.

3.14 COMPRESSION CONNECTORS

Compression connectors shall be specially manufactured for splicing copper cables together. The connectors shall be copper and shall be Type YC-C or YC-L as recommended by the compression connector manufacturer.

3.15 ELECTRICAL TAPE

Conformable water tight sealant having a dielectric strength not less than 15kV for a 1/8 inch thick layer. Tapes shall be vinyl tape and rubber tape. Tape shall be Scotch 88 Vinyl Tape and Scotch C130 Rubber Tape or approved equals.

3.16 LINKED RUBBER SEAL

The linked rubber seal shall consist of a belt of interconnected rubber links connected together with zinc plated carbon steel hardware. The linked rubber seal shall be manufactured by Thunderline Corporation or an approved equal.

3.17 INSULATED CASING SPACERS

Casing insulators (spacers) shall be stainless steel bands that are 11 inches long with glass filled polymer plastic runners that are 2 inches wide. Casing insulators shall be sized in accordance with the casing insulators (spacers) manufacturer's recommendations so as to center the pipe within the casing. The number of casing spacers and the distance between them shall be in accordance with the recommendations of the manufacturer of the casing spacers, however a minimum of three casing spacers (one at each end and one at the midpoint of the pipe) shall be required for each section of pipe. The insulated casing spacers shall be sized to be capable of supporting the weight of the pipe filled with water. Insulating casing spacers shall be Model SSI as manufactured by Advance Products & Systems, Inc. or approved equal.

3.18 CASING END SEALS

Casing end seals shall be made of 1/8 inch thick rubber and shall be full conical in shape. The casing end seal shall be configured to the exact dimensions of the piping and casing. The rubber end seals shall fully enclose the end of the casing and shall be water tight. Rubber casing end seals shall be as manufactured by Advance Products and Systems, Inc.

3.19 MASTIC

The field applied external coating shall be a cold applied mastic with the following properties:

A. Composition: A pyrobituminous resin processed by homogenization with inhibitive pigments and aromatic solvents.

B. Electrical volume resistivity: 2.12 X 10^{13} ohms-cm.

C. Percent solids: 58.6% by volume, 68.2% by weight.

D. Service temperature: 0 to 250^{0}F.

E. Weight per gallon: 9.42 pounds.

F. Specific gravity: 1.13.

G. Flash point: 44^{0}F - seta closed cup.

H. Color: black.

The mastic coating shall be applied only where specifically required by the specifications. The mastic coating shall be used for coating thermite welds to PCCP and concrete bar wrapped cylinder piping. The mastic coating shall be Roskote R28 Rubberized Mastic or approved equal.

PART 4 - EXECUTION

4.01 THERMITE WELDING

A. All thermite welds shall be made as shown on the Drawings and in accordance with the manufacturer's recommendations using the proper combination of equipment for the pipe and wire size being welded. All welding materials and equipment shall be the product of a single manufacturer.

B. Assure that the area where the attachment is to be made is absolutely dry. Remove mill coating, dirt, grime and grease from the pipe or fitting surface at the weld location by wire brushing or by the use of suitable safety solvents. Clean a 2.5 inch square area of the pipe or fitting surface at the weld location to a bright shiny surface, free of all serious pits and flaws by use of a mechanical grinder.

C. Prepare the wire for welding by assuring that the cable is absolutely dry. The cable shall be free of dirt, grease and other foreign products. Cut the cable in such a way as to avoid flattening or forcing out of round. To prevent deformation of the cable, cut the cable with cable cutters. Remove the insulation in a manner that will avoid damage to strands. Install adapter sleeves as recommended by the thermite weld manufacturer for bonds and test wires prior to welding. Either prefabricated factory sleeved joint bonds or bond wire with formed sleeves made in the field are acceptable. Hold the cable at an approximate 30 degree angle to the pipe surface when welding.

D. When the weld has cooled, remove the weld slag and test the weldment for strength by striking a sharp blow with a two pound hammer while pulling firmly on the wire. Reweld unsound welds and retest weldments. Thoroughly clean mold and mold covers after completion of each weld to assure that no slag will penetrate into the next

weld.

E. After soundness of the weld has been verified, thoroughly clean with a stiff wire brush and coat. Thermite welds to steel and ductile iron pipe shall be coated with a plastic cap filled with elastomeric material. The elastomeric cap shall extend on all four sides beyond the cleaned area. Apply primer over the entire weld area and over the entire area where the elastomeric cap will be placed. Push the dome of the prefabricated cap containing elastomeric material firmly into weld area. Lift the wire away from the pipe and apply the elastomeric material completely around and underneath the wire. Push the wire back down on the pipe. Follow all manufacturer's instructions for installing prefabricated caps. Repair pipe coating as recommended by the pipe coating manufacturer.

F. Pin brazing is not an acceptable alternative to thermite welding.

4.02 BONDED JOINTS

A. All new ductile iron pipe joints and the non-welded steel pipe joins, including those on pipe, fittings, valves and branch connections, except those specified to be insulated, shall be bonded with insulated copper cables as shown on the Drawings. All bond cables shall be thermite welded to the pipe or fitting as described above. Pin brazing is not an acceptable alternative to thermite welding.

B. All joints shall be bonded with two HMWPE insulated copper cables. Wire size shall be AWG No. 2 for piping larger than 36-inch, AWG No. 4 for 16-inch through 36-inch piping, and AWG No. 6 for piping smaller than 16-inch.

4.03 PREPACKAGED ANODES

A. Prepackaged magnesium and zinc anodes shall be installed where indicated. Prior to installation, remove all shipping covers from the anode (the prepackaged cardboard box shall not be removed). Install the anodes in existing soils (free from rocks, roots, organic material, trash or other debris) and backfill with a minimum of 6 inches of existing soil (as described above). Do not install the anode in sand, rock or gravel backfill. Provide a minimum anode spacing of two feet from other pipelines. Pre-soak the anode with 5 gallons of water after placement, but prior to backfilling.

B. At anode test stations, anode lead wires shall be buried a minimum of two feet below grade. Handle wire with care. Splice the AWG No. 12 solid copper wire supplied with the anode to an AWG No. 8 HMWPE stranded copper cable through the use of a compression connector as shown. Tape the splice with three layers of high voltage rubber splicing tape (50% overlap), followed by three layers of vinyl electrical tape (50% overlap). Terminate the ends of the AWG No. 8 anode header cable in the test boxes utilizing the terminal lugs and shunts as indicated.

C. At fire hydrant and insulating joint test stations, anode lead wires shall be buried a minimum of two feet below grade. Handle wire with care. Route the AWG No. 12 solid copper wire supplied with the anode to the test box as shown. Terminate the ends

of the anode lead wires in the test boxes utilizing the terminal lugs and shunts as indicated.

4.04 AC GROUND MATS

A. Install the zinc ribbon anode ground mat in a spiral configuration at the test box locations shown on the Drawings, but never in contact with the pipe. The ground mat must be installed circling the test box and not necessarily directly over the pipeline. If the ground mat cannot be installed in a spiral configuration around the test box for some reason, immediately contact the Engineer for direction.

B. The zinc ribbon ground mat shall be a minimum of 18 inches below grade and shall be backfilled with native soil (free from rocks, roots, organic material, trash or other debris) for six inches above the mat. A minimum of 6 inches of gravel (washed stone a minimum of 0.5 inch in diameter) shall be placed above the mat's native soil backfill before finish grading with site soil is performed.

C. The ribbon anode ground mat shall have a maximum spacing of 18 inches between rings and a minimum total width of eight feet on all sides of the test stations. Anode material shall never be in contact with the pipe.

D. Attachment of the AWG No. 8 HMWPE lead wire to the ribbon anodes shall be made by removing only sufficient anode material from the wire core for attachment and installing a compression connector around the wire and core. Follow manufacturer's recommendations for removing the anode material from the core. Tape the resulting splice with three layers of high voltage rubber splicing tape (50% overlap), followed by three layers of vinyl electrical tape (50% overlap). Terminate the ends of the AWG No. 8 anode header cable in the test box utilizing terminal lugs and 0.01 ohm shunts as indicated on the Drawings.

4.05 TEST STATIONS

A. Install test stations at the locations indicated. Test boxes are to be located directly over the pipeline except in areas that would place the test station in a roadway. Locate these test stations to the closest point just off the edge of the road. In that case, the test wires shall be routed under the roadway to the test box through PVC conduit. In Install test stations at the locations indicated. Test boxes are to be located directly over the pipeline except in areas that would place the test station in a roadway.

B. The test boxes shall be set in poured concrete, two feet on each side and six inches thick reinforced with 4 inch by 4 inch - W2.1 by W2.1 welded wire fabric.

C. All test station wires shall be routed a minimum of two feet below finished grade. Maintain sufficient slack in the test wires so that the wires can extend a minimum of 18 inches from the test box. Connect the test wires to the test station terminal block with one-hole, compression terminal lugs for 0.25 inch bolt size. Install a shunt and a copper shorting strap to connect the anode leads to the pipe lead where indicated on the Drawings.

D. Install horizontal PVC or Polyethylene pipe at the bottom of vertical riser to prevent the riser from rotate.

4.06 REFERENCE ELECTRODES

Install reference electrodes at the test stations indicated. The reference electrodes shall be installed at an approximate depth of six inches below the bottom of the pipe trench. The reference electrode shall be approximately 12 inches apart centered on the vertical centerline of the pipe. Native trench material shall be used to backfill the reference electrode for a minimum of six inches. Prior to installation, remove the plastic shipping cover from the reference electrode. The cloth bag containing the special backfill shall remain intact.

4.07 CLEARANCE TO OTHER STRUCTURES

Twelve inches of natural clearance shall be maintained to other structures, where possible. When 12 inches of clearance cannot be maintained, install a flexible polyethylene mesh webbing pad around the new piping and secure with non-metallic tape.

4.08 INSULATING FLANGES

A. Insulating flanges shall be installed where shown on the Drawings. The CONTRATOR shall carefully align and install the insulating components according to the insulator manufacturer's instructions. Before coating, the CONTRACTOR shall test each insulator for electrical isolation. If the insulator is not properly isolated, the CONTRACTOR shall, at his expense, repair or replace all defective components. The CONTRACTOR shall test the repaired insulator. This process will continue until the insulator is tested to be properly isolated. The insulator shall then be coated as described in 4.09 below. After coating, the CONTRACTOR shall test each insulator for electrical isolation. If the insulator is not properly isolated, the CONTRACTOR shall, at his expense, repair or replace all defective components. The CONTRACTOR shall test the repaired and recoated insulator. This process will continue until the coated insulator is tested to be properly isolated.

B. If the insulator is not immediately backfilled after verification of effective isolation of the coated insulator, it shall be retested for effective isolation immediately prior to backfilling. If the insulator is not properly isolated, the CONTRACTOR shall, at his expense, repair or replace all defective components. The CONTRACTOR shall test the repaired and recoated insulator. This process will continue until the coated insulator is tested to be properly isolated. The properly isolated insulator shall then be immediately backfilled.

C. The CONTRACTOR shall retest the insulator for effective isolation immediately after backfilling. If the insulator is not properly isolated, the CONTRACTOR shall, at his expense, expose and repair or replace all defective components. The CONTRACTOR shall test the repaired and recoated insulator. This process will continue until the coated insulator is tested to be properly isolated. The properly isolated insulator shall then be immediately backfilled. The CONTRACTOR shall retest the insulator for

effective isolation immediately after backfilling. This process will continue until the coated insulator is tested to be properly isolated.

D. The coated insulator shall be tested for electrical isolation as part of the final acceptance testing conducted by the ENGINEER. Any and all insulators that fail the final acceptance test for isolation shall be excavated and repaired by the CONTRACTOR at no additional cost.

4.09 COATING OF INSULATING FLANGES

A. Insulating flanges and insulating corporation valves, including all isolation components, shall be fully coated for a minimum of 12 inches on either side of the flange, couplings, or corporation valve. The insulator shall be coated after verification of proper electrical isolation. The insulator shall be coated as described below.

1. Clean the surface of the insulator, and all of its components by power tool cleaning in accordance with the SSPC SP3. Follow all surface preparation recommendations of the coating manufacturer.

2. Apply a uniform coat of the primer to the external surface of the insulator, and all of its components including; bolts, nuts, etc. The primer shall extend a minimum of twelve inches on either side of the insulator.

3. Apply filler mastic to all irregular surfaces of the insulator to assure a smooth profile for application of the inner tape coating.

4. Apply innerwrap to the insulator, and its components in a spiral fashion with a minimum overlap of 55%. The innerwrap shall extend a minimum of twelve inches on either side of the insulator.

5. Apply outerwrap to the insulator, and its components in a spiral fashion with a minimum overlap of one inch. The outerwrap shall be applied with sufficient tension to provide continuous adhesion of the outerwrap tape. Install test facilities at the insulating flanges as shown on the Drawings.

4.10 INSULATED CASING SPACERS AND CASING END SEALS

A. Each length of pipe within the casing shall be supported and electrically isolated from the casing by the use of insulating spacers (supports). The number of casing spacers and the spacing between them shall be in accordance with the recommendations of the casing spacer manufacturer but no fewer than three (one at each end and one at the midpoint of the pipe) shall be used to support each section of pipe. The insulating spacers shall be of sufficient dimension to center the carrier pipe within the casing and to serve as runners to slide the carrier through the casing.

B. After the carrier pipe is installed within the casing, the CONTRACTOR shall test the electrical isolation between the casing and the carrier pipe. If the carrier pipe is not electrically isolated from the casing, the CONTRACTOR shall, at no cost to the

OWNER, remove the carrier pipe from the casing, replace any and all defective or damaged casing spacers and reinstall the carrier pipe in the casing. The CONTRACTOR shall retest the repaired electrical isolation. This process will continue until the casing is tested to be electrically isolated from the carrier pipe. Pipe to casing insulation that passes for effective isolation during the pre-backfill test, but does not render positive isolation results during the acceptance testing must be repaired by the CONTRACTOR at no additional cost to the OWNER. The CONTRACTOR shall provide the ENGINEER a minimum notice of one week prior to the completion of the installation of piping within a casing.

C. Install casing end seals at both ends of the casing after the casing isolation has been confirmed as effective. The casing end seals shall be installed in accordance with the written instructions of the end seal manufacturer.

4.11 CONCRETE BUTTRESSES, SUPPORT BLOCKS, ANCHOR BLOCKS, AND OTHER CONCRETE STRUCTURES

Position reinforcing steel used in the construction of support blocks, anchor blocks, and any and all other concrete structures so that they are not in contact with the piping. Maintain a minimum of 2 inches of clearance between the piping and all reinforcement steel or other metallic components. Under no circumstances shall metallic pipe be in contact with reinforcing steel.

4.12 PENETRATION OF CONCRETE STRUCTURES

When penetrating a concrete slab (wall or floor), install a linked rubber seal between the pipe and the concrete slab sleeve. Install the linked rubber seal in accordance with the manufacturer's recommendations. The linked rubber seal is to be installed to isolate the piping from direct contact to the concrete and to seal the area of the pipe penetration from water intrusion. Under no circumstances shall metallic pipe be in contact with reinforcing steel.

PART 5 - POST INSTALLATION TESTING

5.01 TESTING

Prior to substantial completion, the CONTRACTOR will perform post installation testing of all corrosion control/corrosion monitoring systems. The repair or replacement of any defective or improperly installed systems shall be the sole responsibility of the CONTRACTOR. Any and all repairs or replacement of defective or improperly installed corrosion control/corrosion monitoring systems shall be performed by the CONTRACTOR at no additional cost to the OWNER. Engineer shall approve all work.

A. General: Inspect, energize, and adjust the cathodic protection as soon as possible after the equipment has been installed.

B. Energization: Perform the energizing of the cathodic protection system by a Corrosion Engineer to achieve compliance with the referenced corrosion control standards set forth by NACE and/or AWWA.

C. Method of Testing:

1. Measure native state pipe-to-soil potentials at all test stations, permanent reference cells, electrical isolation devices, and locations of exposed pipe prior to energizing the cathodic protection system

2. Measure casing-to-soil potentials and foreign line potentials, prior to energizing the cathodic protection system.

3. Connect anodes to pipeline as per drawings. Allow sufficient time for the pipeline to polarize.

4. Verify that all electrical isolation devices are operating properly including flange isolators, and casing spacers.

5. Verify that interference does not exist with foreign pipelines. Perform joint tests and mitigate any interference detected.

6. Make a punch list of outstanding work identified during walk-through inspection. Once Contractor has completed all work on punch list, pipeline will be allowed to polarize for 30 days before final testing. Perform final testing after 30-day polarization period. Repair deficiencies discovered during final testing at Contractor's expense.

7. Equipment: All cathodic protection testing instruments to be in proper working order and calibrated according to factory specifications.

END OF SECTION

SPECIAL PROVISIONS SECTION 3 – GEOTECHNICAL INSTRUMENTATION AND MONITORING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Work described under this section pertains to all pipe installation activities and includes trenchless crossings and/or pile driving operations.

B. Furnish all materials, equipment, labor and services required for the complete installation, maintenance, protection and monitoring of instrumentation, and reporting of collected data for all instrumentation on buildings, utilities and in the ground adjacent to the site or on the site as specified in this Section and as necessary to monitor construction performance and impacts on adjacent property.

C. Prior to the start of work the Contractor shall hire an independent qualified inspection agency to perform a pre-constructions survey.

D. Coordinate and obtain all permissions required, both public and private, to install geotechnical instrumentation.

E. Establish response actions to be taken if the maximum allowable instrument readings are exceeded so that existing structures and utilities are protected from damage. Implement response actions if maximum allowable instrument readings are exceeded.

F. If damage to adjacent facilities is reported, the Contractor shall hire an independent qualified inspection agency to perform a post – construction survey. The post-construction survey shall collect data from the same locations as the pre-construction survey. A final report, comparing the results of the pre- and post-construction surveys shall be complete and submitted to the Engineer within 60 days of completion of the work.

G. Dispose of all instruments at the end of the project as instructed by the Engineer.

1.2 SUBMITTALS

A. Submit for review by the Engineer the following information two weeks prior to instrument installation:

1. Full details of the proposed locations, types and installation methods of the instruments.

2. The names, qualifications and experience of the personnel or subcontractor (s) who will install the instruments, performing optical level survey or reading the instruments and reporting data to the Engineer.

3. Submit the qualifications of the independent inspection agency as described herein.

4. Copies of all instrument calibrations and certifications specified.

5. Two copies of the pre-construction survey.

B. Within one (1) week following installation, the Contractor shall submit to the Engineer drawings showing actual locations of the instruments and installation and baseline monitoring records. The installation and monitoring records shall include appropriate items from the following list, but not be limited to:

1. Project name and number.

2. Instrument type and number.

3. Planned and as-built location in horizontal position and elevation.

4. Personnel responsible for installation and / or monitoring.

5. Date and time of installation and / or monitoring.

6. Spaces for initial readings to be taken to ensure the instruments are working properly or any necessary measurements as required to ensure proper installation.

7. A space on the record sheet for notes, including problems encountered, delays, unusual features of the installation, and details of any events that may have a bearing on the instrument behavior.

C. Submit data collected during the work as described in Paragraph 3.05 of this Section.

1.3 QUALITY ASSURANCE

A. The Contractor shall be responsible for all aspects of the geotechnical instrumentation specified herein. Personnel employed by, or subcontractor(s) retained by, the Contractor to perform optical level surveys, instrument readings, and report data shall be qualified by a minimum of three (3) years of experience with similar work. Personnel performing optical level surveys shall be professional Land Surveyors registered in the State of North Carolina.

B. The independent inspection agency hired by the Contractor to perform the pre- and post-construction surveys shall have at least three (3) years of experience with similar work.

PART 2 - PRODUCTS

2.1 SURVEYING INSTRUMENTS

A. Elevations of all instrumentation shall be determined to an accuracy of plus / minus 0.01 feet.

B. Horizontal position of all instrumentation shall be determined to an accuracy of plus / minus 0.1 feet.

2.2 DEFORMATION MONITORING POINTS

A. Deformation monitoring points (DMPs) will be used to monitor vertical and horizontal deformation of various facilities as follows:

1. DMP1 – Vertical deformation of paved areas, non-paved areas or railroad tracks.

2. DMP2 – Vertical deformation and angular distortion of existing buildings and structures near constructions activities.

3. DMP3 – Vertical deformation of the rims on utility manholes.

B. The following three types of DMPs shall be used to monitor deformation.

1. DMP – Type 1 in paved areas shall consist of a 2 inch long masonry nail. The nail shall be manufactured from hardened zinc – plated steel. The masonry nail shall be driven into an asphalt covered surface. Each nail shall be individually identified by an identification tag or surface marking.

2. DMP – Type 1 in non paved areas shall consist of a 3 ft. long, ¾ inch diameter steel rod. The rod shall be driven into the ground or set in concrete in the ground such that no more than 3 inches of the rod is exposed above the ground surface. The top of the rod shall be rounded and punchmarked at its center. Each rod shall be individually identified by a surface marking.

3. DMP – Type 2 shall consist of brass bolts at least 1.5 inches long with ¾ - inch hexagonal heads securely and permanently installed for the full thread length in the surfaces to be monitored such that the elevation of a horizontal surface of each bolt head can be surveyed. Bolts installed in drilled – in blot shields with shields and bolt threads fixed in place with appropriate epoxy glue are suggested. Other device designs or possibly existing building foundation features may be used subject to approval by the Engineer prior to installation.

4. DMP – Type 3 shall consist of an observable cross mark or welded bead on the top horizontal surface of utility manhole rims. The surface within 3 inches of the point shall be cleaned and / or marked to permit easy identification of the exact point. The point shall also be clearly identified using fluorescent spray paint adjacent to the point.

2.3 SEISMOGRAPHS

A. Provide portable seismographs for monitoring the velocities of ground vibrations resulting from construction activities when necessary. Required characteristics of seismographs are listed below:

1. Measure the three mutually perpendicular components of particle velocity in directions vertical, radial and perpendicular to the vibration source.

2. Have a flat velocity frequency response with a minimum broad band of 6 Hz to 150 Hz with a tolerance equal to or better than plus or minus 10 percent.

3. Self – triggering wave form capture mode that provides the following information: plot of wave forms, peak particle velocities, peak overpressure, frequencies of peaks.

4. Continuous monitoring mode must be capable of recording single – component peak particle velocities, and frequency of peaks with an interval of one minute or less.

PART 3 - EXECUTION

3.1 GENERAL

A. The Contractor shall demonstrate to the satisfaction of the Engineer proper installation of each instrument. The Contractor shall immediately replace within 72 hours of damage any instrument that becomes damaged or is destroyed for whatever reason, at no additional cost to the Owner. If necessary, the contractor will suspend work in the areas being monitored by the damaged instrument and take remedial action.

B. The Contractor shall install instruments in accordance with the installation procedures that were submitted by the Contractor as specified in Paragraph 1.03 A.1 and reviewed by the Engineer. Instruments shall be installed and baseline data, acceptable to the Engineer, obtained before construction starts.

C. A factory calibration shall be conducted on seismographs prior to delivery to the site. Certification shall be provided to indicate that the test equipment used for this purpose is calibrated and maintained in accordance with the test equipment manufacturer’s calibration requirements and that, where applicable, calibrations are traceable to the National Institute of Standards and Technology.

D. The instrumentation and monitoring specified here is considered the minimum required. The Contractor shall obtain additional data from the instrumentation and /or furnish, install and monitor additional instrumentation as necessary to adequately monitor construction performance and safety aspects of the work.

3.2 PRECONSTRUCTION SURVEY

A. Perform a video survey as specified in Special Provisions Section 5 supplemented by written narrative and still photographs as necessary of all buildings, streets, curbs, sidewalks, driveways, fences, and other structures within 100 – ft of the proposed construction and within such additional distance as deemed appropriate by the Contractor and / or Engineer. Document existing conditions, paying

particular attention to damage such as cracks, previous settlements, sumps in basement, etc.

3.3 INSTALLATION OF DEFORMATION MONITORING POINTS

A. Install DMPs as described below at trenchless crossing locations. Additional DMPs may be required by the Engineer.

B. DMP – Type 1

1. In general, DMP – Type 1 (DMP1) shall be installed in the pavement or railroad tracks over the proposed jacked or tunneled pipe alignment in rows of 3 oriented perpendicular to the pipe alignment. DMP1 locations are shown on the Drawings are considered the minimum DMP1s required for this project. Locations may be modified to meet site constraints with the approval of the Engineer. The Engineer may require additional DMP1s be installed to monitor ground movements at other locations.

C. DMP – Type 2

1. DMP – Type 2 shall be installed on the exterior walls of buildings or structures located within 100 ft of casing pipe or tunnels. As much as practicable DMP2s shall be installed on supporting walls or columns. Avoid installation in brick unless absolutely necessary.

2. As a minimum four DMP2s shall be installed on the exterior wall corners of buildings, structures or properties boundary walls. The Engineer may require additional DMP2s be installed to monitor building movement at other locations.

3. Install DMP2s in cooperation with property Owners so that installations are inconspicuous and acceptable to he property Owners. Existing features of building foundations that are permanent and can be repeatedly surveyed may substituted for DMP2s if approved by the ENGINEER.

D. DMP – Type 3

1. DMP – Type 3 shall be installed on the rim of manhole covers of utilities located within 100 ft of trenchless crossings.

E. Install and obtain DMP readings prior to beginning excavation, tunneling, pipe jacking or operation of groundwater control system at the site. The Contractor shall obtain two measurements for each DMP to establish the baseline data within three (3) days of installation. These measurements shall be made at least 24 hours apart but not more than 48 hours apart. DMPs with initial surveyed elevations (or offsets as appropriate) differing by more than 2mm shall be check for secure installation and resurveyed.

F. The reading schedule of all DMPs surveyed should be daily during excavation, tunneling and pipe jacking within 100 ft of the work and then at least weekly until all excavation, dewatering and backfill has been completed. Additional surveys shall be made if excessive ground or building movement is noticed.

3.4 INSTALLATION OF SEISMOGRAPHS

A. If construction activities such as jacking or pile driving that induce noticeable ground vibrations will occur within 100 ft of vibration sensitive locations install seismographs to monitor vibrations. Seismograph locations shall include points on the ground surface between 3 and 6 feet from the faces of the nearest building(s). Seismographs shall be firmly mounted on the surface slab of concrete or asphalt, or firmly set in undisturbed soils.

3.5 READING AND REPORTING

A. The Contractor shall collect, tabulate, plot and interpret the survey monitoring data and provide the Engineer with the tabulated and plotted data. Report the status of excavation, bracing, groundwater levels, pipe jacking or tunneling operations and backfilling at the time of data collection with each report.

B. All data shall be tabulated and plotted within 24 hours of collection and made available for the Engineer's review at the Contractor's field office. Communicate verbally with the Engineer immediately after visual observations or data collection if excessive movements or other anomalies are indicated.

C. Seismographs readings shall be taken during jacking, pile driving or other activities that cause noticeable ground vibrations to document that peak particle velocities do not exceed the vibration limit criteria.

D. The maximum allowable deformation measured at any DMP1 shall be 0.10 ft. The maximum allowable deformation measured at any DMP2 or DMP3 shall be 0.05 ft. The Engineer may alter these criteria depending on the results of the pre-construction survey or previous movements at a particular location.

E. The Contractor shall make visual observations of ground conditions and building conditions in the vicinity of the site and communicate immediately with the Engineer if signs of ground or building movements are observed.

F. Where DMP1s cannot be installed due to access limitations due to roadway and/or railroad traffic, detailed visual observations of ground conditions shall be made, as much as practical, at the same frequency as DMP1 readings are the results reported to the Engineer.

G. The Engineer may take independent instrumentation measurements. Cooperate with the Engineer during instrumentation monitoring by providing access to the instrumentation locations in a timely manner and by providing and maintain safe means of access to all instrumentation locations for data collection. Data acquired by the Engineer will be made available to the Contractor in a timely manner.

H. If and when deemed appropriate by the Engineer, the Engineer will advise the Contractor regarding the performance of the excavation support systems, groundwater control systems, pipe jacking and / or tunneling operations in connection with the Contractor's responsibility for the protection of adjacent structures and utilities and maintenance of a dry excavation, and other requirements

of this contract. Such advice by the Engineer, if given, does not relieve the Contractor of his responsibility to complete the Work in accordance with the Contract.

I. The Owner will provide the Contractor with benchmarks and datum for survey reference. All Contractor elevation surveys for geotechnical instrumentation shall begin and end at a benchmark. The Contractor should note that benchmarks may be within the radius of influence of the work and may settle. Check benchmark elevations periodically, as directed by the Engineer, using benchmarks outside the radius of influence of the work.

J. Protect all instruments from damage during the execution of the Contract. If any instrument is damaged, replace the damaged instrument and obtain new initial measurements immediately and at no cost to the Owner.

END OF SECTION SP 3

SPECIAL PROVISIONS SECTION 4 – DUCTILE IRON PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Unless otherwise shown on the Drawings, water main sized 12-inch and larger may be ductile iron pipe.

B. Furnish all labor, material, tools, equipment and incidentals necessary and install, ready for operation, all large-diameter ductile iron pipe as shown on the Drawings and as specified herein. The work shall include the testing of materials, pipe, and pipelines.

C. The Contractor shall be responsible for all details, devices, accessories, and special construction necessary to properly furnish, install, adjust, test, and place the water main in continuous service, and to complete the work.

1.2 SUBMITTALS

A. Submit to the Engineer the name of the pipe and fittings manufacturers and a list of materials to be furnished.

B. Within 5 days after Bid opening, submit a list of similar projects as specified in Paragraph 1.4.A.

C. Submit shop drawings with a tabulated laying schedule showing the location of each piece, by mark number, for the entire job. In addition, the laying schedule shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; the station and invert elevation to which the bell end of each pipe will be laid; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained and/or welded joints, or of concrete encasement. The laying schedule shall indicate fittings, bevels, joint type, outlets, tees, bends, adaptors, and specials. The laying schedule shall show direction of lay, pipe design pressure, station limits, and transition stations for various pipe design pressures. The above shall be submitted to the Engineer for approval before manufacture and shipment. Pipe shall not be supplied from inventory. Submit manufacturer's drawings and specifications indicating details of all items included in the laying schedule.

D. Submit anticipated production and delivery schedule within 10 days after receipt of Notice of Award.

E. Submit to the site representative lists, in duplicate, of all pieces of pipe and fittings in each shipment received. These lists shall give the identifying number, weight, class, size and description of each item received.

F. Design Data

1. Submit design specification data sheets listing all parameters used in the pipe design including but not limited to:

a. Pressure Class and Test Pressure of the pipe

b. Pipe Lining

c. Pipe Coating

d. Joint Type

K. Certificates.

1. Prior to shipment of pipe, submit certification by the pipe manufacturer stating that the pipe for the Contract was manufactured and tested in accordance with the AWWA standards specified herein.

L. Test Reports

1. Contractor shall submit field pressure/leakage test reports. Include pipe mark numbers, test pressures, and test results.

M. Submit test reports for all shop and/or field repairs made to any lining or coating (for information only).

1.3 REFERENCE STANDARDS

A. ANSI/AWWA C104/A21.4 - Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water

B. ANSI/AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems

C. ANSI/AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings, 3-in through 48-in for Water and Other Liquids

D. ANSI/AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

E. ANSI/AWWA C115/A21.15 - Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges

F. ANSI/AWWA C150/A21.50 - Thickness Design of Ductile-Iron Pipe

G. ANSI/AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast for Water

H. ANSI/AWWA C153/A21.53 - Ductile-Iron Compact Fittings, 3-in through 24-in and 54-in through 64-in for Water Service

I. ANSI/AWWA C600 - Installation of Ductile-Iron Water Mains and their Appurtenances

J. ANSI/AWWA C606 - Grooved and Shouldered Joints

K. ANSI/AWS D11.2 - Guide for Welding Iron Casting

Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE

A. Require submitted evidence that the ductile iron pipe and fitting manufacturer has a minimum of ten years of experience in material production of diameters noted on the plans and specifications. All ductile iron pipe shall be domestically manufactured in the United States. All pipe material suppliers shall be ISO registered or provide the services of an independent inspection agency. Prior to the start of manufacturing, any manufacturer not meeting the ISO registration requirements shall submit to the owner and owner's engineer the names of an independent inspection agency for approval. The independent inspection agency shall be responsible for sample monitoring of chemical and mechanical test, sample visual inspection of quality assurance tests performed on in-process pipe and fittings, and a sample visual and dimensional inspection or finished product for this project. A certified inspection report from the independent inspection agency of all witnessed tests shall be supplied to the owner or owner's engineers within ten (10) days of completion of pipe manufacturing. Chemical samples shall be taken from each ladle of iron and the manufacturers' chemical control limits shall be maintained for at least the following elements: carbon, sulfur, phosphorus, silicon, magnesium, chromium, manganese, tin, aluminum, cerium, copper, and lead. When chemical values fall outside the manufacturer's control limits, additional mechanical property tests shall be performed to assure minimum mechanical properties are met.

1.5 DELIVERY, STORAGE AND HANDLING

A. Pipe shall be transported on padded bunks with nylon tie-down straps or padded banding to adequately protect the pipe and coating. Coated pipe shall be handled, stored and shipped in a manner that will prevent damage to the coating. Pipe shall be handled with wide belt slings or padded forklifts. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used.

B. Stored pipe shall at all times be supported on sawdust bags, sand bags, or other suitable support. Bags shall be of sufficient size to prevent contact of the pipe coating with the ground or any other obstruction. Rolling the pipe on the coated surface is not permitted.

C. Sufficient struts shall be furnished to maintain the pipe in a round condition (+/- 1%) and to limit its deflection during storage and transportation to the job site.

PART 2 - PRODUCTS

2.1 GENERAL

A. All pipe, fittings, and specials shall be marked in accordance with the laying schedule. Each pipe shall be uniquely numbered and said number shall appear on the laying schedule on the pipe and in the laying schedule. All special pipe sections and fittings shall be marked to clearly identify their location in the pipeline and to identify the centerline at the top of the piece. The markings on each pipe shall be such that the Owner can track the pipe through the entire manufacturing and installation process.

B. The pipe diameter shall be measured from internal wall of lining system.

2.2 MATERIALS

A. Unless otherwise specified, the design materials and workmanship for pipe shall conform to the requirements of AWWA C150/A21.50. For cement mortar lining, lining thickness for pipe shall be as specified in AWWA C600. Pipe shall be NSI/NSF 61 certified.

B. Ductile Iron Pipe shall be manufactured by American Ductile Iron Pipe Company, U.S. Pipe Co. or pre-approved equal.

C. Design Conditions

1. Ductile iron pipe shall be in accordance with ANSI A21.50/AWWA C150 and conform to the requirements of A21.51/AWWA C151, latest standards. All ductile iron pipe shall be domestically manufactured in the United States. Push-on and restrained joint pipe shall have a minimum rated working pressure of 150 psi. All buried pipe shall be pressure class as follows:

Pipe Sizes (inch)	Pressure Class (psi)
4-12	350
14-20	250
24	200
30-64	150

a. Pipe wall thickness shall be in accordance to bury depth as shown on drawings.
b. Flange pipe or Victaulic grooved pipe shall be class 53.
c. Direct tapping may be used in lieu of service saddles as per AWWA C-800.
d. Welded-on outlets may be used where appropriate in lieu of fittings for outlets smaller than 30” as approved by Engineer.

2. Welded-on Outlets

All welded-on outlets shall be rated for a working pressure of 250 psi and shall have a minimum safety factor of 2.0; except that 36" welded-on outlets for 54"-64" parent pipe diameters shall be rated at 200-psi. Welded-on outlets may be provided as a radial (tee) outlet, a tangential outlet, or a lateral outlet. Parent pipe and branch pipe shall meet hydrostatic test requirements in accordance with AWWA C151, section 51-9, prior to fabrication.

All joints on welded-on branch outlets shall be provided in accordance with the latest revision of ANSI/AWWA C111/A21.11 and/or ANSI/AWWA C115/A21.15, as applicable. All outlets shall be fabricated from centrifugally cast ductile iron pipe designed in accordance with ANSI/AWWA C150/A21.50 and manufactured in accordance with ANSI/AWWA C151/A21.51.

All welds must be produced using 55% nickel iron welding rod or wire. Carbon steel electrodes will not be acceptable. Both branch and parent outlet pipe shall be class 53. After fabrication each outlet pipe shall be air tested to 15 psi to insure weld integrity. A soap and water solution shall be applied during the testing procedure to inspect the weld for leakage. Any welds that show air seepage shall be refabricated and retested.

The type of pipe end for the branch outlet shall be as specified or indicated on the drawings. The maximum size and laying length of the welded-on branch outlet shall be recommended by the pipe manufacturer and acceptable to the Engineer for the field conditions and connecting pipe or valve. Pipe embedment material and trench backfill shall be placed and compacted under and around each side of the outlet to hold the pipe in proper position and alignment during subsequent pipe jointing, embedment, and backfilling operations.

3. Hydrostatic Testing

All pipe 4"-24" shall be tested per AWWA standards to 500 psi. All pipe, 30"-inches and larger, shall be subject to a factory hydrostatic test of at least 500 psi for a period of not less than 10 seconds after which time the pressure is to be elevated to a peak pressure that induces a stress in the pipe wall equivalent to 75% of the minimum specified yield of ductile iron (42,000 psi) as calculated by the following formula:

$$\mathbf{p} = \frac{\mathbf{2f_s\,t}}{\mathbf{D}}$$

Where: **p** = peak hydrostatic pressure

f_s = stress in pipe wall during hydrostatic test, which shall be 0.75 times the minimum yield strength of the ductile iron in tension, i.e.: 42,000 psi

t = nominal wall thickness, in.

D = outside diameter, in.

Factory Hydrostatic Test Pressures for Ductile Iron Pipe (30 in and Larger)										
Pressure Class	150		200		250		300		350	
Pipe Size/ Outside Diameter	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)	"t" (in)	Test Press. (psi)
30″ / 32.00	0.34	669	0.38	748	0.42	827	0.45	886	0.49	965
36″ / 38.30	0.38	625	0.42	691	0.47	773	0.51	839	0.56	921
42″ / 44.50	0.41	580	0.47	665	0.52	736	0.57	807	0.63	892
48″ / 50.80	0.46	570	0.52	645	0.58	719	0.64	794	0.70	868
54″ / 57.60	0.51	558	0.58	635	0.65	711	0.72	788	0.79	865
60″ / 61.60	0.54	552	0.61	624	0.68	695	0.76	777	0.83	849
64″ / 65.70	0.56	537	0.64	614	0.72	691	0.80	767	0.87	835

4. Ductile Iron Pipe and Joints

   General: Ductile Iron Pipe and fittings shall be furnished with push-on joints, push-on restrained joints, mechanical joints, flanged joDucints, and grooved joints as required. Pipe ends (spigot end, bell, and socket) for all pipe shall be gauged with suitable gauges at sufficiently frequent intervals to ensure compliance to the standard dimensions of ANSI/AWWA C151/A21.51, latest addition. Unless otherwise specified gasket material shall be standard styrene butadiene copolymer (SBR.)

   Push-on Joints shall conform to ANSI A21.11/AWWA C111 approved Fastite, Tyton, or Bell-tite, or equal. Unless otherwise specified gasket material shall be standard styrene butadiene copolymer (SBR.)

   Flange Joints shall conform to ANSI A21.15/AWWA C115, or to ANSI A21.10/AWWA C110 or ANSI A21.53/AWWA C153. Bolts and nuts shall conform to ANSI A21.11/AWWA C111. Candidate pipe for 4"- 54" flanged pipe thread-fabrication shall be Special Thickness Class 53 and for 60" – 64" flanged thread-fabrication shall be Pressure Class 350 ductile iron pipes, all in accordance with AWWA C115. Toruseal flange gaskets, or equal are required for all 16" and larger diameter flanged ductile iron connections.

   Mechanical Joints shall conform to AWWA C111. Bolts shall be high strength low alloy steel per AWWA C111. Unless otherwise specified, gasket material shall be standard styrene butadiene copolymer (SBR) per this standard.

   Restrained Joints shall be American FlexRing, American Lok-Ring, US Pipe TR Flex. Restrained gaskets shall be yellow or orange in color and color shall be consistent throughout the entire cross section of the gasket. The color shall not

be attained by surface coating; it shall be inherent within the rubber. Gaskets shall meet applicable requirements of AWWA/ANSI C111/A21.11 and shall be ANSI/NSF Standard 61 certified. Restrained gaskets shall be manufactured in the United States. Additional accepted methods of restraint shall be manufactured American Flex-Ring, Field Flex-Ring, Lok-Ring, US TR Flex, or equal. Restrained joints shall be rated at a minimum as follows:

- 350 psi for 4”-18” diameter
- 250 psi for 20”-24” diameter
- 250 psi for 30”-64” diameter

Grooved Joints. Should grooved joint be called for, groove joints shall be in accordance with AWWA C606. Grooved ductile iron pipe shall be Special Thickness Class 53 for 4” – 16”, Class 54 for 18”, Class 55 for 20”, and Class 56 for 24” – 36”.

Welded-on Thrust Collars: Welded-on thrust collars, for wall pipe and pipe thrust restraint, shall be welded steel collars designed for the thrust generated by 250 psi working pressure with a safety factor of at least two (2.0) against failure.

Subaqueous ductile iron pipe (as required per plans) shall be American Flex-Lok (ball and socket) or equal. Ball and socket pipe shall be class 56 minimum, with an allowable 25 degrees deflection for 4”-12” diameters and 15 degrees for 14”-54” diameters. The ductile iron spherical socket for 14”-54” shall be threaded onto the ductile iron pipe barrel with threads conforming to ANSI B2.1 adapted to standard ductile iron diameters. The ball end for 14”-54” shall be shall be threaded onto or integrally cast with the pipe barrel and machined to fit the adjoining pipe socket to provide constant compression of the gasket through the entire range of deflection of the assembled joint. Underwater lubricant is required with all ball and socket pipe.

5. Marking Pipe

Unless bar codes are provided, the weight, class or nominal thickness, and casting period shall be shown on each pipe. The manufacturer’s mark, country where cast, year in which the pipe was produced, and the letters “DI” or “DUCTILE” shall be cast or metal stamped on the pipe, and letters and numerals on pipe sizes 14” (.356mm) and larger shall be not less ½ in. (13 mm) in height. When required in the purchaser’s specifications, initials not exceeding four in number shall be cast or stamped on the pipe. All required markings shall be clear and legible, and all cast or metal –stamped marks shall be on or near the bell.

6. Ductile Iron Fittings

Mechanical Fittings / Restrained Fittings shall conform to ANSI A21.53/AWWA C153 or A21.10/AWWA C110, latest standard. All fittings shall be manufactured within the Unites States.

Flanged Fittings shall conform to ANSI A21.10/AWWA C110. The AWWA C110 fitting flanges shall have facing and drilling which match AWWA C115 threaded-

on flanges which also match ANSI B16.1 class 125 flanges except where class 250 are specifically noted.

Each fitting shall distinctly cast on the outside of the body the identity of the AWWA standard, the pressure rating; nominal diameter of openings; manufacturer's identification; the country where cast; the letters DI or word Ductile; and the number of degrees or fraction of the circle on all bends.

7. Linings and Coatings

Water and Reuse Water Linings – (Cement mortar lining is advisable for lines handling pH levels ranging from 6-10.) Ductile iron pipe, specials, and fittings shall be lined with cement mortar lining in accordance with AWWA C104.

The exterior of ductile iron pipe for buried service or where noted on the plans shall be coated with a layer of arc-sprayed zinc. The mass of the zinc applied shall be 200 g/m2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The mean dry film thickness of the finishing layer shall not be less than 3 mils with a local minimum not less than 2 mils.

The zinc coating system shall conform to ISO 8179 standard.

All pipe shall be manufactured and zinc coated in the United States at the pipe manufacturer's facility.

Unless otherwise noted, the exterior of ductile iron pipe for exposed service shall be primed with Wasser FerroClad, or Tnemec 37H-77, or Tnemec 140-1211 or equal. All primed material to receive a field coating as specified by the design engineer. Contact ductile iron manufacturer for additional recommended primers.

Ductile iron fittings for buried service shall receive a 1 mil asphaltic coating in accordance per AWWA C151/ANSI A21.51.

Ductile iron fittings for exposed service shall be primed in accordance to pipe requirements with Wasser FerroClad, or Tnemec 37H-77, or Tnemec 140-1211 or equal. All primed material to receive a field coating as specified by the design engineer. Contact ductile iron manufacturer for additional recommended primers.

PART 3 - EXECUTION

3.1 GENERAL

A. Care shall be taken during loading, transporting, and unloading to prevent injury to the pipes, fittings, or coatings. Pipe or fittings shall not be dropped. Each pipe or fitting shall be placed as near as practical to the point where it will be laid. They shall be secured in place to prevent their movement until required. Pipe shall be stored so that it is protected from injury to the pipe, coating, and pipe ends and so that it does not cause an inconvenience to traffic. All pipe and fittings shall be thoroughly

cleaned before laying, shall be kept clean until they are used in the work and when laid shall conform to the lines and grades shown on the Drawings.

B. No metal tools or heavy objects shall be permitted to come unnecessarily into contact with the finished coating. Workmen will be permitted to walk upon the coating only when necessary, in which case they shall wear shoes with rubber or composition soles and heels. All pipe and fittings, specials and couplings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to the coatings shall be repaired as acceptable to the Engineer.

C. All pipe and fittings shall be subjected to a careful inspection prior to and after installation. If any defective pipe is discovered before or after it has been laid, it shall be removed and replaced with a sound pipe.

D. Pipe bedding and backfill shall be as shown on the Drawings.

E. Regulate and control equipment and construction operations such that the loading on the pipe does not exceed the loads for which the pipe is designed and manufactured. Pipe found to have a deflection greater than allowable or longitudinal cracks in the lining (for cement-lined pipe) from construction equipment or other loading shall be removed from the line and replaced with sound pipe and closures as required.

F. The method of jointing the pipe shall be in strict accordance with the manufacturer's instructions. Arrange for the manufacturer to supervise the installation of at least the first three joints. The manufacturer shall make an additional on-site visit when the installation is approximately 50 percent complete to review the installation procedures.

3.2 INSTALLING DUCTILE IRON PIPE

A. All ductile iron pipe and fittings shall be handled and installed in accordance to ANSI/AWWA C600, latest edition and per manufacturer’s recommendations.

B. Domestic Origin … All pipe material (pipe and fittings) shall be manufactured within the United States.

C. Each pipe shall be thoroughly cleaned before being placed in the trench. As the pipe laying progresses, the interior shall be kept free of all debris.

D. The Contractor shall permit and aid in the inspection of the coating on the underside of the pipe at the time of installation and repair any damage before lowering the pipe into the trench. While being laid, the pipe shall not be rolled, skidded, or otherwise moved, when it contacts with the ground at any point.

E. As soon as the excavation is completed to the bottom of the excavation, place granular fill in the trench. The pipe shall then be firmly bedded in this gravel to conform to the line and grade indicated on the Drawings. The pipe embedment material shall be placed and compacted to a point one foot above the top of the pipe and as shown on the Drawings. Blocking under the pipe will not be permitted.

F. Pipe embedment material shall be compacted to give complete vertical and lateral support of the pipe. Before the pipe is lowered into the trench, the ends of the pipe shall be cleaned and free from dirt.

G. Not more than 200 feet of pipe shall be exposed ahead of backfilling in any trench section.

H. Except for short runs that may be permitted by the Engineer, pipe shall be laid uphill on grades exceeding 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement.

I. No pipe shall be installed upon a foundation into which frost has penetrated or at any time that there is danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.

J. Any damage to the pipe or the protective coating from any cause during the installation of the pipeline shall be repaired and holiday tested as acceptable to the Engineer.

K. All pipe shall be sound and clean before laying. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in laying. Fittings, in addition to those shown on the Drawings, shall be provided.

L. Prevent flotation of the pipe from unanticipated water coming into the trench during pipe installation or backfill. Any pipe movement shall result in reinstallation of the pipe. Pipe damaged by the movement shall be replaced.

M. After completion of backfilling and before acceptance of the work, all pipe shall be tested for excessive deflection by measuring the actual inside vertical diameter. Deflection measurements will be made by the Engineer. Pipe with diametral deflection exceeding the percentage specified in Paragraph 2.02.C of the normal inside diameter shall be uncovered and the bedding and backfill replaced as required to prevent excessive deflection. After replacing bedding and backfill, the pipe shall be retested.

3.3 CLEANING

A. At the conclusion of the laying, and prior to testing, thoroughly clean all of the new pipelines by flushing with water or other means to remove all dirt, stones, wood struts, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the lowest sections. If, after this cleaning, obstructions remain, they shall be removed.

B. After the pipelines are cleaned and if the groundwater level is above the pipe, or following a heavy rain, the Engineer will examine the pipe for leaks. If defective pipes or joints are discovered at this time, they shall be repaired or replaced.

3.4 TESTING

A. Joint Testing

1. Testing will be done in accordance with AWWA Standards.

B. Electrical Continuity

1. Furnish all necessary equipment and labor for carrying out a continuity check of the pipeline. This check shall be conducted prior to introduction of water into the pipeline for hydrostatic pressure and leakage testing.

C. Hydrostatic and Leakage Tests

1. Furnish all necessary equipment and labor for carrying out a pressure test on the pipelines. The test shall be made after backfill is compacted in place. The procedures and method for carrying out the pressure tests shall be approved by the Engineer.

2. Make any taps and furnish all necessary caps, plugs, bulkheads, etc, as required in conjunction with testing portions of the pipe. Furnish test pumps, gauges, meters and any other equipment required in conjunction with carrying out the tests. Hydrostatic pressure and leakage tests shall conform to AWWA C600 as modified herein.

3. The pipe shall be slowly filled with water and allowed to stand for 48 hours under slight pressure to allow the cement mortar lining to absorb water prior to application of the test pressure.

4. Lines which fail to meet the requirements of the test shall be repaired and retested as necessary until test requirements are met. Defective materials, pipes, valves and accessories shall be removed and replaced.

5. The Owner will supply at no cost to the Contractor a maximum quantity of water for testing purposes equal to 300 percent of the volume of the pipeline. Additional water required will be provided at the Owner's standard rates for the volume required. The Contractor will coordinate closely with the Owner to identify the source of test water, quantity of water, and allowable withdrawal rates. The Owner reserves the right to restrict or disallow withdrawal of water between 7:00 a.m. and 7:00 p.m. during the months of May through September.

6. Contractor shall provide all labor, equipment, etc. as required to bleed air from new piping to ensure a full pipe for testing purposes.

END OF SECTION SP 4

SPECIAL PROVISIONS SECTION 5 - STEEL PIPE AND FITTINGS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Unless otherwise shown on the Drawings, water main sized 30-inch and larger may be welded steel pipe.

B. Furnish all labor, material, tools, equipment and incidentals necessary and install, ready for operation, all large-diameter steel pipe as shown on the Drawings and as specified herein. The work shall include the testing of materials, pipe, and pipelines.

C. The Contractor shall be responsible for all details, devices, accessories, and special construction necessary to properly furnish, install, adjust, test, and place the water main in continuous service, and to complete the work.

1.2 SUBMITTALS

A. Submit to the Engineer the name of the pipe and fittings manufacturers and a list of materials to be furnished.

B. Within 5 days after Bid opening, submit a list of similar projects as specified in Paragraph 1.04.A.2.

C. Submit shop drawings with a tabulated laying schedule showing the location of each piece, by mark number, for the entire job. The layout schedule shall be prepared based on the alignment survey provided by the Contractor's registered land surveyor. In addition, the laying schedule shall include: the pipe station and invert elevation at all changes in grade or horizontal alignment; the station and invert elevation to which the bell end of each pipe will be laid; all elements of curves and bends, both in horizontal and vertical alignment; and the limits of each reach of restrained and/or welded joints, or of concrete encasement. The laying schedule shall indicate fittings, bevels, joint type, outlets, tees, bends, adaptors, and specials. The laying schedule shall show direction of lay, pipe design pressure, station limits, and transition stations for various pipe design pressures. The above shall be submitted to the Engineer for approval before manufacture and shipment. Pipe shall not be supplied from inventory. Submit manufacturer's drawings and specifications indicating details of all items included in the laying schedule.

D. Submit anticipated production and delivery schedule within 10 days after receipt of Notice of Award.

E. Submit joint and pipe/fitting wall construction details that indicate the type and thickness of the steel wall; manufacturing tolerances; and other pertinent information required for the manufacture of the product.

F. The actual testing and production dates shall be confirmed by the Contractor in writing to the Engineer not less than 14 days prior to the start of a test or production

run. Submit information regarding location, type, size, and extent of all welds shown on the shop drawings. The shop drawings shall distinguish between shop and field welds. Shop drawings shall indicate by welding symbols or sketches the details of the welded joints, and the preparation of parent metal required to make them.

G. Submit to the site representative lists, in duplicate, of all pieces of pipe and fittings in each shipment received. These lists shall give the identifying number, weight, class, size and description of each item received.

H. Design Data

1. Submit design specification data sheets listing all parameters used in the pipe design.

a. ASTM Designation and grade of the steel

b. Thickness and diameter of the pipe

c. Pressure Class and Test Pressure of the pipe

d. Pipe Lining

e. Pipe Coating

f. Joint Welds

2. Submit design calculations for information only including formulas used in the calculations, values of constants used in the formulas in accordance with AWWA C200 and AWWA M11 based on internal pressure, deflection and external loads. Design calculations shall be signed and sealed by a Registered Professional Engineer employed by the pipe manufacturer.

I. Submit shop drawing data on polyurethane lining and/or coating systems. Include product data and samples of all proposed coating and lining products. Provide documentation listing a minimum of five water pipe projects of over 100,000 square feet that have used the proposed polyurethane products including names and phone numbers of customer references. Submit certification for both field and factory personnel who are trained and approved by the coating/lining manufacturer for the application of the proposed products. Include the date of training for each person.

J. Certificates.

1. Within 10 days of shipment of pipe, submit certification (Certificate of Compliance - COC) by the pipe manufacturer stating that the pipe for the Contract was manufactured and tested in accordance with the AWWA standards specified herein. Each individual piece of pipe shall have its own COC. Any additional test reports requested by the engineer shall be submitted within 4 weeks after the conclusion of pipe shipments.

2. Submit certified mill test reports of all materials used in the manufacture

and/or installation of the pipe within 4 weeks after the conclusion of pipe shipments.

3. Submit certification that polyurethane coating and/or lining is to be manufactured at a facility that is certified as meeting SPFA or ISO 9001:2015 quality management standards.

4. Submit certification that any equipment used in applying polyurethane coating is acceptable to the lining/coating manufacturer.

K. Test Reports

1. Submit shop tests results on production pipe including pipe mark number, results of lining coating inspection, and the results of the shop holiday testing for the lining and/or coating on all pipe, fittings, and specials.

2. Contractor shall submit field pressure/leakage test reports. Include pipe mark numbers, test pressures, and test results.

L. Submit test results for field magnetic particle joint test. Include pipe mark numbers and test results.

1.3 REFERENCE STANDARDS

A American Society for Testing and Materials (ASTM)

1. ASTM A139 - Standard Specification for Electric-Fusion (Arc) -Welded Steel Pipe (NPS 4-in and over)

2. ASTM A181 - Specification for Forged or Rolled Steel Pipe Flanges, Forged Fittings, and Valves and Parts for General Service

3. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates

4. ASTM A285 - Specification for Pressure Vessel Plates, Carbon Steel, Low and Intermediate-Tensile Strength

5. ASTM A307 - Specification for Carbon Steel Externally and Internally Threaded Standard Fasteners

6. ASTM A325 - Specification for High Strength Bolts for Structural Steel Joints

7. ASTM A572 - Standard Specification for High-Strength Low-Alloy Columbium- Vanadium Structural Steel

8. ASTM A568 - Specification for General Requirements for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled

9. ASTM A1011 - Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality

10. ASTM C150 - Standard Specification for Portland Cement

B. American Water Works Association (AWWA)

1. AWWA C200 - Steel Water Pipe - 6-in (150mm) and Larger

2. AWWA C205 - Cement-Mortar Protective Lining and Coating for Steel Water Pipe 4-in and Larger - Shop Applied

3. AWWA C206- Field Welding of Steel Water Pipe

4. AWWA C208 - Dimensions for Fabricated Steel Water Pipe Fittings

5. AWWA C216- Heat-Shrinkable Cross-Linked Polyolefin Coatings for the Exterior of Special Sections, Connections, and Fittings for Steel Water Pipelines

6. AWWA C222 - Polyurethane Coatings for the Interior and Exterior of Steel Water Pipe and Fittings

7. AWWA C604 – Steel Pipe Installation Standard

8. AWWA M11 - Steel Pipe -A Guide for Design and Installation.

C. American National Standards Institute (ANSI)

1. ANSI 81.1 - Unified Inch Screw Threads (UN and UNR Thread Form)

2. **ANSI** 818.2.1 - Square and Hex Bolts and Screws, Including Askew Head Bolts, Hex Cap Screws, and Lag Screws

3. **ANSI** 818.2.2 - Square and Hex Nuts

D. American Welding Society (AWS)

E. American Society of Mechanical Engineers (ASME)

F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE

A. Supplier Qualifications

For SUPPLIERS **not** listed as pre-approved in 2.2 B., the CONTRACTOR shall submit to the OWNER minimum ten (10) days prior to bid opening evidence that the SUPPLIER meets the following requirements:

1. Steel Plate Fabricators Association (SPFA) Certification or ISO 9001 Certification.
2. Demonstrate current production capability for volume of work required for this project.
3. Manufacturer must have 10 years of experience in the manufacture of AWWA C200 steel pipe.
4. Experience for the successful pipe manufacturer shall include successful manufacture of at least 100,000 lineal feet of 54 inch diameter or larger pipe, with wall thickness of 0.225 inches or greater, within the past ten years with the type of joint specified and shall have been manufactured in the United States to AWWA C200, lined with cement mortar in accordance with AWWA C205, and coated with either tape in accordance with AWWA C214 or polyurethane in accordance with AWWA C222. Experience in manufacturing pipe to standards other than AWWA C200 shall not apply. Lining and coating shall be applied by the same company that is manufacturing the pipe.
5. Successful manufacturing experience required in number 3 above shall be of the same pipe fabrication process (straight-seam or spiral-seam) as will be used for the bidding project.
6. When the SUPPLIER employs fabrication subcontractors, the SUPPLIER will be responsible for all aspects of outsourcing, submittals, drawings, etc. All submittal drawings, regardless of origin, shall be provided in an identical format. SUPPLIER shall be responsible for any additional inspection costs of fabrication subcontractor and will assure work is performed in full conformance to the project specifications. Fabrication subcontractor(s) must be Steel Plate Fabricators Association (SPFA) or ISO 9001 certified.
7. SUPPLIER shall be responsible for compiling their own design calculations, details, and layout as part of the submittal process. The required submittals shall not be performed by a 3rd party but by direct staff of the Supplier. The submittal process must be overseen by a Professional Engineer (P.E.) employed by the Manufacturer
8. Polyurethane coating materials shall have a documented history of successful application and performance in water piping projects greater than 100,000 square feet.

B. Proof of Design Tests

1. Proof of Design Tests (or previously performed Proof of Design Tests that were witnessed and certified by an independent testing laboratory) shall be required for each joint configuration (except lap weld joints) of each diameter of pipe to be supplied for the project.
2. Testing shall be witnessed by the Engineer. No production pipe shall be manufactured and no pipe shall be shipped to the project until pipe Proof of Design Tests have been completed and accepted by the Engineer. The Contractor shall provide a minimum of 14 days notice to the Engineer prior to conducting the Proof of Design Tests. Contractor shall pay travel expenses for two people to attend witness testing from Wilmington to the plant locations. Costs shall include airfare (if plant is more than 250 miles from Wilmington, NC),

rental car, and meals. Costs shall include hotel if testing is to occur over more than a 1-day period.

3. Straight lengths of test pipe shall be a full length of pipe as that to be used on the project. Pipe that is used in and successfully passes the Proof of Design Tests can be supplied for use as pipe on the project.

4. Hydrostatic Proof of Design Test: Hydrostatic tests shall include at least two lengths of test pipe and a joint. Pipe to be hydrostatically tested may be pre-wetted by maintaining a hydrostatic pressure of not more than the working pressure for a period not to exceed 48 hours. Pipe shall be filled with water and suitably bulkheaded or, if prewetted, water shall be added. Pressure shall be increased to the Quality Assurance (QA) test pressure indicated in these specifications. Test period shall start 5 minutes after pipe has reached QA test pressure. Pipe shall be hydrostatically tested and kept under the QA test pressure for at least 20 minutes. During the test period, no leak or joint seepage shall occur.

5. Failing Proof of Design Tests: Any diameter of pipe or non-welded joint configuration failing any Proof of Design Test shall be redesigned by the supplier and retested until all tests are passed. The costs of any observation of retests by the Owner or the Engineer shall be paid by the Contractor.

C. Shop Tests on Production Pipe

1. All tests required by ANSI/AWWA C200, C205, C209, C210, C222 and as required herein shall be performed by the manufacturer. Shop tests shall be subject to witness by the Engineer and/or Owner No lot of pipe shall be shipped to the site of the work until acceptable shop tests are completed.

2. The Owner and/or the Engineer shall have the right to witness all testing conducted by the Contractor; provided that, the Contractor's schedule is not delayed for the convenience of the Owner. It shall be the responsibility of the Contractor to provide Notice to the Owner and the Engineer of proposed tests in accordance with this section and the contract documents.

   Tests and examinations to verify the quality of work shall be performed by qualified persons other than those engaged in the activity being examined. The manufacturer's records of required tests and inspections shall include records of materials, manufacturing, examination, repairs, and test data taken before and during fabrication. Whenever tests and examinations are performed on a pipe element or pipe, the appropriate pipe identification number shall be shown on the report.

3. The Engineer shall have access to all records of tests and inspections related to pipe manufactured for use in the work.

4. In addition to those tests specifically required, the Owner may request additional samples for testing by the Owner. The cost for these additional samples shall be borne by the Owner at no additional cost to the Contractor.

5. Hydrostatic Test: Prior to lining or coating each length of pipe and each fitting

shall be hydrostatically shop tested and certified to a pressure that will induce a stress of not less than 75 percent of the specified minimum yield strength of the steel used in the manufacture of the pipe or fitting. Fittings fabricated from previously hydrostatically tested pipe need have only the new welds tested by an NOE method acceptable to the Engineer.

6. Inspection Prior to Shipping: For cement mortar lined pipe, no visible crack wider than allowed by ANSI/AWWA C205 shall be permitted in the lining of finished pipe. Loose areas of cement mortar linings in a pipe, fitting or special shall not be accepted .

7. Holiday Testing: Each coated pipe, fitting, and special shall be electrically tested for flaws in the polyurethane coating system with a suitable holiday detector. Reference shall be made to ANSI/AWWA and C222. All holidays detected shall be immediately repaired. The flawed or mislapped area shall be cleared of all affected material. The area shall then be rechecked with a holiday detector.

D. Inspection

1. The Engineer shall have the right to order any pipe, which in the Engineer's opinion does not meet these specifications, to be rejected and not shipped to the project site.

2. The Owner reserves the right to witness the testing of materials by the manufacturer or have same performed by an independent testing service. If the independent test results are found to meet the requirements of the specifications, the costs for such testing shall be paid for by the Owner. If the independent test results show that the pipe manufactured does not meet the requirements of these specifications, the Contractor shall pay for all testing and retesting costs.

3. Inspection of the pipe and fittings will also be made by the Engineer or other representatives of the Owner after delivery. The pipe shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein, even through sample pipes may have been accepted as satisfactory at the place of manufacture. Pipe rejected after delivery shall be marked for identification and shall be removed from the job at once if it cannot be repaired satisfactorily at the jobsite.

1.5 DELIVERY, STORAGE AND HANDLING

A. Pipe shall be transported on padded bunks with nylon tie-down straps or padded banding to adequately protect the pipe and coating. Coated pipe shall be handled, stored and shipped in a manner that will prevent damage to the coating. Pipe shall be handled with wide belt slings or padded forklifts. Chains, cables or other equipment likely to cause damage to the pipe or coating shall not be used.

B. Stored pipe shall at all times be supported on sawdust bags, sand bags, or other suitable support. Bags shall be of sufficient size to prevent contact of the pipe coating with the ground or any other obstruction. Rolling the pipe on the coated surface is not permitted.

C. Sufficient struts shall be furnished to maintain the pipe in a round condition (+/- 1%) and to limit its deflection during storage and transportation to the job site.

PART 2 - PRODUCTS

2.1 GENERAL

A. All pipe, fittings, and specials shall be marked in accordance with the laying schedule. Each pipe shall be uniquely numbered and said number shall appear on the laying schedule on the pipe and in the laying schedule. All special pipe sections and fittings shall be marked to clearly identify their location in the pipeline and to identify the centerline at the top of the piece. The markings on each pipe shall be such that the Owner can track the pipe through the entire manufacturing and installation process.

B. The pipe diameter shall be measured from internal wall of lining system.

2.2 MATERIALS

A. Unless otherwise specified, the design materials and workmanship for pipe shall conform to the requirements of AWWA C200. For cement mortar lining, lining thickness for pipe shall be as specified in AWWA C205. Pipe shall be NSI/NSF 61 certified.

B. Welded Steel Pipe shall be manufactured by Northwest Pipe Company, American SpiralWeld Pipe Company or pre-approved equal.

C. Design Conditions

1. Pipe shall be designed in accordance with the AWWA C200 and AWWA M11, using the following design conditions; these conditions shall also be used in designing steel fittings:

a. External Loading

1) Depth for earthload determinations shall be taken as the greater of the following:

a) Depth from existing ground level to top of pipe as shown on plans,

b) Depth from future ground level to top of pipe as shown on plans, or

c) A depth of 3 ft to the top of the pipe.

2) Earthloads (deadloads) shall be computed assuming the trench width to be that giving the maximum load on the pipe (prism load) for the following parameters:

a) Soil Weight = 120 lbs/cu ft

b) Deflection Lag Factor= 1.00

c) Bedding Constant (k) = 0.10

d) Soil Modulus E' = 1,000 lb/in^2

e) Minimum Wall Thickness = 0.225 in for 54-inch pipe

3) Live loads shall be:

a) Within road right-of-way, AASHTO HS-20 for two trucks side by side

b) Within railroad right-of-way, AREA Coopers E-80 or ASHTO HS-20, whichever is greater.

c) Both HS-20 and E-80 load shall be computed in accordance with AWWA M11.

4) Pipe located in casings shall be designed assuming that one-half of the calculated dead load and live load will be carried by the water main.

b. Internal Pressure

1) Design working pressure shall 150 psi with a design surge pressure of 225 psi.

2) The QA Test pressure shall be per AWWA C200.

3) Internal Field Test Pressure shall be the design surge pressure at 225 psi point in the test segment.

4) Design Vacuum Pressure shall be -14.4 psi.

c. Pipe and fittings with a semi-rigid lining and a flexible coating shall be designed with a maximum deflection of the steel cylinder of 3 percent of the internal diameter.

d. Pipe and fittings with a flexible lining and coating shall be designed with a maximum deflection of the steel cylinder of 4 percent of the internal diameter.

e. The wall thickness and joint weld designs shall assume full thrust is present in the pipe.

D. The steel sheets shall conform to ASTM A570 Grade 36 plates conforming to ASTM A283 Grade C or D, ASTM A36, ASTM A516, or ASTM A572 Grade 42 or coil conforming to the requirements of A1011 or ASTM A139, Grades B or C. All welded seams, whether straight or spiral, shall be butt welded using an approved electric-fusion weld process. Design stress shall be limited to 50 percent of the yield stress at working pressure and 75 percent of the yield stress at total transient pressure per AWWA M11.

E. Fittings and specials shall be fabricated in accordance with AWWA C200 including non-destructive testing by magnetic particle examination of welds not previously tested in the straight pipe. Fittings shall conform to the dimensions of AWWA C208 or may be fabricated into standard pipe lengths. Elbows Oto 22-1/2 degrees shall be two piece, 23 to 45 degrees shall be three piece, 46 to 67-1/2 degrees shall be four piece and 68 to 90 degrees shall be five piece. All tees, laterals and outlets shall be reinforced in accordance with ASME Pressure Vessel Code, Section VIII Paragraph UG-37 or AWWA M11, Chapter 7. Fittings and specials not detailed on the Drawings shall conform to the details furnished by the manufacturer as approved by the

Engineer.

F. Pipe shall be furnished in 50-ft net laying lengths or smaller with special lengths as required by plan and profile for location of elbows, tees, etc. Pipe shall be furnished with a single welded lap joint on the inside of the pipe. Butt strap joints shall be used were required for closures. The joints furnished shall have the same pressure rating as the abutting pipe.

G. Joints shall be single welded lap joints unless otherwise shown on the Drawings.

H. Single welded lap joints shall be prepared for field welding in accordance with AWWA C200. Bell ends shall be formed by an expanding press that stretches the steel plate beyond its elastic limit to form a truly round bell of suitable diameter and shape. Forming the bell by rolling will not be permitted. The facing surfaces of the bell and spigot shall be essentially parallel, but in no case shall the bell slope vary more than 2 degrees from the longitudinal axis of the bell. The bell for field welded lap joints shall provide a maximum 2-1/2 inch lap with an allowable 1 inch pull resulting in the required 1-1/2 inch deflected lap.

I. Flanges shall be in accordance with AWWA C207, Class D, Table 1 or 2 for pressure to 175 psi on 4 to 12-in diameter and 150 psi on diameters over 12-in. Flanges shall be AWWA C207, Class E for pressures over 150 through 275 psi when mating steel to steel; or shall be ANSI 816.5, Class 300 flat faced for 24-in and smaller diameter or Class 250 flat faced with dimensions and drilling conforming to ANSI B16.1 for diameters over 24 through 48-in when mating to cast iron valves.

J. Flexible couplings where indicated on the Drawings shall be Dresser Style 38, Depend-O-Lok, or equal. Middle ring shall be of a thickness equal to or greater than the thickness of pipe wall. Couplings shall have plain gaskets, Grade 27 and shall be shop coated with Dresser Red "D" or primer compatible with the coating system.

Dresser couplings shall be furnished complete with bonding wire and brazing cartridges.

2.3 INTERIOR LINING

A. The interior lining of the steel pipe is to be a cement mortar lining system.

B. A cement mortar lining system shall be as follows:

1. Cement mortar linings shall conform to AWWA C602 for in-place lining, or AWWA C205 for in-shop lining. The minimum thickness of the mortar lining shall be ½ inch for both in-shop lining and in-place lining. Shop lining of welded joint pipe shall be held back 2 inches from the inside and outside welds. Inside field joints shall be prepared and lined as described by appropriate Appendices of AWWA C602 and C205.

2. Cement shall be Type II and shall be in accordance with ASTM C150.

3. Non-shrink grout employed in the interior of field joints shall be Masterflow 713 grout by Master Builders or equal. All non-shrink grout shall be NSF61 compliant.

4. For the field repair of shop-applied cement mortar lining, an epoxy bonding agent

conforming to ASTM C881, Type II shall be used. The epoxy bonding agent shall be moisture insensitive and suitable for the service conditions. Bonding agent shall be Sika-Sikador, 32 HI-MOD, or equal.

5. For the field repair of shop-applied cement mortar lining, a latex admixture may be used if it is NSF61 compliant.

2.4 EXTERIOR COATING

A. The exterior coating of the steel pipe shall be a polyurethane coating with a minimum dry film thickness of 25 mils and conforming to AWWA C222 standards.

B. The polyurethane coating system shall be as specified as follows:

1. The exterior coating shall be blue.

2. The exterior coating shall be factory applied. The coating manufacturer's representative shall be present at the start-up of the factory coating operations. The Engineer shall also be present at start-up of the factory coating operations. Provide 48-hour notice to the Engineer prior to factory coating start-up. Field exterior coating,including joint coating and repair of damaged coating, shall be done by an approved applicator. The coating manufacturer will provide training and certification for each individual who will perform field coating and repair, stating that the individual has been trained and is an approved applicator.

3. The exterior coating shall be Carboline 777PL, Litelast 110 or 210, Sherwin Williams Company, Corrodad 3000 or equal.

4. The surface to be coated shall be cleaned in preparation of abrasive blasting. The surface shall then be blasted in accordance with AWWA C222 or per the lining/coating manufacturer's requirements, whichever is more stringent.

5. The pipe manufacturer or his designated Applicator shall be approved in writing by the lining/coating manufacturer for the application of the proposed lining and/or coating system. The Applicator shall have been trained by the lining/coating manufacturer within 12 months of starting production of the pipe for this project. A listing of trained personnel shall be kept at the place of manufacture at all times and be accessible to the Owner or Engineer during the lining or coating application. A minimum of two people trained in the application of the lining and coating products shall be present at all times during the lining/coating application.

6. Equipment used for the lining and coating application shall be certified by the lining/coating manufacturer as being acceptable for the lining and coating operation.

7. Prior to shipment, the lining and coating shall be given an electrical holiday test per the requirements of AWWA C222. Each holiday found shall be marked with a permanent marker and repaired with approved compatible repair material in accordance with AWWA C222 and the manufacturer's instructions. All repairs shall be retested.

8. Each pipe’s interior and exterior shall have no more than 4 repairs per 100 square feet of pipe surface or 3% of the pipe’s total surface area, whichever is

less. Surface area for lining and coating are to be evaluated independently against the criteria. Any pipe that exhibits more than the allowable number of repairs shall be rejected. The pipe shall be completely blasted, cleaned, prepared, and relined or recoated as previously specified.

9. Adhesion testing shall be conducted on two randomly selected pipe sections from each day's coating or lining production. The adhesion for the lining and coating will be tested per the requirements of AWWA C222. Upon acceptance, the test areas shall be repaired per the manufacturer's recommendations. If tests on both pipe sections fail, the day's coating/lining production will be rejected. If tests on one pipe fail, another pipe shall be tested to determine if the failure is localized. If the failure is localized, that pipe section shall be rejected.

10. Field welded joints shall be coated with a shrink sleeve per AWWA C-216 and per the manufacturer's recommendations. The field coating applicators shall be trained and certified by the shrink sleeve manufacturer within 12 months of beginning the placement of pipe.

11. Coating Manufacturer's Services: The coating manufacturer's technical representative shall be on-site a minimum of three working days at the start of the factory coating application operations. The coating manufacturer's technical representative shall be on-site a minimum of three working days at the start of the field coating operations to inspect the application including preparation, application, repair, and quality control procedures.

PART 3 - EXECUTION

3.1 GENERAL

A. Care shall be taken during loading, transporting, and unloading to prevent injury to the pipes, fittings, or coatings. Pipe or fittings shall not be dropped. Each pipe or fitting shall be placed as near as practical to the point where it will be laid. They shall be secured in place to prevent their movement until required. Pipe shall be stored so that it is protected from injury to the pipe, coating, and pipe ends and so that it does not cause an inconvenience to traffic. All pipe and fittings shall be thoroughly cleaned before laying, shall be kept clean until they are used in the work and when laid shall conform to the lines and grades shown on the Drawings.

B. No metal tools or heavy objects shall be permitted to come unnecessarily into contact with the finished coating. All pipe and fittings, specials and couplings shall be examined before laying and no piece shall be installed which is found to be defective. Any damage to the coatings shall be repaired as acceptable to the Engineer.

C. All pipe and fittings shall be subjected to a careful inspection prior to and after installation. If any defective pipe is discovered before or after it has been laid, it shall be removed and replaced with a sound pipe.

D. Pipe bedding and backfill shall be as shown on the Drawings.

E. Regulate and control equipment and construction operations such that the loading on the pipe does not exceed the loads for which the pipe is designed and manufactured. Pipe found to have a deflection greater than allowable or longitudinal cracks in the

lining (for cement-mortar lined pipe) from construction equipment or other loading shall have embedment removed, the pipe shall be re-rounded and the embedment replaced. Lining cracks greater than allowed by C205 shall be repaired. Any pipe or lining that cannot be satisfactorily repaired to the Engineer's satisfaction shall be removed from the line and replaced with sound pipe and closures as required.

F. The method of jointing the pipe shall be in strict accordance with the manufacturer's instructions. Arrange for the manufacturer to supervise the installation of at least the first three welded joints including the placement of lining and coating material at the joints. The manufacturer shall make an additional on-site visit when the installation is approximately 50 percent complete to review the installation procedures.

3.2 INSTALLING STEEL PIPE

A. Except as otherwise specified herein, pipe and fittings shall be installed in accordance with the requirements of AWWA M11 and AWWA C604. All steel pipe shall have a minimum of 3 feet of cover. Pipe shall be laid such that the invert elevations shown on the Drawings are not exceeded.

B. Struts are to be left in the pipe until backfill is complete.

C. Each pipe shall be thoroughly cleaned before being placed in the trench. As the pipe laying progresses, the interior shall be kept free of all debris.

D. The Contractor shall permit and aid in the inspection of the coating on the underside of the pipe at the time of installation and repair any damage before lowering the pipe into the trench. While being laid, the pipe shall not be rolled, skidded, or otherwise moved, when it contacts with the ground at any point.

E. As soon as the excavation is completed to the bottom of the excavation, place granular fill in the trench. The pipe shall then be firmly bedded in this gravel to conform to the line and grade indicated on the Drawings. Temporary depressions shall be provided at the pipe ends for the expanded ends, putting on the shrink sleeve, and closure pieces. Lap welded pipe shall be laid with spigots ahead, unless otherwise approved by the Engineer. The pipe embedment material shall be placed and compacted to a point one foot above the top of the pipe and as shown on the Drawings. Blocking under the pipe will not be permitted.

F. Pipe embedment material shall be compacted to give complete vertical and lateral support of the pipe. Before the pipe is lowered into the trench, the ends of the pipe shall be cleaned and free from dirt. The joint shall be fillet welded in accordance with AWWA C206 recommendations.

G. Not more than 500 feet of pipe shall be exposed ahead of backfilling in any trench section.

H. Except for short runs that may be permitted by the Engineer, pipe shall be laid uphill on grades exceeding 10 percent. Pipe that is laid on a downhill grade shall be blocked and held in place until sufficient support is furnished by the following pipe to prevent movement.

I. No pipe shall be installed upon a foundation into which frost has penetrated or at any time that there is danger of the formation of ice or penetration of frost at the bottom of the excavation. No pipe shall be laid unless it can be established that the trench will be backfilled before the formation of ice and frost occurs.

J. Welded closures for lap welded pipe and restrained joints shall be delayed until the backfill has been completed to as near as practicable to the pipe ends and the pipe temperature has had time to stabilize. In order to minimize longitudinal movement of the pipe ends, closures shall be welded early in the morning when the air and pipe are coolest. Alternative methods of making closures shall be subject to the acceptance of the Engineer.

K. Field joints shall be shrink wrapped in accordance with AWWA C216.

L. Any damage to the pipe or the protective coating from any cause during the installation of the pipeline shall be repaired and holiday tested as acceptable to the Engineer.

M. Field joints shall be filled with non-shrink grout after backfilling is completed. Non-shrink grout shall be employed. Prior to application the entire joint shall be wetted and the interior concrete mortar allowed to absorb the moisture.

N. All pipe shall be sound and clean before laying. When laying is not in progress, including lunchtime, the open ends of the pipe shall be closed by watertight plug or other approved means. Good alignment shall be preserved in laying. Fittings, in addition to those shown on the Drawings, shall be provided.

0. Prevent flotation of the pipe from unanticipated water coming into the trench during pipe installation or backfill. Any pipe movement shall result in reinstallation of the pipe. Pipe damaged by the movement shall be replaced.

P. After completion of backfilling, removal of stulls, and before acceptance of the work, all pipe shall be tested for excessive deflection by measuring the actual inside vertical diameter. Deflection measurements will be made by the Engineer. Pipe with diametral deflection exceeding the percentage specified in Paragraph 2.02.C of the normal inside diameter shall be uncovered and the bedding and backfill replaced as required to prevent excessive deflection. After replacing bedding and backfill, the pipe shall be retested.

3.3 FIELD WELDING

A. All field welding shall be in accordance with the AWS D.1.1. Welding of joints shall be a full fillet weld for the entire circumference in accordance with AWWA C206.

B. During exterior welding the coating shall be protected by draping an 18-in wide strip of heat resistant material over the top half of the pipe on each side of the coating holdback to avoid damage to the coating by hot weld splatter. No welding ground shall be made on the coated part of the pipe.

3.4 CLEANING

A. At the conclusion of the laying, and prior to testing, thoroughly clean all of the new pipelines by flushing with water or other means to remove all dirt, stones, wood struts, pieces of wood or other material which may have entered during the construction period. Debris cleaned from the lines shall be removed from the lowest sections. If, after this cleaning, obstructions remain, they shall be removed.

B. After the pipelines are cleaned and if the groundwater level is above the pipe, or following a heavy rain, the Engineer will examine the pipe for leaks. If defective pipes

or joints are discovered at this time, they shall be repaired or replaced.

3.5 TESTING

A. Joint Testing

1. Testing will be done in accordance with ANSI/AWS D.1.1 Part C. 10% of lap welded joints will be tested with a magnetic particle tester. Defected welds will be repaired and retested at the Contractor's expense.

B. Electrical Continuity

1. Furnish all necessary equipment and labor for carrying out a continuity check of the pipeline. This check shall be conducted prior to introduction of water into the pipeline for hydrostatic pressure and leakage testing.

C. Hydrostatic and Leakage Tests

1. Furnish all necessary equipment and labor for carrying out a pressure test on the pipelines. The test shall be made after backfill is compacted in place. The procedures and method for carrying out the pressure tests shall be approved by the Engineer.

2. Make any taps and furnish all necessary caps, plugs, bulkheads, etc, as required in conjunction with testing portions of the pipe. Furnish test pumps, gauges, meters and any other equipment required in conjunction with carrying out the tests. Hydrostatic pressure and leakage tests shall conform to AWWA M11 and C604 as modified herein.

3. The pipe shall be slowly filled with water and allowed to stand for 48 hours under slight pressure to allow the cement mortar lining to absorb water prior to application of the test pressure.

4. Lines which fail to meet the requirements of the test shall be repaired and retested as necessary until test requirements are met. Defective materials, pipes, valves and accessories shall be removed and replaced.

5. The Owner will supply at no cost to the Contractor a maximum quantity of water for testing purposes equal to 300 percent of the volume of the pipeline. Additional water required will be provided at the Owner's standard rates for the volume required. The Contractor will coordinate closely with the Owner to identify the source of test water, quantity of water, and allowable withdrawal rates. The Owner reserves the right to restrict or disallow withdrawal of water between 7:00 a.m. and 7:00 p.m. during the months of May through September.

END OF SECTION SP 5

SPECIAL PROVISIONS SECTION 6 – LARGE-DIAMETER GATE VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section describes manually operated buried gate valves sized 16 inches and larger for use in raw water systems.

B. The equipment specified under this section shall be furnished with all accessories, auxiliaries, special tools, spare parts mountings, and appurtenances necessary for a complete installation.

1.2 SUBMITTALS

A. Submit to the Engineer materials required to establish compliance with this Section for shop drawings. Submittals shall include at least the following:

1. Manufacturer's literature, illustrations, specifications and engineering data including:

a. Dimensions.

b. Size.

c. Materials of construction.

d. Weight.

e. Protection coating.

f. Actuator weight.

g. Calculations for actuator torque where applicable.

h. Recommended spare parts.

B. Test Reports

1. Submit certified shop test results specified herein.

C. Operation and Maintenance Manuals

1. Submit complete operation and maintenance manuals including copies of all approved Shop Drawings.

D. Certificates

1. Submit certificates of compliance where specified by referenced standards: For each valve specified to be manufactured and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests.

E. Submit reference list of five projects where similar sized valves have been in use for a minimum of 5 years. Include reference name and telephone number.

1.3 REFERENCE STANDARDS

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. American Water Works Association (AWWA)

1. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron and Pressure Pipe and Fittings.

2. AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants.

3. AWWA C515 – Resilient-Seated Gate Valves for Water Supply Service.

C. American National Standards Institute (ANSI)

1. ANSI B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.

D. American Society for Testing and Materials (ASTM)

1. ASTM A48 - Standard Specification for Gray Iron Castings.

2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

4. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

5. ASTM A536 - Standard Specification for Ductile Iron Castings.

E. The Society for Protective Coatings (SSPC)

1. SSPC SP-6 - Joint Surface Standard Commercial Blast Cleaning

F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Valves and appurtenances provided under this Section shall be the standard product in regular production by manufacturers whose products have proven reliable in similar service for at least 5 years.

2. All units of the same type shall be the product of one manufacturer.

B. Source Quality Control

1. Gate valves shall be shop tested in accordance with AWWA C515.

1.5 SYSTEM DESCRIPTION

A. All of the valves and materials specified herein are intended to be products of proven ability for use in controlling the flow of water under pressure.

B. Valves, appurtenances, and miscellaneous items shall be installed substantially as shown on the Drawings, so as to form complete, workable systems.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the work.

B. Protect threads and seats from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until time of use.

C. All valves shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.

D. Store equipment to permit easy access for inspection and identification. Prior to Owner acceptance, any corrosion in evidence on stored material shall be removed or, if not removable, the valve shall be removed from the job.

E. Store all equipment in covered storage off the ground.

1.7 SPECIAL TOOLS AND SPARE PARTS

A. Special tools and the manufacturer’s standard stock of spare parts, if required for normal operation and maintenance of the valve, shall be supplied with each distinct type or size of gate valve.

PART 2 - PRODUCTS

2.1 GENERAL

A. All buried valves shall open counter-clockwise.

B. Valves shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard to which they are manufactured cast in raised letters on some appropriate part of the body.

C. Unless otherwise noted, valves shall have a minimum working pressure of 150 psi or be of the same working plus surge pressure as the pipe they connect to, whichever is higher.

D. Valves shall be especially constructed for buried service.

2.2 VALVE BOXES

A. All gate valves shall be provided with extension shafts, operating nuts and valve boxes as follows:

1. Extension shafts shall be solid Type 316 stainless steel and the operating nut shall be a 2-in square stainless or bronze nut. Shafts shall be designed to provide a factor of safety of not less than four. Operating nuts shall be pinned to the shafts with stainless steel pins or adequate diameter to withstand 150% of the normal operating torque.

2. Top of the operating nut shall be located 2-in below the rim of the valve box.

3. Valve boxes shall be manufactured per CFPUA Standard Specifications and Details.

4. A position-indicating device shall be provided for each gate valve. The position-indicating device shall be GPI Series Geared Position Indicator by Dyna-Torque Inc., Muskegon, MI or equal, which shall mount over the shaft and visually show the position of the valve at all times. All material shall be noncorrosive, nonmagnetic and shall require no lubrication. Unit shall be furnished and arranged for use with the valve box. The required valve box adapters and cover shall be furnished.

5. An approved operating key or wrench shall be furnished – one per every three gate valves furnished.

6. All fasteners shall be Type 316 stainless steel.

2.3 RESILIENT SEATED GATE VALVES

A. Valves shall be manufactured in accordance with AWWA C515, by American Flow Control; Clow; Mueller; or equal as specified herein.

B. Valves shall either have a spur gear arrangement if the valve stands upright, or a bevel gear if laid horizontally.

C. Valves shall be rated for minimum 250 psig working pressure.

D. Valves shall be provided with a minimum of two O-ring stem seals.

E. Bonnet and gland bolts and nuts shall be 316 stainless steel.

F. Wedges shall be cast iron or ductile iron and shall be totally encapsulated with rubber. The wedge shall seal equally well with flow in either direction.

G. Stem shall be bronze or 304 stainless steel.

H. All external and internal surfaces of the valve body and bonnet shall have a fusion bonded epoxy coating complying with AWWA C550, applied electrostatically prior to assembly with minimum 8 mil coating.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

A. During installation of all valves and appurtenances, verify that all items are clean, free of defects in material and workmanship and function properly.

A. All valves shall be closed and kept closed until otherwise directed by the Engineer.

3.2 INSTALLATION OF BURIED VALVES AND VALVE BOXES

A. Buried valves shall be cleaned and manually operated before installation. Buried valves and valve boxes shall be set with the stem vertically aligned in the center of the valve box. Valves shall be set on a firm foundation and supported by tamping pipe bedding material under the sides of the valve. The valve box shall be supported during backfilling and maintained in vertical alignment with the top flush with finish grade. The valve box shall be set so as not to transmit traffic loads to the valve.

B. Before backfilling, all exposed portions of any bolts shall be coated with two coats of bituminous paint.

B. All marred or damaged coatings shall be repaired by the Contractor in accordance with the manufacturer’s requirements so that the integrity of the initial coating is restored.

3.3 FIELD TESTS AND ADJUSTMENTS

A. Prior to installation, conduct a functional field test of each valve, including actuators and valve control equipment, in presence of Engineer to demonstrate that each part and all components together function correctly. This test shall be repeated after installation. All testing equipment required shall be furnished by the Contractor.

3.4 MANUFACTURER'S SERVICE

A. Following installation of the valves, furnish the services of a qualified, factory-trained representative of the manufacturer of the respective valves, to check the installations before they are placed in operation, supervise initial operations and testing in the presence of the Engineer, instruct the Owner in care and maintenance of the equipment, and make all necessary field adjustments. A minimum of four non-consecutive 8-hour days shall be provided for these services. In the event of trouble with the equipment, the representative of the respective manufacturer shall revisit the site as often as necessary until all troubles are corrected.

END OF SECTION SP 6

SPECIAL PROVISIONS SECTION 7 – AIR RELEASE AND AIR VACUUM VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This section describes air release, air/vacuum, and combination air valves sized 3 inches and larger for use in potable water systems.

B. The equipment specified under this section shall be furnished with all accessories, auxiliaries, special tools, spare parts mountings, and appurtenances necessary for a complete installation.

1.2 SUBMITTALS

A. Submit to the Engineer materials required to establish compliance with this Section for shop drawings. Submittals shall include at least the following:

1. Manufacturer's literature, illustrations, specifications and engineering data including:

a. Dimensions.

b. Orifice and vent sizes.

c. Materials of construction.

d. Weight.

e. Protective coatings.

f. Recommended spare parts.

B. Test Reports

1. Submit certified shop test results specified herein.

C. Operation and Maintenance Manuals

1. Submit complete operation and maintenance manuals including copies of all approved Shop Drawings.

D. Certificates

1. Submit certificates of compliance where specified by referenced standards: For each valve specified to be manufactured and/or installed in accordance with AWWA and other standards, submit an affidavit of compliance with the appropriate standards, including certified results of required tests.

E. Submit reference list of five projects where similar sized valves have been in use

for a minimum of 5 years. Include reference name and telephone number.1.3 REFERENCE STANDARDS

A. Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

B. American Water Works Association (AWWA)

1. AWWA C111 – Rubber-Gasket Joints for Ductile-Iron and Pressure Pipe and Fittings.

2. AWWA C504 – Rubber-Seated Butterfly Valves, Class B.

3. AWWA C509 – Resilient-Seated Gate Valves for Water Supply Service.

4. AWWA C512 – Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service

5. AWWA C550 – Protective Epoxy Interior Coatings for Valves and Hydrants.

C. American National Standards Institute (ANSI)

1. ANSI B16.1 – Cast Iron Pipe Flanges and Flanged Fittings.

D. American Society for Testing and Materials (ASTM)

1. ASTM A48 - Standard Specification for Gray Iron Castings.

2. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.

3. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

4. ASTM A276 - Standard Specification for Stainless Steel Bars and Shapes.

5. ASTM A536 - Standard Specification for Ductile Iron Castings.

E. The Society for Protective Coatings (SSPC)

1. SSPC SP-6 - Joint Surface Standard Commercial Blast Cleaning

F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Valves and appurtenances provided under this Section shall be the standard product in regular production by manufacturers whose products have proven reliable in similar service for at least 5 years.

2. All units of the same type shall be the product of one manufacturer.

B. Source Quality Control

1. Gate valves shall be shop tested in accordance with AWWA C500.

2. All air valves shall be shop tested as follows:

a. Air valves shall be subjected to both hydrostatic and leakage tests in accordance with ANSI/AWWA C512. Fully assembled and complete valve assemblies with all appurtenances attached shall be tested. Acceptance criteria shall be as set forth in ANSI/AWWA C512.

b. With the valve completely closed, the full design hydrostatic pressure (200 psig) shall be applied to the valve, with the outlet end open to the atmosphere. The test pressure shall be maintained for 3 minutes, during which time there shall be no visible evidence of leakage through the valve, nor shall any part show evidence of damage or distortion.

c. Each air release valve shall be tested at both a minimum internal hydrostatic pressure of 20 psig and a maximum of 200 psig, with zero allowable leakage. After completing the hydrostatic test, each valve shall be opened and closed at least three (3) times using water at 20 psig, to activate the float and float mechanisms. During these tests, each valve shall seal droptight after each cycle.

d. Each air/vacuum and combination air valve shall be tested at both a minimum internal hydrostatic pressure of 20 psig and a maximum pressure of 200 psig, with zero allowable leakage. The low pressure testing shall be repeated four (4) times, with the float or plug rotated 90-degrees after each test cycle. There shall be no evidence of leakage at any of the test positions.

e. Should the valves fail any test, the Contractor shall cause the manufacturer to adjust, redesign, and/or remanufacture the valve and retest. The Owner will witness the cycle tests and will witness the testing of at least one valve of each size and type. The Contractor shall furnish the Owner with not less than 2 weeks' notice of the date and location where the tests will be performed. The Contractor will pay for travel and subsistence costs including airfare, room, transportation, and meals for two Owner representatives. All costs of retesting, including the Owner's costs, shall be borne by the Contractor.

f. Certified shop test reports shall be provided for each valve as specified in Paragraph 1.02, B.

1.5 SYSTEM DESCRIPTION

A. All of the valves and materials specified herein are intended to be products of proven ability for use in controlling the flow of air and water under pressure on a water distribution main.

B. Valves, appurtenances, and miscellaneous items shall be installed substantially as shown on the Drawings, so as to form complete, workable systems.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the work.

B. Protect threads and seats from corrosion and damage. Rising stems and exposed stem valves shall be coated with a protective oil film which shall be maintained until time of use.

C. All valves shall be shipped and stored on site until time of use with wood or plywood covers on each valve end.

D. Store equipment to permit easy access for inspection and identification. Prior to Owner acceptance, any corrosion in evidence on stored material shall be removed or, if not removable, the valve shall be removed from the job.

E. Store all equipment in covered storage off the ground.

1.7 SPECIAL TOOLS AND SPARE PARTS

A. Special tools and the manufacturer’s standard stock of spare parts, if required for normal operation and maintenance of the valve, shall be supplied with each distinct type or size of air valve.

B. Provide to the Owner a list of all spare and replacement parts with individual prices and locations where they can be purchased. Prices shall remain in effect for a period of not less than one year after start-up and final acceptance.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT - GENERAL

A. The use of a manufacturer's name and/or model or catalog number is for the purpose of establishing the standard of quality and general configuration desired.

B. Valves and appurtenances shall be of the size shown on the Drawings or as noted and as far as possible equipment of the same type shall be identical and from one manufacturer.

C. Valves and appurtenances shall have the name of the maker, nominal size, flow directional arrows, working pressure for which they are designed and standard referenced, cast in raised letters or indelibly marked upon some appropriate part of the body.

D. Unless otherwise noted, items shall have a minimum working pressure of 150 psi or be of the same working pressure as the pipe they connect to, whichever is higher and suitable for the pressures noted where they are installed.

E. Joints, size and material - unless otherwise noted or required by the Engineer:

1. Except where noted, all joints referred to herein shall be of the same type, nominal diameter, material and with a minimum rating equal to the pipe or fittings they are connected to.

2. Valves and appurtenances shall be of the same nominal diameter as the pipe or fittings they are connected to.

3. All valves exposed to view, or in vaults:

a. 3-in and smaller - threaded ends unless otherwise shown.

b. 4-in and larger - flanged ends unless otherwise shown.

F. Provide all special adaptors as required to ensure compatibility between valves, appurtenances and adjacent pipe.

G. Valves and actuators located outdoors but not within a building, within two feet above a liquid, in vaults, or where otherwise noted shall be especially designed for submerged service where water may completely submerge the valve.

H. Surface Preparation and Shop Coatings:

1. The interior ferrous metal surfaces, except finished or bearing surfaces, shall be blast cleaned in accordance with SSPC SP-10 and painted with two coats of an approved two-component epoxy coating specifically formulated for potable water use. The coating shall be NSF certified to Standard 61.

2. Exterior ferrous metal surfaces of all buried and below-grade valves shall be blast cleaned in accordance with SSPC SP-6 and given two shop coats of an approved two-component coal tar epoxy paint.

2.2 AIR AND/OR AIR/VACUUM VALVES - GENERAL

A. This Section applies to all air release, air/vacuum, combination air and air/vacuum, vacuum relief, or similar valves.

B. Valves shall be supplied with shutoff gate or ball valves with operator handles or levers removed. Valves shall be properly vented and piped to drain, unless otherwise shown on the drawings.

C. Attention is directed to the requirement that valve's pressure rating be at least equal to the attached pipe's rating.

D. All valves shall have a ¼-inch NPT minimum plugged drain port located near the bottom of the valve body, and a plugged test port near the top of the valve.

E. Valves shall be appropriate model by Val-Matic; APCO; GA; Cla-Val or equal.

2.3 AIR RELEASE VALVES

A. Air release valves shall be installed to release any small accumulations of air which may collect while pipe is in operation and under pressure.

B. The small orifice assembly air release valve shall automatically release air accumulations from the pipe while under positive pressure. When the valve body fills with air, the float ball shall fall to open the small orifice and exhaust the air to atmosphere. When the air has been exhausted, the float ball shall be buoyed up and tightly close the small orifice.

C. The small orifice assembly shall be furnished with cast iron body and cover (ASTM A126 Class B). The float ball shall be constructed of stainless steel and attached to a stainless steel lever mechanism, and be capable of withstanding a collapse pressure of 1000 psig. A resilient, Buna-N seat shall be attached to the lever mechanism for drop-tight closure, and be designed for easy removal and replacement in the field.

2.4 AIR/VACUUM VALVES

A. The large orifice assembly air and vacuum valve shall automatically exhaust air from a pipeline during the initial filling of the pipeline. The large orifice assembly shall not blow shut while exhausting air, even while venting air at sonic velocity. When all air has been exhausted from the pipeline, the large orifice float ball shall be buoyed up to seat tightly against a resilient seat ring. The large orifice float ball shall remain tightly closed while the pipeline is under positive pressure. Should the pipeline pressure fall below atmospheric pressure (such as during draining or a line break), the large orifice float ball shall automatically fall away from the seat ring and permit air to enter the pipeline.

B. The large orifice assembly shall be furnished with cast iron body and cover (ASTM A126 Class B). A resilient, Buna-N seat ring shall be affixed to the valve cover, and be designed for easy removal and replacement in the field. The float ball shall be constructed of stainless steel with a minimum pressure rating of 1,000 psi. The float ball shall be free floating within the valve body; guide stems, linkages or levers attached to the float are not acceptable.

2.5 COMBINATION AIR AND AIR/VACUUM VALVES

A. Units shall be a small orifice (air release) valve mounted on a large orifice air/vacuum valve of the proper type and size as noted on the Drawings. Individual valves shall be as specified previously.

B. The small orifice valve shall be piped to the body of the large orifice valve by non-corrosive piping equal in size to the small orifice inlet connection. An isolating

stop valve (with operator removed) shall be furnished between the small and large orifice valves.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. During installation of all valves and appurtenances, verify that all items are clean, free of defects in material and workmanship and function properly.

B. All valves and appurtenances shall be installed per the manufacturer's instructions in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the Engineer before they are installed.

C. Install all supports, extension rods, guides, operators, and appurtenances as shown on the Drawings or otherwise required. Before setting these items, check all Drawings and/or details which have a direct bearing on their location. The Contractor shall be responsible for the proper location of valves and appurtenances during the construction of the Work. Submit shop drawings and working drawings for all piping and supports.

D. All materials shall be carefully inspected for defects in construction and materials. All debris and foreign material shall be cleaned out of openings, etc. All valve flange covers shall remain in place until connected piping is in place. All operating mechanisms shall be operated to check their proper functioning and all nuts and bolts checked for tightness. Valves and other equipment which do not operate easily, or are otherwise defective, shall be repaired or replaced at no additional cost to the Owner.

E. Where installation is covered by a referenced Standard, installation shall be in accordance with that Standard, except as herein modified, and the Contractor shall certify such. Also note additional requirements in other parts of this Specification.

F. Unless otherwise noted, joints for valves and appurtenances shall be made up utilizing the same procedures as specified under the applicable type connecting pipe joint, and all valves and other items shall be installed in the proper position as recommended by the manufacturer. Contractor shall be responsible for verifying manufacturers' torquing requirements for all valves.

G. Whether or not shown on the Drawings, all valves and the piping to all valves shall be supported within 2 feet of the valve.

3.2 INSPECTION, TESTING AND CORRECTION OF DEFICIENCIES

A. Following installation of the valves, furnish the services of a qualified, factory-trained representative of the manufacturer of the respective valves, to check the installations before they are placed in operation, supervise initial operations and testing in the presence of the Engineer, instruct the Owner in care and maintenance of the equipment, and make all necessary field adjustments. A minimum 8-hour day shall

be provided for these services. In the event of trouble with the equipment, the representative of the respective manufacturer shall revisit the site as often as necessary until all troubles are corrected.

B. Take care not to over pressure valves or appurtenances during pipe testing. If any unit proves to be defective, it shall be replaced or repaired to the satisfaction of the Engineer.

C. No testing shall be performed until the connected equipment manufacturer's service engineer has provided written certification that the installed equipment has been examined and found to be in complete accordance with the manufacturer's requirements.

D. Functional Test: Prior to system testing and startup, all valves shall be inspected for proper alignment, smooth operation, proper connection and satisfactory performance.

E. The various pipes in which the valves and appurtenances are installed are to be field pressure tested. During these tests any defective valve or appurtenance shall be adjusted, removed and replaced, or otherwise made acceptable to the Engineer, at no cost to the Owner.

F. Various regulating valves, strainers, or other appurtenances shall be tested to demonstrate their conformance with the specified operational capabilities, and any deficiencies shall be corrected or the device replaced or otherwise made acceptable to the Engineer, at no cost to the Owner.

3.3 CLEANING AND DISINFECTION

A. All items (including valve interiors) shall be cleaned prior to installation, testing, and final acceptance.

END OF SECTION SP 7

SUPPLEMENTAL SPECIFICATION 8

DIVISION 5
SUBGRADE, BASES AND SHOULDERS

SECTION 500
FINE GRADING SUBGRADE, SHOULDERS AND DITCHES

500-1 DESCRIPTION

Perform the work covered by this section on all portions of the project which will be paved under the contract including, but not limited to, preparing, grading, shaping, manipulating moisture content and compacting either an unstabilized or stabilized roadbed to a condition suitable for placement of base course, pavement and shoulders. Clean, shape and maintain roadway ditches; strip existing vegetation; and place and compact in accordance with Sections 235 and 560 all materials resulting from the shaping operation. Stockpile surplus material for the construction of shoulders and dispose of any necessary surplus stockpile material as waste.

On those portions of the project where there is no pavement to be placed under the contract, perform the work of Sections 225 or 230, depending upon the source of the material. This section will not be applicable to such work.

500-2 CONSTRUCTION METHODS

(A) General

Shape the roadway to conform to the lines, grades and typical sections shown on the plans. Strip all existing vegetation from the ground surface wherever shaping of the roadway is to be done. Use all suitable surplus material in the construction of the roadway or stockpile for use in shoulder construction. Dispose of surplus material in excess of that needed for roadway or shoulder construction as waste. Obtain additional material, if needed, from roadway excavation or borrow sources.

Remove all unsuitable material, boulders and all vegetative matter and replace with suitable material. Obtain suitable material, when not available from the shaping or fine grading operation, from roadway excavation or borrow sources.

Clean, reshape and maintain roadway ditches in a satisfactory condition until final acceptance of the project. Conduct operations so as to avoid damage to any previously constructed structures and facilities.

(B) Preparation of Subgrade

Shape the subgrade to the lines, grades and typical sections shown on the plans. Where the Engineer directs that areas of the subgrade are to be stabilized with aggregate, the subgrade surface in such areas may, subject to the approval of the Engineer, be left uniformly below grade to provide for the addition of the stabilizer material.

Store or stockpile material excavated in preparing the subgrade so as to not interfere with proper drainage or later operations of stabilization, placing base or placing pavement.

(C) Compaction of Subgrade

Compact all material to a depth of 8 inches below the finished surface of the subgrade to a density equal to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T 99 as modified by the Department. Copies of these modified testing procedures as described in the *Conventional Density Operator's Manual* are available from the Materials and Tests Unit.

Compact the subgrade at a moisture content which is approximately that required to produce the maximum density indicated by the above test method. Dry or add moisture to the subgrade when required to provide a uniformly compacted and acceptable subgrade.

Where the subgrade is to be stabilized with lime, aggregate or cement, the above density requirements will not apply before the incorporation of the stabilizing material; however, perform compaction in accordance with Articles 501-10, 510-3 or 542-9, as appropriate.

500-3 TOLERANCES

A tolerance of ± 1/2 inch from the established grade will be permitted after the subgrade has been graded to a uniform surface. Subgrade tolerance of ± 1/4 inch from the established grade is required for subgrade under concrete pavement mainline lanes.

Perform the grading operation such that the maximum difference between the established grade and the graded subgrade within any 100 foot section is 1/2 inch for normal subgrade and 1/4 inch for subgrade for concrete pavement.

500-4 MAINTENANCE OF SUBGRADE

Provide and maintain ditches and drains to drain the subgrade satisfactorily. Where previously approved subgrade is damaged by natural causes, hauling equipment or other traffic, restore the subgrade to the required lines, grades, typical sections and density.

500-5 MEASUREMENT AND PAYMENT

Fine Grading will be paid at the contract lump sum price. Such lump sum price will be full payment for all material excavated to a depth of 0.4 feet below the existing graded surface.

Any material which has been excavated from the subgrade at the depth greater than 0.4 feet below the existing graded surface will be *Unclassified Excavation* and will be paid in accordance with Article 225-7.

As an exception to the above, on those areas in which the Contractor is responsible for constructing the embankment on which the subgrade is located, no payment will be made for that excavation that may be necessary to bring the grade to the established subgrade elevation and typical section. Incorporate such surplus material into the project at no additional cost to the Department.

When sufficient material is not available from the fine grading operation to complete the work of fine grading, additional material will be paid in accordance with Article 225-7 for *Unclassified Excavation* or Article 230-5 for *Borrow Excavation*, depending on the source of material.

Surplus material stockpiled for shoulder construction and incorporated into the work will be paid in accordance with Article 560-4 for *Shoulder Borrow*. No payment will be made for the removal and disposal of any surplus material remaining in the stockpile after the shoulders have been completed.

Maintenance, repair and restoration of the subgrade to the required lines, grades, typical sections and density as it applies to fine grading is incidental to the work of this section.

Payment will be made under:

Pay Item	**Pay Unit**
Fine Grading	Lump Sum

SECTION 501
LIME-TREATED SOIL

501-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, treating the subgrade, embankment, natural ground or existing pavement structure by adding water and lime in the form specified herein, mixing, shaping, compacting and finishing the mixture to the required density. Prepare the soil layer to be stabilized; haul, proportion, spread and mix the materials within the depth range as shown on plans; manipulate, compact and finish the lime-treated soil; correct, repair and maintain the lime-treated soil; and apply a sand seal in accordance with the requirements of Article 501-3. Construct the work in accordance with the typical sections, lines and grades shown on the plan.

501-2 MATERIALS

Refer to Division 10.

Item	Section
Lime	1052-3
Water	1024-4

Use soil material which consists of material upon which the pavement is to be placed, existing material upon which the embankment is to be placed, approved borrow material or a combination of these materials proportioned as directed. Remove all vegetation, roots or other objectionable matter from the soil, as well as all aggregate or stone larger than 2 inches for the full depth to be treated.

501-3 LIMITATIONS

Do not perform lime stabilization when the air temperature is below 45°F. Do not mix the lime with frozen soils or when the soils contain frost. Apply lime to such areas as can be initially mixed and sealed during the day of application. Do not apply lime when wind conditions are such that blowing lime becomes hazardous to traffic, workers or adjacent property owners or when excessive loss of lime may occur.

Do not construct lime-treated soil that will not be covered with a layer of pavement or base by December 1 of that same calendar year. The Engineer may suspend the lime stabilization operations in writing when he determines that the Contractor will not cover the completed stabilization by December 1 as specified above.

Failure of the Contractor to cover the lime-treated soil as required will result in the Engineer notifying the Contractor in writing to cover the lime-treated soil with a sand seal. Apply the sand seal in accordance with Section 660, except Articles 660-3 and 660-12 will not apply. If the Contractor fails to apply the sand seal within 72 hours after receipt of such notice, the Engineer may proceed to have such work performed by other forces and equipment. The application of the sand seal by the Contractor or other forces will in no way relieve the Contractor of the responsibility to maintain or repair the damaged stabilization, no matter what the cause of damage, at no cost to the Department.

501-4 EQUIPMENT

(A) General

Use any combination of machines and equipment to produce the required results that meet the approval of the Engineer. Correct any leakage of fluids or materials promptly or the Engineer may order such equipment removed and replaced with satisfactory equipment. Use equipment and methods for applying lime, water, curing seal and blotting sand that will not damage the base and in accordance with Article 107-21.

(B) Lime Spreaders

Spread lime at the required rate by methods and equipment which have been approved.

(C) Water Distribution Equipment

Add water to the soil with a pressure distributor or other suitable equipment capable of uniformly distributing the required amount.

(D) Mixers

Perform mixing with a self-propelled rotary mixer, except that disc harrows, motor graders and other equipment may be used only to supplement the mixing done by the rotary mixer.

Use mixing equipment capable of mixing to a compacted depth of at least 10 inches.

(E) Compaction Equipment

Use compaction equipment that is self-propelled. Perform finish rolling with a pneumatic tired roller, or as permitted, a smooth, steel-wheel roller or a combination of both types.

(F) Scarifying Equipment

Use a grader-scarifier for the initial scarification of the soil. Use equipment capable of scarifying to the full depth of the stabilized treatment. When required, use a weeder, spiketooth harrow or nail drag, followed by a broom drag to scarify during finishing operations.

501-5 PROTECTION AND SAFETY

Take necessary precautions to protect personnel from dust created by the lime application and mixing operation to include eye protection, dust masks and appropriate training.

501-6 PREPARATION OF ROADBED

Before the addition of any lime to the soil, grade and shape the area to be stabilized in accordance with the typical sections, lines and grades shown on the plans. Remove all materials such as aggregate larger than 2 inches, roots and turf.

501-7 SCARIFYING

When required by the method of application, scarify the soil to the required depth and width and then partially pulverize by making one pass through the area with a pulverizing rotary mixer. Delete the pulverizing portion of the scarifying operation in areas where the soil types or conditions make pulverizing with a rotary mixer impractical.

501-8 APPLICATION OF LIME

(A) General

When the Contractor has brought the soil layer to the elevation required by the plans, the Engineer will sample the soil and determine the quantity of lime to be incorporated. Allow 24 calendar days for the Engineer to perform the required sampling, testing and final design of the lime stabilization. The optimum moisture will be determined by the Engineer.

Spread lime or lime slurry only on an area of such size that all primary mixing operations can be completed in the same day during daylight hours, except where the work is to be done at night as required by the contract.

Incorporate the lime or lime slurry into the soil mixture at the rates determined by the Engineer. Distribute the lime at the uniform rate and minimize the scattering by the wind. Mix the lime into the soil within 2 hours after application.

No equipment, except that used in spreading, slaking and mixing, will be allowed to pass over the freshly spread lime until it is mixed with the soil.

(B) Slurry Method

Do not add lime slurry to the soil when the moisture content exceeds 2% above optimum moisture. Aerate soil or allow to dry naturally until the soil contains no more than 2% above optimum moisture.

Mix hydrated lime applied by this method with water in approved agitating equipment and apply to the soil to be treated as a thin water suspension or slurry. When quicklime is used to produce the slurry, use equipment specifically manufactured for the slaking of quicklime. Use distributing equipment that provides continuous agitation of the slurry from the slurry production site until the slurry is applied to the soil. Proportion the lime so that the dry solids content is at least 30% by weight.

Split the lime application into approximately 2 equal applications with the first being partially mixed into the soil to a minimum depth of 3 inches before applying the second application.

(C) Quicklime

Do not add dry quicklime to the soil when the moisture content exceeds 4% above optimum moisture. Aerate soil or allow to dry naturally until it contains no more than 4% above optimum moisture.

Where the "Bottom-Dump" method of application is used, omit the preliminary scarification of the soil surface. Apply the quicklime by slowly driving the tanker truck over the coverage area with the bottom discharge valves open creating a windrow of quicklime.

Repeat the process until the tanker is empty in order to provide at least 3, for a 24 foot roadway, reasonably uniform and equally spaced windrows over the area being stabilized. The number of windrows required will depend on the width of the section being stabilized and will be stipulated by the Engineer.

Carefully spread the windrows of quicklime with a motor grader into an equal depth layer over the entire area to be stabilized.

After the lime has been spread, follow with a sprinkling of water to slake the lime. After a complete slaking of the lime, thoroughly mix the lime with the soil. The Engineer may direct that the lime first be mixed into the soil followed by sprinkling and additional mixing to ensure complete slaking of the lime throughout the layer to be stabilized.

(D) Hydrated Lime

Use hydrated lime only with written permission and do not add to the soil when the moisture content exceeds 6% above optimum moisture.

501-9 MIXING

(A) Primary Mixing

Immediately after the lime has been spread and slaked, if required, mix the lime into the soil for the full depth of treatment. Mix the lime into the soil to provide a compacted depth of at least 8 inches. A minimum number of mixing passes will be required to ensure uniform incorporation of the lime. Add water as necessary and thoroughly mix with the soil lime mixture so that the mixture contains no less than optimum moisture. A tolerance of 3% above optimum will be allowed. Incorporate all of the lime thoroughly and uniformly into the soil layer to the full depth of treatment so that the result is a homogeneous, friable mixture of soil and lime, free of clods or lumps exceeding 2 inches in size.

After primary mixing operations and before curing, shape and lightly compact the lime-treated area to the approximate section to allow for proper drainage and to minimize evaporation loss.

(B) Preliminary Curing

Following primary mixing operations, cure the stabilized layer for 1 to 4 days. The actual duration of this curing period will be determined by the Engineer. During the curing period, keep the surface of the material moist to prevent drying and cracking and maintain in a properly sealed and crowned condition. Mix, compact, shape and finish the stabilized layer no later than 4 days after primary mixing.

(C) Final Mixing and Pulverizing

Immediately after the completion of the preliminary curing period, mix and pulverize completely the stabilized layer to the full depth of the stabilization. Continue the final mixing until all of the clods are broken down to pass a 1/2 inch sieve and at least 80% pass a No. 4 sieve, exclusive of rock. Add water, as required, during the final mixing to raise the moisture content before compaction.

501-10 COMPACTING, SHAPING AND FINISHING

Begin compaction of the mixture immediately after completion of the final mixing operations. Aerate or moisten the mixture as necessary during compaction operations to maintain the moisture between optimum and optimum plus 2%. Compact the full depth of the mixture to a density equal to at least 97% of that obtained by compacting a sample of the soil lime mixture in accordance with AASHTO T 99 as modified by the Department. Copies of these modified procedures are available upon request from Materials and Tests Unit. Accompany the compaction with sufficient blading to eliminate irregularities.

Perform the final rolling of the completed surface with a pneumatic-tired roller or if permitted a smooth, steel-wheel roller.

Complete shaping, final mixing, compacting and finishing on the same day upon completion of the preliminary curing. This work is to be completed no later than 4 days after primary mixing and done during daylight hours, unless otherwise provided in the contract. If the above work is not completed as specified, rip up the entire section and add additional lime, as directed, at no additional cost to the Department.

501-11 THICKNESS

The compacted thickness of the completed treated soil layer will be determined by measurements made in test holes located at random intervals not to exceed 500 feet. Do not deviate the measured thickness from that shown on the plans by more than plus 1 inch or minus 1/2 inch.

Where the lime-treated soil layer is deficient in thickness by more than 1/2 inch, remove and replace the area of deficient thickness with lime-treated soil having the required thickness at no cost to the Department.

As an exception to the above, if the deficiency is not considered sufficient to seriously impair the required strength of the lime-treated soil layer, the deficient area may, at the discretion of the Engineer, be left in place.

501-12 FINAL CURING

After the lime-treated soil has been finished in accordance with Article 501-10, protect it against drying for a 7 day curing period in accordance with Section 543.

501-13 TRAFFIC

Completed sections of the lime-treated soil may be opened when necessary to lightweight local traffic, provided it has hardened sufficiently to prevent marring or distorting of the surface and provided the curing is not impaired. Do not use construction equipment on the lime-treated soil, except as necessary to discharge material into the spreader during paving operations or except as may be otherwise permitted for embankment construction.

501-14 MAINTENANCE

Maintain the lime-treated soil in an acceptable condition until final acceptance of the project. Include immediate repair of any defects or damage in maintenance operations. Repeat as necessary to keep the lime-treated soil in an acceptable condition. Perform repairs to lime-treated soil by replacing the lime-treated soil for its full depth rather than by adding a thin layer of lime stabilized material to the existing layer. An alternate repair method may be used if approved in writing.

501-15 MEASUREMENT AND PAYMENT

Lime-Treated Soil will be measured and paid as the number of square yards of each layer of lime-treated soil that has been completed and accepted. In determining this quantity, the width of the lime-treated soil will be measured across the top surface of the treated layer. The length will be the actual length constructed, measured along the centerline of the surface of the treated layer.

Lime for Lime-Treated Soil where hydrated lime or quick lime is spread directly on the soil in solid form or when hydrated lime is used to produce a slurry, the quantity of lime to be paid will be the number of tons of lime that has been incorporated into the soil at the required rates. No measurement will be made of any lime added or replaced for corrective measures during construction or for repairing damaged areas. Measurement is to be made in bulk in the truck on certified platform scales or other certified weighting devices.

Where quicklime is slaked on the project and applied in slurry form, measurement will be calculated as indicated below for each truckload using the certified lime purity for that load.

A+B = Total hydrated lime produced (pay quantity)

Where:

A = Certified weight of quicklime delivered x % purity x 1.32
B = Certified weight of quicklime delivered x % inert material

Asphalt Curing Seal will be paid in accordance with Article 543-5.

Blotting Sand will be paid in accordance with Article 818-4.

If a layer of lime-treated soil is deficient in thickness but has been permitted to be left in place in accordance with Article 501-11, payment for that lime-treated soil and lime will be made at 50% of the contract unit prices for *Lime-Treated Soil* and *Lime for Lime-Treated Soil*.

Sand seal applied due to the failure of the Contractor to cover the lime-treated soil as required will be incidental to the work of this section. If the Contractor fails to provide sand seal as required and the Engineer has the work performed by other forces, the cost of such work will be deducted from monies due or to become due to the Contractor.

Maintenance, repair and restoration of the lime stabilization is incidental to the work of this section.

Payment will be made under:

Pay Item	**Pay Unit**
Lime-Treated Soil	Square Yard
Lime for Lime-Treated Soil	Ton

SECTION 505
AGGREGATE SUBGRADE

505-1 DESCRIPTION

Construct aggregate subgrades in accordance with the contract or as directed. Undercut as needed in cut areas. Install geotextile for soil stabilization and place Class IV subgrade stabilization at locations shown on the plans.

505-2 MATERIALS

Refer to Division 10.

Item	Section
Geotextile for Soil Stabilization, Type 4	1056
Select Material, Class IV	1016

Use Class IV select material for Class IV subgrade stabilization.

505-3 CONSTRUCTION METHODS

When shallow undercut is required to construct aggregate subgrades, undercut 6 inches to 24 inches as shown on the plans or as directed. Perform undercut excavation in accordance with Section 225. Install geotextile for soil stabilization in accordance with Article 270-3. Place Class IV subgrade stabilization (standard size no. ABC) by end dumping ABC on geotextiles. Do not operate heavy equipment on geotextiles until geotextiles are covered with Class IV subgrade stabilization. Compact ABC to 92% of AASHTO T 180 as modified by the Department or to the highest density that can be reasonably obtained.

Maintain Class IV subgrade stabilization in an acceptable condition and minimize the use of heavy equipment on ABC in order to avoid damaging aggregate subgrades. Provide and maintain drainage ditches and drains as required to prevent entrapping water in aggregate subgrades.

505-4 MEASUREMENT AND PAYMENT

Shallow Undercut will be measured and paid in cubic yards. Shallow undercut will be measured in accordance with Article 225-7. The contract unit price for *Shallow Undercut* will be full compensation for excavating, hauling and disposing of materials to construct aggregate subgrades.

Class IV Subgrade Stabilization will be measured and paid in tons. Class IV subgrade stabilization will be measured by weighing material in trucks in accordance with Article 106-7. The contract unit price for *Class IV Subgrade Stabilization* will be full compensation for furnishing, hauling, handling, placing, compacting and maintaining ABC.

Geotextile for Soil Stabilization will be measured and paid in accordance with Article 270-4.

Payment will be made under:

Pay Item	Pay Unit
Shallow Undercut	Cubic Yard
Class IV Subgrade Stabilization	Ton

SECTION 510
AGGREGATE STABILIZATION

510-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, furnishing all aggregate and water; hauling, spreading and mixing the required amount of aggregate with the subgrade materials; shaping and compacting the stabilized subgrade to the required grade and typical section; and maintaining the aggregate.

510-2 MATERIALS

Refer to Division 10.

Item	Section
Stabilizer Aggregate	1008-1

510-3 CONSTRUCTION METHODS

(A) Mixing

Remove sufficient subgrade material, if necessary, to compensate for the addition of the stabilizer aggregate. Spread the quantity of aggregate required by the contract uniformly over the subgrade by means of a mechanical spreader. Spread the aggregate on the subgrade in advance of the mixing operations only to the extent that processing can be completed within one week. Mix the aggregate with the top 3 inches of the subgrade soil. Continue mixing until the aggregate is uniformly mixed with the soil to the width and depth to be treated.

The aggregate shall be sampled, tested and approved before placing layers of base material or pavement thereon.

(B) Shaping and Compaction

Shape the stabilized subgrade to the lines, grades and typical sections shown on the plans.

Compact the entire depth and width of the stabilized subgrade to a density equal to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T 99 as modified by the Department. Copies of these modified testing procedures are available upon request from the Materials and Tests Unit. Compact the stabilized subgrade at a moisture content which is approximately that required to produce the maximum density indicated by the above test method. Dry or add moisture to the material as required to provide a uniformly compacted and acceptable subgrade.

510-4 TOLERANCE

A tolerance of ± 1/2 inch from the established grade will be permitted after the stabilized subgrade has been graded to a uniform surface.

Perform grading of the subgrade such that the maximum differential between the established grade and the stabilized subgrade within any 100 foot distance is 1/2 inch.

510-5 PROTECTION

Protect the aggregate stabilized subgrade in accordance with Article 500-4.

510-6 MEASUREMENT AND PAYMENT

Stabilizer aggregate will be measured and paid as the actual number of tons of aggregate, exclusive of any corrective material, which has been mixed with the completed and accepted subgrade. This quantity will be measured as provided for in Article 520-11.

Payment will be made under:

Pay Item	Pay Unit
Stabilizer Aggregate	Ton

SECTION 520
AGGREGATE BASE COURSE

520-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, constructing a base composed of an approved aggregate material hauled to the road, placed on the road, mixed, compacted and shaped in accordance with the lines, grades, depths and typical sections shown in the plans; applying a sand seal in accordance with Article 520-5; and maintaining the base.

520-2 MATERIALS

Refer to Division 10.

Item	Section
Aggregate Base Course	1006 and 1010

520-3 METHODS OF PRODUCTION

Furnish aggregate upon which no restrictions are placed on the production or stockpiling, except as provided in Sections 1005, 1006 and 1010. Place aggregates on the roadway which have been sampled, tested and approved in accordance with Article 520-6.

520-4 SUBGRADE PREPARATION

Prepare the subgrade in accordance with Section 500 before placement of the base material.

520-5 HAULING AND PLACING AGGREGATE BASE MATERIAL

Place the aggregate material on the subgrade with a mechanical spreader box capable of placing the material to a uniform loose depth and without segregation; except, for areas inaccessible to a mechanical spreader box, the aggregate material may be placed by other methods approved by the Engineer. In addition, as approved by the Engineer, place by end dumping aggregate on approved sandy subgrade soils to provide a working platform and reduce wheel rutting of the subgrade. When allowed, end dumping will be limited to a uniformly spread thickness of 2 to 3 inches prior to placing the remaining aggregate thickness with a mechanical spreader box.

Where the Contractor elects to use more than one source of aggregate as described in Section 1005, place the various types of aggregate used in an approved manner which will permit the sampling and testing required by Section 1006 and 1010.

Where the required compacted thickness of base is 10 inches or less, the base material may be spread and compacted in one layer. Where the required compacted thickness is more than 10 inches spread the base material and compact in 2 or more approximately equal layers. Compact the base material to a minimum thickness of approximately 4 inches for any one layer.

Have each layer of material sampled, tested, compacted and approved before placing succeeding layers of base material or pavement.

Do not place base material on frozen subgrade or base.

Base course that is in place on November 15 shall immediately be covered with a subsequent layer of pavement structure or with a sand seal. Base course that has been placed between November 16 and March 15 inclusive shall be covered within 7 calendar days with a subsequent layer of pavement structure or with a sand seal. Apply sand seal in accordance with Section 660, except Articles 660-3 and 660-12 will not apply.

Failure by the Contractor to cover the base course as required above will result in the Engineer notifying the Contractor in writing to cover the base course with a sand seal and to suspend the operations of placing aggregate base course until such cover has been placed. If the Contractor fails to apply the sand seal within 72 hours after receipt of such notice, the Engineer may proceed to have such work performed with other forces and equipment. The application of the sand seal by the Contractor or by others will in no way relieve the Contractor of the responsibility to maintain or repair the damaged base or subgrade, no matter what the cause of damage.

Do not allow traffic on the completed base course other than necessary local traffic and that developing from the operation of essential construction equipment as may be authorized by the Engineer. Repair any defects that develop in the completed base or any damage caused by local or construction traffic acceptably. Hauling equipment may be operated with the approval of the Engineer, over a lower layer of base, however, acceptably repair any rutting, weaving or soft areas that develop.

Do not exceed 35 mph with hauling equipment traveling over any part of the base.

Use methods of handling, hauling and placing which will minimize segregation and contamination. If segregation occurs, the Engineer may require that changes to the Contractor's methods and may require mixing on the road to correct segregation. Remove and replace all aggregate which is contaminated with foreign materials to the extent that the base course will not adequately serve its intended use. The above requirements will be applicable regardless of the type of aggregate placed and regardless of prior acceptance.

520-6 SAMPLING, TESTING AND ACCEPTANCE

Perform sampling for the determination of gradation, LL and PI for the various types of aggregate, as defined in Articles 1010-1 and 1010-2.

Where visual observation indicates the need to do so, the Engineer may require the Contractor to road mix areas of nonuniform gradation. The Engineer reserves the right to take samples in addition to the lot acceptance samples from within the lot in areas exhibiting nonuniform gradation. When the test results from such an additional sample is outside the gradation limits in Section 1010 and the nonuniformity cannot be corrected by road mixing, the aggregate base course represented by the sample will be rejected and replaced by the Contractor.

520-7 SHAPING AND COMPACTION

Machine and compact the layer of base within 48 hours after beginning the placing of a layer of the base. Maintain each layer to the required cross section during compaction and compact each layer to the required density before placing the next layer.

Compact the base material at a moisture content which is approximately that required to produce a maximum density. Dry or add moisture to the material when required to provide a uniformly compacted and acceptable base. If it is necessary to add water after the material is placed, scarify the material and add water uniformly throughout the full depth of the layer of the base course material. Density determination will be based on Article 520-9.

Shape the final layer of base material in accordance with the lines, grades and typical section as shown on the plans. Construct the base course so that it is smooth, hard, dense, unyielding and well bonded upon completion. A broom drag may be used in connection with the final finishing and conditioning of the surface of the base course.

520-8 TOLERANCES

After final shaping and compacting of the base, the Engineer will check the surface of the base for conformance to the grade and typical section and determine the base thickness.

Construct the base so that the thickness of the base is within a tolerance of ± 1/2 inch of the base thickness required by the plans. When the base course will be used under concrete pavement, the tolerance will be ± 1/4 inch.

Construct the base so that the maximum differential between the established grade and the base within any 100 feet section is 1/2 inch or 1/4 inch when used as a base course under concrete pavement.

520-9 DENSITY DETERMINATION

The Engineer may use nuclear or conventional means as described below to determine the density of selected base course materials required by Sections 520 and 540. The target density will be from the material's most recent AASHTO T 180 test results, which may be obtained from the Materials and Tests Unit.

A new target density is to be obtained when there is a change in the source of material, when a significant change occurs in the composition of the materials from the same source or when determined necessary.

(A) Conventional Method

When electing to use conventional density test number 3 (ring test) to determine density, compact each layer of the base to a density equal to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T 180 as modified by the Department. Information on these modified testing procedures are available in the *NCDOT Conventional Density Operator's Manual* on line in the Materials and Tests Unit's web site.

(B) Nuclear Method

When electing to use a nuclear density gauge to determine density, compact each layer of the base to a density meeting requirements in the *NCDOT Nuclear Density Testing Manual – Base Course, FDR and Select Materials.* Copies of this manual are available upon request from the Materials and Tests Unit.

520-10 MAINTENANCE

Where the base material is placed in a trench section, provide adequate drainage through the shoulders to protect the subgrade and base until such time as the shoulders are completed.

Maintain the surface of the base by watering, machining, rolling or dragging when necessary to prevent damage to the base by weather or traffic.

Where the base or subgrade is damaged, repair the damaged area; reshape the base to required lines, grades and typical sections; and recompact the base to the required density at no cost to the Department.

520-11 MEASUREMENT AND PAYMENT

Aggregate Base Course will be measured and paid at the contract unit price per ton for the actual number of tons of aggregate which has been incorporated into the completed and accepted work. Sampling and acceptance will be determined in accordance with Section 1010.

The aggregate will be measured by being weighed in trucks on certified platform scales or other certified weighing devices. If permitted by the contract, the weight of base course material shipped by barge may be determined from water displacement measurements.

No deductions will be made for any moisture contained in the aggregate at the time of weighing.

Sand seal applied due to the failure of the Contractor to cover the base course as required will be incidental to the work of this section. If the Contractor fails to provide sand seal as

required and the Engineer has the work performed by other forces, the cost of such work will be deducted from monies due or to become due to the Contractor.

Maintenance, repair and restoration of the base course and subgrade is incidental to the work of this section. If segregation during handling, hauling or placing occurs and the Engineer requires a change in methods or mixing on the road to correct this segregation, this work will be incidental to the work of this section. Removal and replacement of aggregate which is contaminated with foreign materials or outside the gradation limits will be incidental to the work of this section.

Payment will be made under:

Pay Item	**Pay Unit**
Aggregate Base Course	Ton

SECTION 535
CONDITIONING EXISTING BASE

535-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, scarifying, shaping, furnishing water, compacting and maintaining the base. Included in the work is:

(A) Conditioning of an existing base to prepare it for the placement of a pavement directly upon the base. Included in the conditioning is scarifying, shaping and compacting the base to conform to the required lines, grades, depths and typical sections established by the plans.

(B) Conditioning of an existing base in preparation for the placement of additional layers of base material. Included in the conditioning is scarifying, shaping and compacting the base to conform to the approximate lines, grades, depths and typical sections established by the plans.

535-2 CONSTRUCTION METHODS

Compact the base to a degree satisfactory to the Engineer. Dry or add moisture to the material when required to provide a uniformly compacted and acceptable base.

Do not condition the existing base when it contains excess moisture or is frozen.

Maintain the base in accordance with Article 520-10.

535-3 MEASUREMENT AND PAYMENT

Conditioning Existing Base will be measured and paid at the contract unit price per 1,000 sy for the actual number of units of 1,000 sy of base over which the work of conditioning existing base has been acceptably performed. The length will be measured along the centerline of the surface of the base. The width will be the width required by the plans or established by the Engineer measured across the top surface of the base.

Payment will be made under:

Pay Item	**Pay Unit**
Conditioning Existing Base	1,000 Square Yards

SECTION 540
CEMENT-TREATED BASE COURSE

540-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, construction and curing a cement-treated base composed of aggregate, furnishing of water and aggregate; the mixing, proportioning, hauling and spreading of the materials; furnishing Portland cement at the point where it is incorporated into the mix; manipulating, compacting and finishing the base; maintaining the base; making repairs or corrections to the base; and applying sand seal in accordance with Article 540-3. Compact, shape and cure the base to conform to the lines, grades, depths and typical sections shown on the plans.

When cement-treated base course is called for on the plans, the Contractor has the option of providing a plant mixed cement-treated base course or a road mixed cement-treated base course as specified below.

540-2 MATERIALS

Refer to Division 10.

Item	Section
Aggregate	1010-1, 1010-2
Portland Cement, Type I	1024-1
Water	1024-4

540-3 LIMITATIONS

Do not construct cement-treated base when the air temperature is less than 40°F nor when conditions indicate that the temperature may fall below 40°F within 24 hours. Do not incorporate frozen materials into the mixture nor place material on frozen subgrade. Protect the base from freezing for 7 days after completion.

Do not place cement-treated base that will not be covered with pavement by December 1 of the same year. Failure of the Contractor to cover the cement-treated base as required above will result in the Engineer notifying the Contractor in writing to cover the cement-treated base with a sand seal. Apply the sand seal in accordance with Section 660, except Articles 660-3 and 660-12 will not apply. If the Contractor fails to apply the sand seal within 72 hours after receipt of such notice, the Engineer may proceed to have the work performed with other forces and equipment. The application of the sand seal by the Contractor or other forces will in no way relieve the Contractor of the responsibility to maintain or repair the damaged base, no matter what the cause of damage.

540-4 PREPARATION OF SUBGRADE

Prepare the subgrade in accordance with Section 500. Prepare the subgrade so that it is firm and able to support without displacement the construction equipment and the compaction operations hereinafter specified. Soft or yielding subgrade shall be corrected and made stable before construction proceeds. Moisten the subgrade as needed before spreading the base material.

540-5 CONSTRUCTION METHODS

(A) Composition of Mixture

When the Contractor proposes to use a source of aggregate that is not documented by a currently approved job mix formula, submit to the Department's Materials and Tests Unit, samples of all aggregates proposed for use at least 3 weeks before beginning production. Take the aggregate samples in the presence of the Engineer. Submit in writing the proposed gradation for the cement-treated base material. The Department will then prepare a mix design based upon the samples submitted and the Contractor's stated proposed gradation.

A job mix formula will be established for the cement-treated base material within the design limits in Section 1010. Use the job mix formula unless modified in writing by the Engineer.

Prepare all cement-treated base material mixtures so that they conform to the job mix formula within the tolerance ranges specified in Table 540-1. If the Contractor is unable to maintain the production within the tolerance ranges specified in Table 540-1 for two consecutive lots, production will stop until such time as a new mix design and job mix formula has been established and approved by the Engineer.

TABLE 540-1
TOLERANCES FOR JOB MIX FORMULA
PORTLAND CEMENT-TREATED BASE

Sieve Size	Tolerance for Percent Passing
1 1/2"	0
1"	± 5
1/2"	± 8
No. 4	± 7
No. 10	± 7
No. 40	± 4
No. 200	± 2
Material Passing No. 10 Sieve (Soil Mortar)	
No. 40	± 8
No. 200	± 5

(B) Plant Mixed Cement-Treated Base Course

(1) Mixing

(a) General

Add to the aggregate the quantity of cement specified by the Engineer.

Thoroughly mix the cement, aggregates and water in an approved central mixing plant. Use a batch or continuous-flow type stationary mixer and equip it with feeding and metering devices that will add aggregate, cement and water into the mixer in the specified quantity. Use batch weights or rates of feed of cement that are within 0.3% of the quantity designated by the Engineer. Use batch weights or rates of flow of water that are within a range of optimum to optimum plus 1.5% moisture. Use batch weights or rates of feed of aggregate that are within 5% of the amounts designated by the Engineer.

Mix materials at least 20 seconds to assure a proper blend of materials.

(b) Batch Type Plant

Equip the mixer with a sufficient number of paddles of a type and arrangement to produce a uniformly mixed batch.

Add water during the mixing operation as required to provide the quantity of moisture specified; however, do not add water to the mixture before the aggregate and cement have been mixed sufficiently to prevent the formation of cement balls.

Equip the mixer with a timing device which will indicate by a definite audible or visual signal the expiration of the mixing period.

(c) Continuous Flow Type Plant

Calibrate and mark cement storage silos so that the amount of cement in the silo can be readily determined at any time. Design feeders and/or meters for introducing the cement into the mixer such that the amount of cement can be accurately determined before it is introduced into the mixer. Use a variable speed motor on the cement feeder which is regulated by a control mechanism indicating the speed of the motor in r.p.m. or equivalent measure. Design the indicator so that it can be read in daylight from a point 4 feet from the indicator. Equip the cement holding tank which is used in feeding cement with an air pressure gauge and air pressure regulating control such that air pressure can be regulated to a uniform flow.

Measure the water by a meter which determines flow in gallons per minute and control it with 2 valves. Use a variable flow valve for controlling the rate of flow of the water only on one valve and use an on-off valve connected to the plant controls such that the water is turned on and/or off when the plant is started and stopped for the other valve.

After the material has been processed by the pug mill, store it in a holding bin with the minimum capacity of 3 tons before discharging into trucks. Hold the material in the holding bin for loading purposes only and do not store for loading subsequent trucks. Loading trucks directly from a belt or auger box will not be permitted.

Have available a satisfactory platform for obtaining samples from trucks. Make provisions for calibrating the plant daily and at other times as deemed necessary by the Engineer. On plants that are electronically controlled, manual calibration will be required to verify the electronic calibration and shall be performed at the beginning of a project. If the plant operation is interrupted by more than 4 calendar days during an active project, perform the manual calibration process again. Perform random manual calibrations at the direction of the Engineer.

(2) Hauling and Placing

Haul the mixed base material to the roadway in trucks with protective covers to avoid moisture loss. Do not exceed one hour between the loading of the haul trucks and the beginning of compaction.

Place stringlines for alignment control for placing a layer of base.

Place the base in a uniform layer on the moistened, prepared subgrade to produce the depth required by the plans. To insure homogenous distribution of the base material in each layer, place the material using approved spreaders. Perform the spreading operations to eliminate pockets of material of non-uniform gradation resulting from segregation in the hauling or discharging operations. Spread each layer so that compaction can be started without further shaping.

A single spreader may be used provided it is capable of placing a uniform, full-depth layer of material across the full width of the base in one pass. Otherwise, 2 or more spreaders will be required and operate the spreaders so that the spreading progresses along the full width of the base in a uniform manner.

Base placed on areas inaccessible to mechanical spreading equipment may be spread in one layer by approved methods. After spreading, compact the material thoroughly to the required lines, grades and typical sections by means of pneumatic tampers or with other compaction equipment which will constantly obtain the degree of compaction required.

(C) Road Mixed Cement-Treated Base Course

(1) Equipment

Use any combination of machines or equipment that will produce the required results meeting the approval of the Engineer. Use a cement spreader which has an adjustable rate of flow and the capability of spreading the required amount of cement in one pass. Mix cement, aggregate and water with a self-propelled rotary mixer capable of mixing to a depth of 10 inches. Correct any leakage of fluids and/or materials promptly or the Engineer may order such equipment removed and replaced with satisfactory equipment. Use equipment and methods for applying cement, water, curing seal and blotting sand that does not damage the base and in accordance with Article 107-21.

(2) Spreading and Mixing

Place the required quantity of aggregate on the prepared subgrade in a uniform layer. Spread aggregate on the subgrade in advance of the mixing operations only to the extent that processing can be completed within one week. Apply the required quantity of cement in a uniform spread on the aggregate in place and immediately blend the aggregate until the cement is uniformly distributed throughout the aggregate. Maintain the moisture content at or below the optimum moisture at the time of application of the cement. Do not apply cement on excessively windy days and apply only to such an area that all operations shall be completed on the same day during daylight hours.

The Engineer will establish the actual cement content during construction.

Immediately after the aggregate and cement have been thoroughly blended, apply water as needed and incorporate into the mixture. Control the application of the water so that there is no excessive concentration on or near the surface of the mixture. After the necessary water has been applied, continue mixing until a thorough and uniform mixture is obtained.

Maintain the moisture content at the time of final mixing and during compaction within a range of optimum to optimum plus 1.5% as determined. Make sure that the moisture content in the mix does not exceed the quantity that will cause the base course to become unstable during compaction or finishing operations.

540-6 COMPACTION

Begin compaction immediately after the plant mixed base has been placed on the prepared subgrade or immediately after cement and water has been incorporated into the previously placed aggregate. Compact any one layer of base so the thickness is between 4 inches and 8 inches.

After spreading, maintain the moisture content of the material within a range of optimum to optimum plus 1.5% moisture during compaction.

Accomplish compaction by the use of approved self-propelled rollers, except do not use a sheep-foot roller for more than 2 passes. Compact the base by the use of approved self-propelled rollers to a density equal to at least 97% of the maximum density obtained by compacting a sample of the material in accordance with AASHTO T 180 as modified by the Department. Copies of these modified testing procedures are available upon request from the Materials and Tests Unit. The Engineer may, at his option, utilize nuclear methods as described in the *NCDOT Nuclear Density Testing Manual – Base Course, FDR and Select Materials* to determine the density of the base instead of the methods required above. Copies of this manual are available upon request from the Materials and Tests Unit.

Complete final compaction, including that necessary due to correction of high or low areas, within 3 hours after water has been added to the mixture. Do not leave any cement-aggregate

mixture undisturbed for more than 30 minutes if it has not been compacted and finished. When rain causes excessive moisture, reconstruct the entire section. When such reconstruction is necessary, perform the work of reconstruction and provide the cement required at no cost to the Department.

540-7 CONSTRUCTION JOINTS

Build the base for large, wide areas in a series of parallel lines of convenient length and width meeting the approval of the Engineer. Form straight longitudinal joints at the edge of each day's construction by cutting back into the completed work to form a vertical face free of loose or shattered materials. Where traffic considerations require that a longitudinal joint be exposed for an excessive length of time, the Engineer may require that it be covered with a curing seal in accordance with Section 543.

540-8 TOLERANCES

After final shaping and compacting of the base, the Engineer will check the surface of the base for conformance to the grade and typical section and determine the base thickness.

Construct the thickness of the base so that it is within a tolerance of ± 1/2 inch of the base thickness required by the plans. When the base course will be used under concrete pavement the tolerance will be ± 1/4 inch.

Construct the base so that the maximum differential between the established grade and the base within any 100 foot section is 1/2 inch or 1/4 inch when used as a base course under concrete pavement.

540-9 CURING

After the cement-treated base has been finished as specified herein, cure it in accordance with Section 543.

540-10 AGGREGATE FOR CEMENT-TREATED BASE

Use aggregate for cement-treated base course from an approved source participating in the Department’s Aggregate Quality Control/Quality Assurance Program (Aggregate QC/QA Program) which has been sampled, tested and approved in accordance with Section 1006.

540-11 TRAFFIC

Completed sections of the base may be opened when necessary to lightweight local traffic, provided the base has hardened sufficiently to prevent marring or distorting of the surface and provided the curing is not impaired. Do not operate construction equipment on the base, except as necessary to discharge into the spreader during paving operations.

540-12 MAINTENANCE

Maintain the base in an acceptable condition until final acceptance of the project. Include immediate repair of any defects or damage that may occur in any maintenance operation. Perform this maintenance at no cost to the Department and repeat as often as may be necessary to keep the base in an acceptable condition. Perform repairs to the base by replacing the base for its full depth rather than by adding a thin layer of cement-stabilized material to the existing layer of base.

540-13 MEASUREMENT AND PAYMENT

Aggregate for Cement-Treated Base Course will be measured and paid at the contract unit price per ton that has been incorporated into the completed and accepted work. The quantity will be measured by weighing in trucks on certified platform scales or other certified weighing devices. No deduction will be made for any moisture contained in the aggregate at the time of weighing. Measurement will not be made of any base mixture added or replaced for corrective measures during construction or for repairing damaged areas.

Portland Cement for Cement-Treated Base Course will be measured and paid at the contract unit price per ton that has been incorporated into the mix. When bulk cement is used, the quantity will be measured by weighing in trucks on certified platform scales or other certified weighing devices. When cement-treated base is produced at a commercial source for more than one project, the Engineer may elect to measure the cement based upon the cement content shown in the approved job mix formula. Measurement will not be made of any cement added or replaced for corrective measures during construction or for repairing damaged areas.

Asphalt Curing Seal will be paid in accordance with Article 543-5.

Blotting Sand will be paid in accordance with Article 818-4.

The above prices and payments will be full compensation for all work covered by this section including, but not limited to, the furnishing of water and aggregate; the mixing, proportioning, hauling and spreading of the materials; furnishing Portland cement at the point where it is incorporated into the mix; manipulating, compacting and finishing the base; maintaining the base; making repairs or corrections to the base; and applying sand seal in accordance with Article 542-3.

If the Contractor fails to provide sand seal as required and the Engineer has the work performed by other forces, the cost of such work will be deducted from monies due or to become due to the Contractor.

Payment will be made under

Pay Item	**Pay Unit**
Aggregate for Cement-Treated Base Course	Ton
Portland Cement for Cement-Treated Base Course	Ton

SECTION 542
SOIL-CEMENT BASE

542-1 DESCRIPTION

The work covered by this section consists of constructing and curing a soil-cement base by treating the subgrade, existing subbase or existing base, or any combination of these materials, by pulverizing, adding Portland cement, adding aggregate when required, mixing, wetting and compacting the mixture to the required density. Proportion, spread and mix the materials on the roadway; manipulate, compact and finish in accordance with the *Standard Specifications* and the lines, grades, depths and typical sections shown on the plans or established by the Engineer.

542-2 MATERIALS

Refer to Division 10.

Item	**Section**
Aggregate, ABC	Table 1005-1
Portland Cement, Type I	1024-1
Water	1024-4

Use soil material that consists of material existing in the area to be paved, approved borrow material or a combination of these materials proportioned as directed by the Engineer that is free from vegetation, roots or other objectionable matter; and does not contain aggregate or stone larger than 2 inches.

542-3 LIMITATIONS

Do not construct the soil-cement base when the air temperature is below 40°F nor when conditions indicate that the temperature may fall below 40°F within 24 hours. Do not place or mix materials with frozen subgrade. Protect the base from freezing for 7 days after

completion. Perform the work only during daylight hours except as otherwise provided in the contract.

Do not construct soil-cement base that will not be covered with a layer of base or pavement by December 1st of the same year. Failure of the Contractor to cover the soil-cement base as required above will result in the Engineer notifying the Contractor in writing to cover the soil-cement base with a sand seal. Apply the sand seal in accordance with Section 660 except Articles 660-3 and 660-12 will not apply. If the Contractor fails to apply the sand seal within 72 hours after a receipt of such notice, the Engineer may proceed to have the work performed with other forces and equipment. The application of the sand seal by the Contractor or other forces will in no way relieve the Contractor of the responsibility to maintain or repair the damaged base, no matter what the cause of damage.

542-4 EQUIPMENT

(A) General

Use any combination of machines or equipment that will produce the required results meeting the approval of the Engineer. Correct any leakage of fluids and/or materials promptly or the Engineer may order such equipment removed and replaced with satisfactory equipment. Use equipment and methods for applying cement, water, curing seal and blotting sand that will not damage the base and in accordance with Article 107-21.

(B) Cement Spreaders

Use mechanical spreaders that have an adjustable rate of flow and the capability of spreading the required amount of cement in one pass.

(C) Water Distribution Equipment

Add water to the soil with a pressure distributor or other suitable equipment capable of uniformly distributing the required amount.

(D) Mixers

Perform all mixing with a self-propelled rotary mixer. Disc harrows, motor graders and other equipment may be used only to supplement the mixing done by the rotary mixer.

Use mixing equipment that is capable of mixing to a compacted depth of at least 10 inches.

(E) Compaction Equipment

Use self-propelled compaction equipment. Accomplish finish rolling with a pneumatic-tire roller or if permitted by the Engineer, a smooth steel-wheel roller.

(F) Scarifying Equipment

Use a grader-scarifier for the initial scarification of the soil. Use equipment capable of scarifying the soil to the full depth of the stabilized treatment. When required by the Engineer, use a weeder, spiketooth harrow or nail drag, followed by a broom drag when scarifying during finishing operations.

542-5 PREPARATION OF ROADBED

Before the addition of any cement to the soil, grade and shape the area to be stabilized in accordance with the typical sections, lines and grades shown on the plans. Perform drying or addition of moisture where necessary before the application of cement. Create the subgrade so it is firm and able to support the construction equipment and compaction operations specified. Correct and make stable, soft or yielding subgrade before construction proceeds.

542-6 SCARIFYING

Scarify the soil in the area to be stabilized to the required depth and width before application of cement. Pulverizing with a rotary mixer will follow scarifying, except it may be deleted in areas where, if determined, the soil types or conditions make pulverizing with a rotary mixer impractical.

542-7 APPLICATION OF CEMENT

When the Contractor has brought the subgrade to the elevation required by the plans, the Engineer will sample the soil to be stabilized in order to determine the quantity of cement to be incorporated. Incorporate 24 calendar days into the schedule to allow the Engineer sufficient time to perform the required sampling, testing and final design of the cement stabilization.

Before spreading cement, aggregate shall be spread at the rate shown in the plans.

Incorporate cement into the mix at the rate directed by the Engineer. Uniformly spread the quantity of cement required for the full depth of treatment over the surface in one pass. Do not apply cement on excessively wet grade or on windy days.

Apply cement to the soil when the percentage of moisture in the soil material is the correct amount that assures a uniform mixture of soil material and cement during the mixing operation. Do not exceed the optimum moisture content established by the Engineer for the soil cement moisture except by permission.

The optimum moisture content and density will be determined in the field by a moisture-density test on representative samples of soil-cement mixture; however, preliminary moisture-density values may be determined by laboratory tests using soils from the project. Moisture content will be determined by the Engineer in accordance with standard test procedures used by the Department.

Apply cement only to such an area that all operations shall be completed in the same day during daylight hours. Complete finishing the soil-cement mix within 4 hours of adding water to the soil-cement mixture. No equipment, except that used in spreading and mixing, will be allowed to pass over the freshly spread cement until it is mixed with the soil. Replace all spread cement that has been displaced before mixing is started.

542-8 MIXING

Immediately after the cement has been spread, mix it with the loosened soil material for the full depth of the treatment until a homogenous and uniform mixture is produced. Mixing will be sufficient when 100% of the mixture passes a 1/2 inch sieve and at least 80% passes a No. 4 sieve, exclusive of any aggregate.

Immediately after mixing the soil and cement, add any additional water that is necessary to bring the moisture content between optimum and optimum plus 2% as determined by the Engineer. If moisture content exceeds the specified range, the soil-cement mixture may, if approved by the Engineer, be manipulated by remixing or blading to reduce the moisture content to within the specified range. Avoid excessive concentrations of water as well as wet spots or streaks on or near the surface. After all mixing water has been applied, continue mixing until a uniform mixture is obtained at the required moisture content. Perform the operations of cement spreading, water application and mixing so that they result in a uniform soil, cement and water mixture for the full depth and width of the area being treated. Remix any soil and cement mixture that has not been compacted and finished within 30 minutes.

542-9 COMPACTION

Begin compaction of the mixture immediately after the mixing operation is completed. At the start of compaction, make sure that the moisture in the mixture is no more than 2% above or below the optimum moisture content and is less than the quantity which will cause the soil-cement mixture to become unstable during compaction and finishing. Compact the mixture to

at least 97% of that obtained by a moisture-density test using AASHTO T 134 as modified by the Department. Copies of these modified testing procedures are available upon request from the Materials and Tests Unit.

Before compaction, prepare the mixture in a loose condition for its full depth. Compact the loose mixture uniformly to the specified density. During the compaction operations, initial shaping may be required to obtain uniform compaction and required grade and cross section.

542-10 FINISHING

When initial compaction is nearing completion, shape the surface of the soil-cement to the required lines, grades and cross section. Maintain the moisture content of the surface material at optimum or higher during finishing operations.

If necessary, lightly scarify the surface to remove any tire imprints or smooth surfaces left by equipment. Continue compaction until a uniform and adequate density is obtained.

Perform the compaction and finishing to produce a dense surface free of compaction planes, cracks, ridges or loose material.

When rain causes excessive moisture, reconstruct the entire section. Where such reconstruction is necessary, furnish all work and cement required.

542-11 THICKNESS

The compacted thickness of the completed soil-cement base will be determined by measurements made in test holes located at random intervals not to exceed 500 feet. Construct the soil-cement base so that the measured thickness does not deviate from that shown on the plans by more than + 1 inch or - 1/2 inch.

Where the base is deficient in thickness by more than 1/2 inch, remove and replace the area of deficient base with base of the required thickness.

As an exception to the above, if the deficiency is not considered sufficient to seriously impair the required strength of the soil-cement base, the deficient area may, at the discretion of the Engineer, be left in place.

542-12 CURING

After the cement-treated base has been finished as specified herein, cure it in accordance with Section 543.

542-13 CONSTRUCTION JOINTS

Build soil-cement for large wide areas in a series of parallel lanes of convenient length and width meeting the approval of the Engineer. Form straight longitudinal joints at the edge of each day's construction by cutting back into completed work to form a true vertical face free of loose or shattered material.

Construct joints to provide a vertical joint having adequately mixed properly compacted material immediately adjacent to the joint. A longitudinal joint adjacent to partially hardened soil-cement built the preceding day may be formed by cutting back into the previously constructed area during mixing operations. Set guide stakes for cement spreading and mixing if deemed necessary.

542-14 TRAFFIC

Completed sections of the base may be opened when necessary to light-weight local traffic, provided the base has hardened sufficiently to prevent marring or distorting of the surface and provided the curing is not impaired. Do not use construction equipment on the base for hauling except as necessary to discharge into the spreader during paving operations.

542-15 MAINTENANCE

Maintain the soil-cement base in an acceptable condition until final acceptance of the project. Include, in maintenance operations, immediate repair of any defects or damage that may occur. Repeat as often as may be necessary to keep the base in an acceptable condition. Perform repairs to the base by replacing the base for its full depth rather than by adding a thin layer of soil-cement mixture to the existing layer of base.

542-16 MEASUREMENT AND PAYMENT

Soil Cement Base will be measured and paid at the contract unit price per square yard that has been completed and accepted. In measuring this quantity, the width of the base will be measured across the top surface of the base. The length will be the actual length constructed, measured along the centerline of the surface of the base. Measurement will not be made of any base added or replaced for corrective measures during construction or for repairing damaged areas.

Aggregate for Soil Cement Base will be measured and paid in tons at the contract unit price per ton. The aggregate will be measured by weighing in trucks or certified platform scales or other certified weighing devices. No deductions will be made for any moisture contained in the aggregate at the time of weighing.

Portland Cement for Soil Cement Base will be paid at the contract unit price per ton that has been incorporated into the mix. When bulk cement is used, the quantity will be measured by weighing in trucks on certified platform scales or other certified weighing devices. Measurement will not be made of any cement added or replaced for corrective measures during construction or for repairing damaged areas.

Asphalt curing seal will be paid as provided in Article 543-5.

Blotting Sand will be paid as provided in Article 818-4.

If a layer of soil-cement base is deficient in thickness but has been permitted to be left in place in accordance with Article 542-11, payment for that soil-cement base will be made at 50% of the contract unit prices for *Soil Cement Base*.

Sand seal applied due to the failure of the Contractor to cover the soil-cement base as required will be incidental to the work of this section. If the Contractor fails to provide sand seal as required and the Engineer has the work performed by other forces, the cost of such work will be deducted from monies due or to become due to the Contractor.

Payment will be made under:

Pay Item	**Pay Unit**
Soil Cement Base	Square Yard
Portland Cement for Soil Cement Base	Ton
Aggregate for Soil Cement Base	Ton

SECTION 543
ASPHALT CURING SEAL

543-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, keeping the stabilized layer moist; furnishing and applying the asphalt curing seal; correcting, maintaining and repairing the asphalt curing seal; and blotting sand where directed, to either a chemically stabilized soil layer or to a cement-stabilized base course.

543-2 MATERIALS

Refer to Division 10.

Item	Section
Asphalt, Grade CRS-1	1020-3
Asphalt, Grade CRS-1H	1020-3
Asphalt, Grade CRS-2	1020-3
Asphalt, Grade RS-1	1020-3
Asphalt, Grade RS-1H	1020-3

543-3 EQUIPMENT

Use equipment to apply the asphalt material in accordance with Article 600-5.

Use equipment to apply water, curing seal and blotting sand that is of such type and weight that it will not damage the completed stabilized layer.

543-4 CONSTRUCTION METHODS

Continuously moisten the finished stabilized layer or base course until the asphalt curing seal is placed. Place the curing seal as soon as possible, but no later than 24 hours after completing finishing operations except where delayed by wet weather. If wet weather delays application of the curing seal, apply the curing seal as soon as the surface becomes sufficiently dry.

At the time the asphalt curing seal is applied, prepare the surface of the stabilized layer or base so that it is free of all loose or extraneous material and contains sufficient moisture to prevent excessive penetration of the asphalt material. If deemed necessary, sweep the base surface clean of loose material before applying the curing seal. Apply the curing seal in accordance with Section 600.

Apply the asphalt material to the surface of the completed stabilized layer or base at a target rate of 0.14 +/- 0.04 gal/sy with approved equipment. Apply the asphalt material at the exact rate and temperature of application as established by the Engineer.

Cure the underlying materials for 7 curing days. Curing time will be counted in at least 1/2 day units and only when the air temperature measured at the location of the operation is at least 50°F. Complete the curing before placement of subsequent layers of pavement.

Maintain the curing material during the curing period so that all of the stabilized layer or base will be covered effectively during the period. Provide sufficient protection from freezing to the stabilized layer or base during the entire curing period and until it has hardened. Replace excessive loss of curing seal caused by heavy rains within 8 hours of placement.

If the Engineer determines that it is necessary to allow local traffic to use parts of the stabilized layer or base before the asphalt material has cured sufficiently, protect those areas by applying blotting sand in accordance with Section 818.

543-5 MEASUREMENT AND PAYMENT

Asphalt Curing Seal will be measured and paid at the contract unit price per gallon that has been placed on the stabilized layer or base. Seal material placed on the stabilized layer or base in excess of the authorized rate plus 0.02 gal/sy will not be measured for payment. Measurement will not be made of any curing seal used to replace curing seal lost by heavy rains which occur after placing the curing seal.

Blotting Sand will be paid as provided for in Article 818-4.

Payment will be made under:

Pay Item	Pay Unit
Asphalt Curing Seal	Gallon

SECTION 545
INCIDENTAL STONE BASE

545-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, furnishing, hauling, placing and shaping a graded stone material for use in driveways, temporary maintenance of traffic, adjacent to mailboxes, beneath traffic island, median covers and at any other locations, other than use as a part of any base course on which pavement is to be placed; shaping; tamping when required; maintaining the base; and disposing of any surplus stockpiled material.

545-2 MATERIALS

Use stone, gravel or recycled concrete for the graded stone material which is well graded from the 1-1/2 inches through the No. 200 sieve sizes in accordance with Article 1006. The liquid limit of the recycled concrete is raised 5 points to no more than 35.

545-3 GRADATION SAMPLING, TESTING AND ACCEPTANCE

Acceptance of the graded stone material will be made by visual inspection and approval by the Engineer as being satisfactory for the purpose intended before its use. No sampling or testing of the graded stone material will be performed.

545-4 PLACING AND SHAPING STONE

Spread the stone material uniformly over the area required and then shape and dress to the satisfaction of the Engineer.

Uniformly spread, grade to the required depth and firmly tamp the stone material beneath traffic island and median covers. If the Contractor desires, the surface of the stone material may be covered with a sufficient amount of fine material to facilitate grading and shaping.

545-5 MAINTENANCE

Maintain the stone material until final acceptance of the project by reshaping and by the addition of incidental stone base material when directed by the Engineer.

Maintain all stone material beneath traffic islands and median covers in satisfactory condition until the covers are placed.

545-6 MEASUREMENT AND PAYMENT

Incidental Stone Base will be measured and paid at the contract unit price per ton that has been stockpiled or incorporated into the completed and accepted work. This quantity will be measured as provided for in Article 520-11. Incidental stone base which has been stockpiled will not be measured more than one time.

Payment will be made under:

Pay Item	Pay Unit
Incidental Stone Base	Ton

SECTION 560
SHOULDER CONSTRUCTION

560-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, furnishing the source of the borrow; building; maintaining and obliterating haul roads; clearing and grubbing the borrow source; removal, hauling and disposition of overburden and other unsuitable material; excavation; hauling; formation of roadway shoulders include the reshaping and finishing of slopes adjacent to the shoulders and roadway ditches; restoration of the source and haul roads to an acceptable condition; disposal of surplus stockpiled material; and seeding and mulching.

560-2 MATERIALS

Refer to Division 10.

Item	Section
Shoulder Borrow	1019-2
Aggregate Shoulder Borrow	1019-3

560-3 CONSTRUCTION METHODS

Construct the top 6 inches of shoulders with soils capable of supporting vegetation.

Construct the shoulders in proper sequence with the type of base and pavement being constructed. Perform the work so as to provide proper drainage at all times. Shape and roll the shoulder material during placement to provide for bonding of layers and compaction to the satisfaction of the Engineer.

Before placing any earth material on existing graded shoulders, remove all existing vegetation and scarify the existing shoulders to ensure a proper bond.

Perform the final shaping of the shoulders, adjacent slopes and ditches in accordance with the typical section shown on the plans.

Provide adequate equipment to perform the work. Do not damage base, surface, pavement or drainage features during the construction of the shoulders. Should damage occur because of the Contractor's operations, repair the damaged portions or remove and replace them as directed at no cost to the Department.

560-4 MEASUREMENT AND PAYMENT

(A) General

Shoulder borrow will be measured in its original position or in the haul truck, as directed by the Engineer.

No measurement will be made of material transported directly from unclassified excavation or fine grading and deposited directly in place on the shoulder.

The quantity of shoulder borrow will be paid at the contract unit price per cubic yard for *Shoulder Borrow*, except as otherwise provided below.

(B) Measured in Original Position

The quantity of shoulder borrow to be paid will be the actual number of cubic yards of approved material, measured in its original position in the borrow source or stockpile by cross sectioning and computed by the average end area method, which has been incorporated into the completed and accepted work. No measurement will be made of any overburden or unsuitable material removed from the borrow source, nor of any material excavated before cross sections being taken.

(C) Truck Measurement

The quantity of shoulder borrow to be paid will be the actual number of cubic yards of approved material, measured in trucks, which has been incorporated into the completed and accepted work. Each truck will be measured by the Engineer and shall bear a legible identification mark indicating its capacity. Load each truck to its measured capacity at the time it arrives at the point of delivery. The recorded capacity will be adjusted by making a 25% deduction to allow for shrinkage, and the adjusted capacity will be the quantity to be paid.

When shoulder material is obtained as a result of fine grading operations, trenching out existing subgrade or shaping slopes and ditches, no direct payment will be made for the work of shoulder construction as such work will be incidental to the work of constructing the base or pavement.

No payment will be made for the removal and disposal of any surplus material remaining in the stockpile after the shoulders have been completed.

Where the borrow source has been furnished by the Department, payment for clearing and grubbing the source will be made as provided in Article 200-8 and payment for draining the source will be made as provided in Article 240-4. Where the source has been furnished by the Contractor, no separate payment will be made for clearing and grubbing or draining the source as such work will be incidental to the work covered by this section.

If aggregate shoulder borrow (ASB) is used for borrow, a unit weight of 140 lb/cf will be used to convert the weight of ASB to cubic yards.

Payment for seeding and mulching all borrow sources will be made at the contract unit prices for the items established in the contract as payment for the work of seeding and mulching.

Payment will be made under:

Pay Item	**Pay Unit**
Shoulder Borrow	Cubic Yard

SUPPLEMENTAL SPECIFICATION 9

DIVISION 6
ASPHALT PAVEMENTS

SECTION 600
PRIME COAT

600-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, treating an existing non-asphalt base course with asphalt material by furnishing and applying the prime, furnishing and placing granular material to protect the prime and maintaining the prime coat in accordance with these Specifications.

Treat all non-asphalt bases beneath an asphalt surface treatment with a prime coat.

600-2 MATERIALS

Refer to Division 10.

Item	Section
Prime Coat Materials	1020-5

Use materials for prime coat application that are on the APL for prime coats available on the Department's website.

Where the grade of prime coat material is not established by the contract, the Contractor may select the grade to be used from the APL. All prime coat materials shall be delivered to the project ready for use.

600-3 WEATHER LIMITATIONS

Apply prime coat only when the surface to be treated is free of standing water, at proper moisture content and the atmospheric temperature measured at the location of the operation away from artificial heat is 40°F or above for plant mix and 50°F or above for asphalt surface treatment.

Do not apply prime coat on a frozen surface or when the weather is foggy or rainy.

600-4 BASE PREPARATION

Clean the base of objectionable debris, excessive dust and any other deleterious matter before placing the prime coat.

When directed, dampen the surface of the base before application of the prime coat.

600-5 APPLICATION EQUIPMENT

Provide, maintain and operate a pressure distributor that is designed and equipped such that the asphalt material remains at a constant temperature and is applied uniformly on variable widths of surface at predetermined and controlled rates. Use a distributor equipped with a tachometer or synchronizer, pressure gauges, accurate volume measuring devices or a calibrated tank and a mounted thermometer for measuring temperature.

Use a distributor equipped with a power driven pump of sufficient capacity to distribute the required quantity of asphalt material at constant flow and uniform pressure. Provide a full circulation spray bar adjustable laterally and vertically and adjustable in length to conform to the required width of application without overlapping. Provide and maintain nozzles designed to provide equal and uniform application at all times. Provide a hand spray hose and nozzle to cover areas inaccessible to the spray bars. Equip the distributor with a positive shut-off control for the spray bar and hand hose.

600-6 APPLICATION RATES AND TEMPERATURES

Apply the prime coat at a rate from 0.20 to 0.50 gal/sy. The exact rate for each application will be established by the Engineer before application.

The required rate of application of asphalt materials will be based on the volume of material measured at the application temperature. Apply the prime coat material at a temperature that is in accordance with the manufacturer's recommendations or as approved.

600-7 APPLICATION OF PRIME COAT

Apply the prime coat only when the base to be treated has been approved.

Cover bridge floors, curbs and handrails of structures and all other appurtenances to protect them from tracking or splattering of prime coat.

After the prime coat has penetrated sufficiently and when directed, roll the primed surface until all loose base material is thoroughly bonded.

600-8 MAINTENANCE AND PROTECTION

When directed, apply blotting sand in accordance with Section 818.

Maintain the prime coat in an acceptable condition until such time as the pavement is placed. Replace any damaged prime coat.

600-9 MEASUREMENT AND PAYMENT

Ensure the volume of the distributor tank is calibrated by a commercial laboratory or the manufacturer before use. Provide a calibration chart with an accurately calibrated measuring stick graduated in increments of not more than 25 gal on the distributor at all times for use by the Engineer.

Prime Coat will be paid at the contract unit price per gallon of prime coat material satisfactorily placed on the roadway. Each distributor load of prime coat material delivered and used on the project will be measured. Repair damaged prime coat at no cost to the Department.

Blotting Sand will be paid in accordance with Article 818-4.

Payment will be made under:

Pay Item	Pay Unit
Prime Coat	Gallon

SECTION 605
ASPHALT TACK COAT

605-1 DESCRIPTION

Apply tack coat material to existing asphalt or concrete surfaces in accordance with these Specifications.

Apply tack coat beneath each layer of asphalt plant mix to be placed. Where a prime coat or a newly placed asphalt surface treatment mat coat has been applied, apply tack coat as directed.

605-2 MATERIALS

Refer to Division 10.

Item	Section
Asphalt Binder, Grade PG 58-28	1020-2
Asphalt Binder, Grade PG 64-22	1020-2
Emulsified Asphalt, Grade CRS-1	1020-3
Emulsified Asphalt, Grade CRS-1H	1020-3

Emulsified Asphalt, Grade CRS-2	1020-3
Emulsified Asphalt, Grade HFMS-1	1020-3
Emulsified Asphalt, Grade RS-1H	1020-3

Do not dilute or mix the tack coat material with water, solvents or other materials before application.

Unless otherwise specified in the contract, use any of the grades of tack coat material specified in this article.

For tack coat beneath an open-graded asphalt friction course, the asphalt grade and rate of application to be used on the project will be specified in accordance with Section 650-5.

605-3 WEATHER LIMITATIONS

Apply tack coat only when the surface to be treated is dry and when the atmospheric temperature measured at the location of the paving operation away from artificial heat is 35°F or above.

Do not apply tack coat when the weather is foggy or rainy.

605-4 SURFACE PREPARATION

Ensure that the existing asphalt or concrete surface is free of all dust and foreign material before applying the tack coat.

Remove grass, dirt and other materials from the edge of the existing pavement before the placement of tack coat.

605-5 ACCEPTANCE OF ASPHALT MATERIALS

The acceptance of asphalt materials will be in accordance with Article 1020-1.

605-6 APPLICATION EQUIPMENT

Provide equipment for heating and uniformly applying the asphalt material in accordance with Article 600-5.

605-7 APPLICATION RATES AND TEMPERATURES

Apply tack coat uniformly across the existing surface at target application rates shown in Table 605-1.

TABLE 605-1
APPLICATION RATES FOR TACK COAT

Existing Surface	**Target Rate (gal/sy)**
	Emulsified Asphalt
New Asphalt	0.04 ± 0.01
Oxidized or Milled Asphalt	0.06 ± 0.01
Concrete	0.08 ± 0.01

Apply tack coat at a temperature within the ranges shown in Table 605-2. Tack coat shall not be overheated during storage, transport or at application.

TABLE 605-2 APPLICATION TEMPERATURE FOR TACK COAT	
Asphalt Material	**Temperature Range**
Asphalt Binder, Grade PG 58-28 or PG 64-22	350 - 400°F
Emulsified Asphalt, Grade RS-1H	130 - 160°F
Emulsified Asphalt, Grade CRS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-1H	130 - 160°F
Emulsified Asphalt, Grade HFMS-1	130 - 160°F
Emulsified Asphalt, Grade CRS-2	130 - 160°F

605-8 APPLICATION OF TACK COAT

Apply only as much tack coat material as can be covered with base, intermediate or surface course material during the next day's operation except where public traffic is being maintained.

If public traffic is being maintained, cover the tack coat in the same day's operation. Provide safe traffic conditions. If needed, apply suitable granular material so it bonds to the tack coat. In addition, the Engineer may limit the application of tack coat in advance of the paving operation depending on traffic conditions, project location, proximity to business or residential areas or other reasons.

Take necessary precautions to limit the tracking or accumulation of tack coat on either existing or newly constructed pavements. Excessive accumulation of tack coat requires corrective measures.

Apply tack coat with a distributor spray bar that can be adjusted to uniformly coat the entire surface at the directed rate. Use a hand hose attachment only on irregular areas and areas inaccessible to the spray bar. Cover these areas uniformly and completely.

Apply tack coat as directed by and in the presence of the Engineer. Do not place any asphalt mixture until the tack coat has sufficiently cured.

Apply tack coat to all exposed transverse and longitudinal edges of each course before mixture is placed adjacent to such surfaces. Apply tack coat to contact surfaces of headers, curbs, gutters, manholes and vertical faces of old pavements.

Cover bridge floors, curbs and handrails of structures and all other appurtenances to protect them from tracking or splattering tack coat material.

605-9 PROTECTION OF TACK COAT

After the tack coat has been applied, protect it until it has cured for a sufficient length of time to prevent it from being picked up by traffic.

605-10 MEASUREMENT AND PAYMENT

There will be no direct payment for the work covered by this section.

Payment at the contract unit prices for the various mix items covered by Sections 610, 650 and 654 will be full compensation for all work covered by this section.

SECTION 607
MILLING ASPHALT PAVEMENT

607-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, milling and re-milling the pavement at locations, depths, widths and typical sections indicated in the contract; cleaning the milled surface; loading, hauling and stockpiling the milled material for use in recycled asphalt mixtures; and disposal of any excess milled material.

Except where the milled material is used in the work or where otherwise directed, provide areas outside the right of way to dispose of milled material, which shall be property of the Contractor.

607-2 EQUIPMENT

Use a self-propelled unit capable of removing the existing asphalt pavement to the depths, widths and typical sections shown in the contract. Use milling machines designed and built exclusively for pavement milling operations and with sufficient power, traction and stability to accurately maintain depth of cut and slope. Use milling machines equipped with an electronic control system that will automatically control the longitudinal profile and cross slope of the milled pavement surface. Accomplish this through the use of a mobile grade reference, an erected string line, joint matching shoe, slope control systems or a combination of approved methods. Use an erected fixed stringline when required by the contract. Otherwise, use a mobile grade reference system capable of averaging the existing grade or pavement profile over at least 30 feet. Use either a non-contacting laser or sonar type ski systems with at least 4 referencing stations mounted on the milling machine at a length of at least 24 feet. Coordinate the position of the grade control system such that the grade sensor is at the approximate midpoint of the mobile reference system. Use a machine capable of leaving a uniform surface suitable for handling traffic without damage to the underlying pavement structure. Use a milling machine and other loading equipment capable of loading milled material to be used in other parts of the work without segregation.

Provide additional equipment necessary to satisfactorily remove the pavement in the area of manholes, water valves, curb, gutter and other obstructions.

Equip the milling equipment with a means of effectively limiting the amount of dust escaping from the removal operation in accordance with Federal, State and local air pollution control laws and regulations.

607-3 CONSTRUCTION METHODS

Mill the existing pavement to restore the pavement surface to a uniform longitudinal profile and cross section in accordance with typical sections shown in the plans. Where indicated in the contract, remove pavement to a specified depth and produce a specified cross slope. Mill intersections and other irregular areas unless otherwise directed by the Engineer.

The Contractor may elect to make multiple cuts to achieve the required depth of cut or cross slope required by the plans.

Establish the longitudinal profile of the milled surface by a mobile string line on the side of the cut nearest the centerline of the road. Establish the cross slope of the milled surface by an automatic cross slope control mechanism or by a second skid sensing device located on the opposite edge of the cut. The Engineer may waive the requirement for automatic grade and cross slope controls where conditions warrant.

Operate the milling equipment so as to prevent damage to the underlying pavement structure, utilities, drainage facilities, curb and gutter, paved surfaces outside the milled area and any other appurtenances. Produce milled pavement surfaces that are reasonably smooth and free of excessive scarification marks, gouges, ridges, continuous grooves or other damage. Repair any leveling or patching required as a result of negligence by the Contractor with hot asphalt plant mix in a manner acceptable to the Engineer. Coordinate the adjustment of manholes, meter boxes and valve boxes with the milling operation in accordance with Article 858-3 including a temporary asphalt ramp.

When necessary, the contractor may remove the top section of a utility and use a bridge steel plate placed to cover the entire width of the structure, ensuring no debris is dropped inside the structure. Backfill with compacted material and hot mix asphalt as a temporary riding surface as well as any further necessary requirements of the utility owner. This steel plate must be capable of carrying any traffic load carried by the facility. Where necessary, double-reference the location of each structure that has been removed and maintain a map of their location. Construct a temporary ramp of asphalt plant mix to extend a minimum of 3 feet around raised structures before opening to traffic.

The Engineer may require re-milling of any area exhibiting laminations or other defects. Thoroughly clean the milled pavement surface of all loose aggregate particles, dust and other objectionable material. Disposing or wasting of oversize pieces of pavement or loose aggregate material will not be permitted within the right of way.

Conduct pavement removal operations so as to effectively minimize the amount of dust being emitted. Plan and conduct the operation so it is safe for persons and property adjacent to the work including the traveling public.

607-4 TOLERANCE

Remove the existing pavement to the depth required by the contract. The Engineer may vary the depth of milling.

607-5 MEASUREMENT AND PAYMENT

(A) Milled Asphalt Pavement

Milled Asphalt Pavement, __" Depth and *Milling Asphalt Pavement, __" to __"* to be paid will be the actual number of square yards of pavement surface milled in accordance with this Specification. In measuring this quantity, the length will be the actual length milled, measured along the pavement surface. The width will be the width required by the plans or directed, measured along the pavement surface. Areas to be paid under these items include mainline, turn lanes, shoulders, and any additional equipment necessary to remove pavement in the area of manholes, water valves, curb, gutter and other obstructions.

(B) Milled Asphalt Pavement Depth Varies from Required Depth

Where the depth of milling varies from the required depth, no adjustment in the contract unit price for *Milling Asphalt Pavement, __" Depth* and *Milling Asphalt Pavement, __" to __"* will be made, except if the Engineer directs the depth of milling per cut to be altered by more than 1 inch. In this case, either the Department or the Contractor may request an adjustment in unit price in accordance with Article 104-3. In administering Article 104-3, the Department will give no consideration to value given to RAP due to the deletion or reduction in quantity of milling. Article 104-3 will not apply to the item of *Incidental Milling*.

For each square yard that the Engineer directs to be milled, including, but not limited to, the mainline, turn lanes, bus loading and unloading areas, widening for bus or truck U-turns, shoulders, intersections and crossovers requiring any additional equipment necessary to remove pavement in the area of manholes, water valves, curb, gutter and other obstructions, compensation will be made at the contract unit price per square yard for *Milling Asphalt Pavement, __" Depth* or *Milling Asphalt Pavement, __" to __"*.

(C) Incidental Milling

Incidental Milling to be paid will be the actual number of square yards of surface milled where the Contractor is required to mill butt joints, irregular areas and intersections milled as a separate operation from mainline milling and re-mill areas that are not due to the Contractor's negligence whose length is less than 100 feet. Measurement will be made as provided in Subarticle 607-5(A) for each cut the Contractor is directed to

perform. Where the Contractor elects to make multiple cuts to achieve the final depth, no additional measurement will be made. Compensation will be made at the contract unit price per square yard for *Incidental Milling*.

(D) Milling of Defects

If defects are determined to be the result of the Contractor's negligence, then measurement for the re-milling or repairs will not be made. If the Engineer directs re-milling of an area that is equal to or greater than 100 feet and is not due to the Contractor's negligence, the re-milled area will be measured as provided in Subarticle 607-5(A) and paid at the contract unit price per square yard for *Milled Asphalt Pavement, __" Depth* or *Milling Asphalt Pavement, __" to __"*.

Payment will be made under:

Pay Item	**Pay Unit**
Milling Asphalt Pavement, __" to __"	Square Yard
Milling Asphalt Pavement, __" Depth	Square Yard
Incidental Milling	Square Yard

SECTION 609
QUALITY MANAGEMENT SYSTEM FOR ASPHALT PAVEMENTS

609-1 DESCRIPTION

Produce and construct asphalt mixtures and pavements in accordance with a quality management system as described herein. Apply these *Standard Specifications* to all materials and work performed in accordance with Division 6. Perform all quality control (QC) activities in accordance with the Department's *Asphalt Mixture Quality Management System (QMS) Manual* in effect on the date of contract advertisement.

(A) Quality Control (QC)

Define a "quality control (QC) program" as all activities, including mix design, process control, plant and equipment calibration, sampling and testing and necessary adjustments in the process that are related to production of a pavement that meet the *Standard Specifications*. Provide and conduct a QC program in accordance with this section.

(B) Quality Assurance (QA)

Define a "quality assurance (QA) program" as all activities, including inspection, sampling and testing related to determining that the quality of the completed pavement conforms to specification requirements. The Department will conduct a QA program in accordance with Article 609-10.

609-2 MIX DESIGN/JOB MIX FORMULA REQUIREMENTS

Apply all requirements of Article 610-3.

609-3 FIELD VERIFICATION OF MIXTURE AND JOB MIX FORMULA ADJUSTMENTS

Conduct field verification of the mix at each plant within 45 calendar days before initial production of each mix design, when required by the *Allowable Mix Adjustment Policy* and when directed as deemed necessary.

Field verification testing consists of performing a minimum of one full test series on mix sampled and tested in accordance with Subarticle 609-6(B). Mix obtained from Department or non-Department work may be used for this purpose provided it is sampled, tested and the test data handled in accordance with the *Asphalt QMS Manual* and this article.

Obtain the mix verification sample and split in accordance with procedures in the *Asphalt QMS Manual.* Do not begin normal plant production until all field verification test results have been completed and the mix has been satisfactorily verified by the Contractor's Level II technician.

In addition to the required sampling and testing for field verification, perform all preliminary inspections and plant calibrations as outlined in the *Asphalt QMS Manual*. Retain records of these calibrations and mix verification tests at the QC laboratory. Furnish copies to the Engineer for review and approval within one working day after beginning production of the mix.

Failure by the Contractor to fully comply with the above mix verification requirements will result in immediate production stoppage by the Engineer. Do not resume normal production until all mix verification sampling, testing, calibrations and plant inspections have been performed and approved.

609-4 CONTRACTOR'S QUALITY CONTROL PERSONNEL REQUIREMENTS

Obtain all certifications in accordance with the Department's QMS Asphalt Technician Certification Program as outlined in the *Asphalt QMS Manual*. Perform all sampling, testing, data analysis and data posting by or under the direct supervision of a certified QMS asphalt plant technician.

Provide a certified asphalt plant technician Level I to perform QC operations and activities at each plant site at all times during production of material for the project. A plant operator who is a certified asphalt plant technician Level I may be used to meet this requirement when daily production for each mix design is less than 100 tons provided the randomly scheduled increment sample as defined in Section 7.3 of the *Asphalt QMS Manual* is not within that tonnage. When performing in this capacity, the plant operator will be responsible for all QC activities that are necessary and required. Absences of the Level I technician, other than those for normal breaks and emergencies shall be pre-approved by the appropriate Engineer or his designated representative. Any extended absence of the technician that has not been approved will result in immediate suspension of production by the Engineer. All mix produced during this absence will be accepted in accordance with Article 105-3.

Provide and have readily available a certified asphalt plant technician Level II to supervise, coordinate and make any necessary adjustments in the mix QC process in a timely manner. The Level II technician may serve in a dual capacity and fulfill the Level I technician requirements specified above.

Provide a certified QMS roadway technician with each paving operation at all times during placement of asphalt. This person is responsible for monitoring all roadway paving operations and all QC processes and activities, to include stopping production or implementing corrective measures when warranted. Provide a certified density gauge operator when density control is being used.

Post in the QC laboratory an organizational chart, including names, telephone numbers and current certification numbers of all personnel responsible for the QC program while asphalt paving work is in progress.

609-5 CONTRACTOR'S QUALITY CONTROL FIELD LABORATORY REQUIREMENTS

For a contract with 5,000 or more total tons of asphalt mix, furnish and maintain a Department certified laboratory at the plant site meeting the minimum requirements outlined in Section 7.2 of the *Asphalt QMS Manual*.

For a contract with less than 5,000 total tons of asphalt mix, the QC testing may be conducted in a Department certified off-site laboratory meeting the requirements.

Provide testing equipment as required in Section 7.2 of the *Asphalt QMS Manual*. Provide equipment that is properly calibrated and maintained. Allow all measuring and testing

devices to be inspected to confirm both calibration and condition. If at any time the Engineer determines that the equipment is not operating properly or is not within the limits of dimensions or calibration described in the applicable test method, the Engineer may stop production until corrective action is taken. Maintain and have available a record of all calibration results at the laboratory.

609-6 PLANT MIX QUALITY CONTROL

(A) General

Include in the QC process the preliminary inspections, plant calibrations and field verification of the mix and JMF in accordance with the *Asphalt QMS Manual*. Obtain all scheduled samples at randomly selected locations in accordance with the *Asphalt QMS Manual*. Log all samples taken on forms provided by the Department. Split and retain all samples taken in accordance with the *Asphalt QMS Manual*. Provide documentation as required in Subarticle 609-8. Identify any additional QC samples taken and tested on the appropriate forms. Process control test results shall not be plotted on control charts nor reported to the QA Laboratory.

Retain and store all samples in accordance with the requirements of Section 7.5 of the *Asphalt QMS Manual*.

(B) Required Sampling and Testing Frequencies

Maintain minimum test frequencies as established in the schedule below. Complete all tests within 24 hours of the time the sample is taken, unless specified otherwise within these provisions. If the specified tests will not be completed within the required time frame, cease production at that point until such time the tests are completed.

If the Contractor's testing frequency fails to meet the minimum frequency requirements as specified, all mix without the specified test representation will be unsatisfactory. The Engineer will evaluate if the mix may remain in place in accordance with Article 105-3.

Sample and test the completed mixture from each JMF at the following minimum frequency during mix production:

Accumulative Production Increment	Number of Samples per Increment
750 tons	1

If production is discontinued or interrupted before the accumulative production increment tonnage is completed, continue the increment on the next production day(s) until the increment tonnage is completed. Obtain a random sample within the specified increment at the location determined in accordance with the *Asphalt QMS Manual*. Conduct QC testing on each random sample in accordance with Section 7.3 of the *Asphalt QMS Manual*. When daily production of each mix design exceeds 100 tons and a regularly scheduled full test series on a sample from a random sample location for that JMF does not occur during that day's production, perform at least one partial test series in accordance with Section 7.3 of the *Asphalt QMS Manual*. These partial test series and associated tests do not substitute for the regularly scheduled random sample for that increment.

(C) Control Charts

Maintain standardized control charts furnished by the Department at the field laboratory. For mix incorporated into the project, record full test series data from all regularly scheduled random samples or directed samples that replace regularly scheduled random samples, on control charts the same day the test results are obtained.

Record QC sample data on the standardized control charts in accordance with Section 7.4 of the *Asphalt QMS Manual*.

Maintain a continuous moving average with the following exceptions.

Re-establish a new moving average only when:

(1) A change in the binder percentage, aggregate blend or G_{mm} is made on the JMF, or

(2) When the Contractor elects to stop or is required to stop production after one or two moving average values, respectively, fall outside the moving average limits as outlined in Table 609-1, or

(3) Failure to stop production after 2 consecutive moving averages exceed the moving average limits occurs, but production does stop at a subsequent time, re-establish a new moving average beginning at the actual production stop point.

In these cases, re-establish the moving averages for all mix properties. Moving averages will not be re-established when production stoppage occurs due to an individual test result exceeding the individual test limits or the *Standard Specifications*.

All individual test results for regularly scheduled random samples or directed samples that replace regularly scheduled samples are part of the plant QC record and shall be included in moving average calculations with the following exception. When the Contractor's testing data has been proven incorrect, use the correct data as determined by the Engineer instead of the Contractor's data to determine the appropriate pay factor in accordance with Section 7021 of the *Asphalt QMS Manual*. In this case, replace the data in question and any related data proven incorrect.

(D) Control Limits

Establish control limits for mix production in accordance with Table 609-1. Control limits for the moving average limits are based on a moving average of the last 4 data points. Apply all control limits to the applicable target source.

TABLE 609-1
CONTROL LIMITS

Mix Control Criteria	Target Source	Moving Average Limit	Individual Limit
2.36 mm Sieve	JMF	± 4.0%	± 8.0%
1.18mm Sieve (S4.75A only)	JMF	± 4.0%	± 8.0%
0.075 mm Sieve	JMF	± 1.5%	± 2.5%
Binder Content	JMF	± 0.3%	± 0.7%
VTM @ N_{des}	JMF	± 1.0%	± 2.0%
VMA @ N_{des}	Min. Spec. Limit	Min. Spec. Limit	- 1.0%
$P_{0.075}$/ P_{be} Ratio	1.0	± 0.4 %	± 0.8%
% G_{mm} @ N_{ini}	Max. Spec. Limit	-	+ 2.0%
TSR	Min. Spec. Limit	-	- 15%

(E) Corrective Actions

All required corrective actions are based upon initial test results and shall be taken immediately upon obtaining those results. If more than one corrective action or adjustment applies, give precedence to the more severe of these actions. Stopping production when required takes precedence over all other corrective actions. Document all corrective actions.

If the process adjustment improves the property in question such that the moving average after 4 additional tests is on or within the moving average limits, the Contractor may continue production.

When any of the following occur, production of a mix shall cease immediately:

(1) An individual test result for a mix control criteria (including results for required partial test series on mix) exceeds both the individual test control limits and the applicable specification design criteria, or

(2) Two consecutive field TSR values fail to meet the minimum specification requirement, or

(3) Two consecutive binder content test results exceed the individual limits, or

(4) Two consecutive moving average values for any one of the mix control criteria fall outside the moving average limits.

Do not resume normal plant production until one of the following has occurred.

Option 1: Approval has been granted by the appropriate QA supervisor.

Option 2: The mix in question has been satisfactorily verified in accordance with Section 7.4 of the *Asphalt QMS Manual*. Normal production may resume based on the approval of the contractor's Level II technician, provided notification and the verification test results have been furnished to the QA Laboratory.

Failure to fully comply with any of the above corrective actions will result in immediate production stoppage by the Engineer. Normal production shall not resume until a complete verification process has been performed and approved by the Engineer.

Failure to stop production when required will make all mix unacceptable from the stop point tonnage to the point when Option 1 or Option 2 occurs or to the tonnage point when production is actually stopped, whichever occurs first.

In any case, remove and replace this mix with materials that comply with the *Standard Specifications*, unless otherwise approved. The Engineer will evaluate acceptance of the mix in question based on Articles 105-3 and 609-11.

Immediately notify the Engineer when any moving average value exceeds the moving average limit. If two consecutive moving average values for any one of the mix control criteria fall outside the moving average limits, immediately cease production of that mix and make adjustments. The Contractor may elect to stop production after only one moving average value falls outside the moving average limits. In either case, do not determine a new moving average until the fourth test after the elective or mandatory stop in production.

(F) Allowable Resampling and Retesting for Mix Deficiencies

The Contractor shall resample and retest for plant mix deficiencies when warranted as outlined in Section 7.19 of the *Asphalt QMS Manual*. Perform the retesting within 10 days after initial test results are determined. Retests for any mix deficiency other than as listed below will not be allowed, unless otherwise permitted.

The Department reserves the right to require the Contractor to resample and retest at any time or location as directed.

TABLE 609-2 RETEST LIMITS FOR MIX DEFICIENCIES	
Property	**Limit**
VTM	by more than ± 2.5%
VMA	by more than ± 2.0%
% Binder Content	by more than ± 1.0%
0.075 mm sieve	by more than ± 3.0%
2.36 mm sieve	exceeds both the Specification mix design limits and one or more of the above tolerances
TSR	by more than - 15% from Specification limit

609-7 FIELD COMPACTION QUALITY CONTROL

(A) General

Perform QC of the compaction process in accordance with these provisions and applicable requirements of Article 610-10. The Contractor may elect to use either pavement core samples or density gauge readings as the method of density control. Provide to the Department at the pre-construction conference the method of density QC that will be used on the project.

Establish acceptable control strips when required at locations approved by the Engineer and in accordance with the *Asphalt QMS Manual*. In addition, place control strips anytime deemed necessary by the Engineer.

Perform density sampling and testing on all pavements as outlined in Sections 10.4 and 10.6 of the *Asphalt QMS Manual* unless otherwise approved.

Perform the sampling and testing at the minimum test frequencies as specified. If the density testing frequency fails to meet the minimum frequency as specified, all mix without the required density test representation will be unsatisfactory. The Engineer will evaluate if the mix may remain in place in accordance with Article 105-3.

(B) Limited Production Procedures

Define "resurfacing" as the first new uniform layer placed on an existing pavement. Proceed on limited production when, for the same mix type and on the same contract, one of the following conditions occur (except as noted below).

(1) Two consecutive failing lots, except on resurfacing,

(2) Three consecutive failing lots on resurfacing, or

(3) Two consecutive failing density gauge control strips.

As exceptions to the above, pavement within each construction category (New and Other), as defined in Section 10.3.3 of the *Asphalt QMS Manual*, and pavement placed simultaneously by multiple paving crews will be evaluated independently for limited production purposes.

Limited production is defined as the production, placement and compaction of a sufficient quantity of mix to construct a 300 feet control strip plus 100 feet of pavement adjacent to each end of the control strip.

Remain on limited production until such time as satisfactory density results are attained or until two control strips have been attempted without achieving acceptable density test results. If the Contractor fails to achieve satisfactory density after two control strips have been attempted, cease production of that mix type until such time as the cause of the failing density test results can be determined. As an exception, the Engineer may grant approval to produce a different mix design of the same mix type if Quality Control and Quality Assurance plant mix test indicate the failing densities are attributed to the mix problem(s) rather than compaction related problems and limited production startup would

not be required. The determination of whether a mix problem exists at this time will be made by QA personnel.

If the Contractor does not operate by the limited production procedures when conditions as specified in Section 10.9 of the *Asphalt QMS Manual*, all mix produced thereafter will be unacceptable. Remove this material and replace with material that complies with the *Standard Specifications*, at no additional cost to the Department.

609-8 CONTRACTOR QUALITY CONTROL DOCUMENTATION (RECORDS)

Document all QC activities, records of inspection, samples taken, adjustments to the mix and test results on a daily basis. Note the results of observations and records of inspection as they occur in a permanent field record. Record adjustment to mix production and test results on forms provided. Process control sample test results are for the Contractor's informational purposes only.

Make all such records available to the Engineer, upon request, at any time during project construction. Complete and maintain all QC records and forms and distribute in accordance with the *Asphalt QMS Manual*. Submit data electronically using the Department's software. Failure to maintain QC records and forms as required, or to provide these records and forms to the Engineer upon request, may result in production stoppage, placement stoppage, removal from the NCDOT Certified Asphalt Laboratory List and removal from the NCDOT Certified Asphalt Plant List until the problem is resolved.

Falsification of test results, documentation of observations, records of inspection, adjustments to the process, discarding of samples and/or test results or any other deliberate misrepresentation of the facts will result in the revocation of the applicable person's QMS certification. The Engineer will determine acceptability of the mix and/or pavement represented by the falsified results or documentation. If the mix and/or pavement in question is determined to be acceptable, the Engineer may allow the mix to remain in place at no pay for the mix, asphalt binder and other mix components. If the mix or pavement represented by the falsified results is determined not to be acceptable, remove and replace with mix that complies with the *Standard Specifications*.

609-9 QUALITY ASSURANCE

The Department's QA program will be conducted by a certified QMS technician(s) and will be accomplished based on the requirements of Section 7.60 for mix and Sections 10.5 and 10.7 for density in the *Asphalt QMS Manual*.

Differences between the Contractor's and the Department's split sample test results will be acceptable if within the limits of precision in Table 609-3.

TABLE 609-3 LIMITS OF PRECISION FOR TEST RESULTS	
Mix Property	**Limits of Precision**
25.0 mm sieve (Base Mix)	± 10.0%
19.0 mm sieve (Base Mix)	± 10.0%
12.5 mm sieve (Intermediate Mix)	± 6.0%
9.5 mm sieve (Surface Mix)	± 5.0%
4.75 mm sieve (Surface Mix)	± 5.0%
2.36 mm sieve (All Mixes)	± 5.0%
0.075 mm sieve (All Mixes)	± 2.0%
Asphalt Binder Content	± 0.5%
Maximum Specific Gravity (G_{mm})	± 0.020
Bulk Specific Gravity (G_{mb})	± 0.030
TSR	± 15.0%
QA retest of prepared QC Gyratory Compacted Volumetric Specimens	± 0.015
Retest of QC Core Sample	± 1.2% (% Compaction)
QA Verification Core Sample	± 2.0% (% Compaction)
Comparison of Density Gauge QC Test	± 2.0% (% Compaction)
QA Density Gauge Verification Test	± 2.0% (% Compaction)

The Engineer will immediately investigate the reason for differences if any of the following occur: QA test results of QC split sample does not meet above limits of precision, QA test results of QC split sample does not meet the individual test control limits or the specification requirements or QA verification sample test results exceed the allowable retesting tolerances.

If the potential for a pavement failure exist, the Engineer may suspend production, wholly or in part, in accordance with Article 108-7 while the investigation is in progress. The Engineer's investigation may include, but not be limited to: review and observation of the QC technician's sampling and testing procedures, evaluation and calibration of QC and QA testing equipment, comparison testing of other retained quality control samples, and/or comparison testing of additional density core samples.

The Engineer will periodically witness the sampling and testing being performed by the Contractor. If the Engineer observes that the sampling and QC tests are not being performed in accordance with the applicable test procedures, the Engineer may stop production until corrective action is taken. The Engineer will promptly notify the Contractor of observed deficiencies, both verbally and in writing. The Engineer will document all witnessed samples and tests.

609-10 ACCEPTANCE

Final acceptance of the asphalt pavement will be made by the Department in accordance with the following:

(A) Mix Acceptance

The Engineer will base final acceptance of the mix on the results of random testing made on split samples during the assurance process, verification samples, retests (if applicable) and validation of the Contractor’s quality control process conducted in accordance with Specifications.

(B) Density Acceptance

The Department will evaluate the asphalt pavement for density compliance after the asphalt mix has been placed and compacted using the Contractor's quality control test results, the Department’s quality assurance test results (including verification samples)

and by observation of the Contractor's total density quality control process conducted in accordance with Specifications.

609-11 MEASUREMENT AND PAYMENT

Any mix produced that is not verified may be assessed a price reduction at the Engineer's discretion in addition to any reduction in pay due to mix or density deficiencies.

Produce and construct all asphalt mixtures and pavements in accordance with these *Standard Specifications*. There will be no direct payment for work covered by this Specification. Payment at the contract unit prices for the various asphalt items will be full compensation for all work covered by these specifications.

If the mix or pavement represented by the falsified results is removed and replaced, payment will be made for the actual quantities of materials required to replace the falsified quantities, not to exceed the original amounts.

SECTION 610
ASPHALT CONCRETE PLANT MIX PAVEMENTS

610-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, the construction of one or more courses of asphalt mixture placed on a prepared surface in accordance with these Specifications and in reasonably close conformity with the lines, grades, thickness and typical sections shown on the plans. This work includes producing, weighing, transporting, placing and compacting the plant mix; furnishing aggregate, asphalt binder, anti-strip additive and all other materials for the plant mix; furnishing and applying tack coat as specified; furnishing scales; maintaining the course until final acceptance of the project; making any repairs or corrections to the course that may become necessary; providing and conducting QC as specified in Section 609; and surface testing of the completed pavement. The design requirements for the various mix types are given in Section 610 for dense-graded mix types, Section 650 for OGFC, Section 652 for PADC and Section 661 for UTBWC.

Perform all activities in accordance with the Department's *Asphalt Quality Management System (QMS) Manual* in effect on the date of contract advertisement

Provide and conduct the QC and required testing for acceptance of the asphalt mixture in accordance with Section 609.

Define "warm mix asphalt (WMA)" as additives or processes that allow a reduction in the temperature at which asphalt mixtures are produced and placed. Use only WMA additives or processes listed on the NCDOT APL maintained by the Materials and Tests Unit.

610-2 MATERIALS

Refer to Division 10.

Item	Section
Anti-Strip Additives	1020-8
Asphalt Binder, Performance Grade	1020-2
Coarse Aggregate	1012-1(B)
Fine Aggregate	1012-1(C)
Mineral Filler	1012-1(D)
Reclaimed Asphalt Pavement (RAP)	1012-1(F)
Reclaimed Asphalt Shingles (RAS)	1012-1(E)
Silicone	1020-9

610-3 COMPOSITION OF MIXTURES (MIX DESIGN AND JOB MIX FORMULA)

(A) Mix Design-General

Prepare the asphalt mix design using a mixture of coarse and fine aggregate, asphalt binder, mineral filler and other additives when required. Size, uniformly grade and combine the several aggregate fractions in such proportions that the resulting mixture meets the grading and physical requirements of the Specifications for the specified mix type. Materials that will not produce a mixture within the design criteria required by the Specifications will be rejected, unless otherwise approved.

At least 10 days before start of asphalt mix production, submit the mix design and proposed JMF targets for each required mix type and combination of aggregates to the Engineer for review and approval. Prepare the mix design using a Department certified mix design technician in an approved mix design laboratory and in accordance with the procedures outlined in Section 4.5 of the *Asphalt QMS Manual.*

For the final surface layer of the specified mix type, use a mix design with an aggregate blend gradation above the maximum density line on the 2.36 mm and larger sieves.

The Contractor has the option to use a recycled plant mix in lieu of virgin plant mix. However, all provisions of the Specifications for virgin mixes apply to recycled mixes. This means that the same design criteria tests, test frequencies, and quality control requirements will apply.

Reclaimed Asphalt Pavement (RAP) or Reclaimed Asphalt Shingles (RAS) may be incorporated into asphalt plant mixes in accordance with Article 1012-1 and the following applicable requirements. However, use of RAP materials is not allowed in Open Graded Friction Course (OGFC) mixes or Ultra-Thin Bonded Wearing Course (UBWC) mixes. Use of RAS materials is not allowed in Ultra-Thin Bonded Wearing Course (UBWC) mixes.

RAS material may constitute up to 6% by weight of total mixture, except for Open Graded Friction Course (OGFC) mixes, which are limited to 5% RAS by weight of total mixture. Also, when the percentage of RAP is greater than 30% by weight of total mixture, use Fractionated RAP (FRAP) meeting the requirements of Subarticle 1012-1(F)(c).

When RAP, RAS, or a combination of both is used in asphalt mixtures, the recycled binder replacement percentage (RBR%) shall not exceed the amounts specified in Table 610-4 for the mix type. For recycled mixtures, the virgin binder Performance Grade (PG) grade to be used is specified in Table 610-5 for the mix type based on the recycled binder replacement percentage (RBR%).

If the Contractor wishes to submit mix designs containing recycled material amounts exceeding the specified maximums, additional testing will be required to verify the Performance Grade (PG) of the reclaimed binder. Also, the Contractor has the option to have additional testing performed to determine if the mix can be approved using a virgin binder grade different than specified in Table 610-5. The Engineer will determine if the binder grade is acceptable for use based on the test data submitted with the mix design. If the mix design is acceptable, the Engineer will establish and approve the grade and percentage of virgin asphalt binder to be used.

If a change in the source of RAP or RAS be made, a new mix design and JMF may be required in accordance with Article 1012-1. Samples of the completed recycled mixture may be taken by the Department on a random basis to determine the PG grading on the recovered asphalt binder in accordance with AASHTO M 320. If the grading is determined to be a value other than required for the specified mix type, the Engineer may require the Contractor to adjust any combination of the grade, the percentage of

additional asphalt binder or the blend of reclaimed material to bring the grade to the specified value.

(B) Mix Design Criteria

Design and produce asphalt concrete mixtures that conform to the gradation requirements and design criteria in Table 610-2 and Table 610-3 for the mix type specified. The mix type designates the nominal maximum aggregate size and the design traffic level.

Surface mix designs will be tested by the Department for rutting susceptibility. Rut depth requirements for each surface mix type and traffic level are specified in Table 610-3. Mix designs that fail to meet these requirements will be unacceptable and shall be redesigned by the Contractor such that rut depths are acceptable.

Table 610-2 provides gradation control points to be adhered to in the development of the design aggregate structure for each mix type. Aggregate gradations shall be equal to or pass between the control points. Table 610-3 provides the mix design criteria for the various mix types.

Use an anti-strip additive in all asphalt mixes. It may be hydrated lime or a chemical additive or a combination of both as needed to meet the retained strength requirements as specified in Table 610-3. When a chemical additive is used, add at a rate of not less than 0.25% by weight of binder in the mix, or as approved by the Engineer. When hydrated lime is used, add at a rate of not less than 1.0% by weight of the total dry aggregate.

(C) Job Mix Formula (JMF)

Establish the JMF gradation target values within the design criteria specified for the particular type of asphalt mixture to be produced. Establish the JMF asphalt binder content at the percentage that will produce voids in total mix (VTM) at the midpoint of the specification design range for VTM, unless otherwise approved. The formula for each mixture will establish the following: blend percentage of each aggregate fraction, the percentage of reclaimed aggregate, if applicable, a single percentage of combined aggregate passing each required sieve size, the total percentage and grade of asphalt binder required for the mixture (by weight of total mixture), the percentage and grade of asphalt binder to be added to the mixture (for recycled mixtures), the percentage of chemical anti-strip additive to be added to the asphalt binder or percentage of hydrated lime to be added to the aggregate, the temperature at that the mixture is to be discharged from the plant, the required field density and other volumetric properties.

When WMA is used, document the additive or process used and recommended rate on the JMF submittal. Verify the JMF based on plant produced mixture from the trial batch.

The mixing temperature at the asphalt plant will be established on the JMF. The JMF mix temperature shall be within the ranges shown in Table 610-1 unless otherwise approved.

TABLE 610-1
MIXING TEMPERATURE AT THE ASPHALT PLANT

Binder Grade	JMF Temperature
PG 58-28; PG 64-22	250 - 290°F
PG 70-22	275 - 305°F
PG 76-22	300 - 325°F

When using RAP or RAS with a different binder than specified, use mixing temperatures in Table 610-1 based on the original binder grade for that mix type shown in Table 610-3.

When RAS is used, the JMF mix temperature shall be established at 275°F or higher.

Have on hand at the asphalt plant the approved mix design and JMF issued by the Department, before beginning the work.

The JMF for each mixture will remain in effect until modified in writing, provided the results of QMS tests performed in accordance with Section 609 on material currently being produced conform with specification requirements. When a change in sources of aggregate materials is to be made, a new mix design and JMF will be required before the new mixture is produced. When a change in sources of RAP or RAS material is to be made, a new JMF is required and a new mix design may be required. When unsatisfactory results or other conditions make it necessary, the Engineer may revoke the existing JMF or establish a new JMF.

TABLE 610-2
AGGREGATE GRADATION CRITERIA
(Percent Passing Control Points)

Standard Sieves (mm)	Mix Type (Nominal Max. Aggregate Size)							
	4.75 mm		9.5 mm[A]		19.0 mm		25.0 mm	
	Min	*Max*	*Min*	*Max*	*Min*	*Max*	*Min*	*Max*
50.0	-	-	-	-	-	-	-	-
37.5	-	-	-	-	-	-	100	-
25.0	-	-	-	-	100	-	90.0	100
19.0	-	-	-	-	90.0	100	-	90.0
12.5	100	-	100	-	-	90.0	-	-
9.50	95.0	100	90.0	100	-	-	-	-
4.75	90.0	100	-	90.0	-	-	-	-
2.36	-	-	32.0[B]	67.0[B]	23.0	49.0	19.0	45.0
1.18	30.0	60.0	-	-	-	-	-	-
0.075	6.0	12.0	4.0	8.0	3.0	8.0	3.0	7.0

A. For the final surface layer of the specified mix type, use a mix design with an aggregate blend gradation above the maximum density line on the 2.36 mm and larger sieves.

B. For Type SF9.5A, the percent passing the 2.36 mm sieve shall be a minimum of 60% and a maximum of 70%.

TABLE 610-3
MIX DESIGN CRITERIA

Mix Type	Design ESALs[A] millions	Binder PG Grade[B]	Compaction Levels G_{mm} @		Max. Rut Depth (mm)	Volumetric Properties			
			N_{ini}	N_{des}		VMA % Min.	VTM %	VFA Min.-Max.	$\%G_{mm}$ @ N_{ini}
S4.75A	< 1	64 - 22	6	50	11.5	16.0	4.0 - 6.0	65 - 80	≤ 91.5
SF9.5A	< 0.3	64 - 22	6	50	11.5	16.0	3.0 - 5.0	70 - 80	≤ 91.5
S9.5B	0.3 - 3	64 - 22	7	65	9.5	15.5	3.0 - 5.0	65 - 80	≤ 90.5
S9.5C	3 - 30	70 - 22	7	75	6.5	15.5	3.0 - 5.0	65 - 78	≤ 90.5
S9.5D	> 30	76 - 22	8	100	4.5	15.5	3.0 - 5.0	65 - 78	≤ 90.0
I19.0B	< 3	64 - 22	7	65	-	13.5	3.0 - 5.0	65 - 78	≤ 90.5
I19.0C	3 - 30	64 - 22	7	75	-	13.5	3.0 - 5.0	65 - 78	≤ 90.0
I19.0D	> 30	70 - 22	8	100	-	13.5	3.0 - 5.0	65 - 78	≤ 90.0
B25.0B	< 3	64 - 22	7	65	-	12.5	3.0 - 5.0	65 - 78	≤ 90.5
B25.0C	> 3	64 - 22	7	75	-	12.5	3.0 - 5.0	65 - 78	≤ 90.0
	Design Parameter					**Design Criteria**			
All Mix Types	Dust to Binder Ratio ($P_{0.075}$ / P_{be})					0.6 - 1.4[E]			
	Tensile Strength Ratio (TSR)					85% Min.[C,D]			

A. Based on 20 year design traffic.

B. Volumetric Properties based on specimens compacted to N_{des} as modified by the Department.

C. TSR for Type S4.75A and Type B 25.0X mixes is 80% minimum.

D. AASHTO T 283 Modified (No Freeze-Thaw cycle required).

E. Dust to Binder Ratio (P0.075 / Pbe) for Type S4.75A is 1.0 - 2.0.

TABLE 610-4 MAXIMUM RECYCLED BINDER REPLACEMENT PERCENTAGE (RBR%)			
Recycled Material	**Intermediate & Base Mixes**	**Surface Mixes**	**Mixes Using PG 76-22**
RAS	23%	20%	18%
RAP or RAP/RAS Combination	45%	40%	18%

TABLE 610-5 BINDER GRADE REQUIREMENTS (BASED ON RBR%)			
Mix Type	**%RBR ≤ 20%**	**21% ≤ %RBR ≤ 30%**	**%RBR > 30%**
S4.75A, SF9.5A, S9.5B, I19.0B, I19.0C, B25.0B**,** B25.0C	PG 64-22	PG 64-22[A]	PG 58-28
S9.5C, I19.0D	PG 70-22	PG 64-22	PG 58-28
S9.5D, OGFC	PG 76-22[B]	n/a	n/a

A. If the mix contains any amount of RAS, the virgin binder shall be PG 58-28.

B. Maximum Recycled Binder Replacement (%RBR) is 18% for mixes using PG 76-22 binder.

610-4 WEATHER, TEMPERATURE AND SEASONAL LIMITATIONS FOR PRODUCING AND PLACING ASPHALT MIXTURES

Do not produce or place asphalt mixtures during rainy weather, when the subgrade or base course is frozen or when the moisture on the surface to be paved would prevent proper bond. Do not place asphalt material when the air or surface temperatures, measured at the location of the paving operation away from artificial heat, do not meet Table 610-6.

Do not place surface course material that is to be the final layer of pavement between December 15 and March 16 of the next year if it is 1 inch or greater in thickness, or between November 15 and April 1 of the next year if it is less than 1 inch in thickness, unless otherwise approved.

As an exception to the above, when in any day's operations the placement of a layer of asphalt base course material or intermediate material 2 inches or greater in thickness has started, it may continue until the temperature drops to 32°F.

Do not place plant mix base course that will not be covered with surface or intermediate course during the same calendar year or within 15 days of placement if the plant mix is placed in January or February. Failure by the Contractor to cover the plant mix as required above will result in the Engineer notifying the Contractor in writing to cover the plant mix with a sand seal. Apply the sand seal in accordance with Section 660, except that Articles 660-3 and 660-12 will not apply. In the event the Contractor fails to apply the sand seal within 72 hours of receipt of such notice, the Engineer may proceed to have such work performed with Department forces and equipment.

TABLE 610-6 PLACEMENT TEMPERATURES FOR ASPHALT	
Asphalt Concrete Mix Type	**Minimum Surface and Air Temperature**
B25.0B, C	35°F
I19.0B, C, D	35°F
SF9.5A, S9.5B	40°F[A]
S9.5C	45°F[A]
S9.5D	50°F

A. For the final layer of surface mixes containing RAS, the minimum surface and air temperature shall be 50°F.

610-5 ASPHALT MIXTURE PRODUCTION

Use plants that are either of the batch mixing, continuous mixing or drum mixing type, and so designed, equipped and operated that the weighing, proportioning and mixing of the materials will result in a uniform and satisfactory asphalt mixture meeting these Specifications. All plants shall conform to requirements of Sections 5 and 6 of the *Asphalt QMS Manual*.

Before production of the mix, stockpile aggregates for a sufficient period of time to facilitate the drainage of free moisture. Keep the different aggregate sizes separated until they have been delivered to the cold feeders. Keep the separate stockpiles readily accessible for sampling. When mineral filler is required in the mix, feed or weigh-in separately from the other aggregates.

Introduce the asphalt binder and other additives, when required, into the mixture at the amounts and percentages specified by the JMF. No working tolerance will be allowed. Introduce the hot and dry aggregates, mineral filler, and recycled materials, in amounts and at temperatures such that the mixture produced is within the production control limits of Subarticle 609-6(D). Provide a positive means of controlling mixing time to obtain complete and uniform coating of the aggregate particles and thorough distribution of the asphalt binder throughout the aggregate. Produce the mixture at the asphalt plant within ±25 °F of the JMF mix temperature. The temperature of the mixture, when discharged from the mixer, shall not exceed 350°F.

All asphalt plants shall be certified by the Department. Certification is effective from the date of issuance and is non-expiring subject to continued compliance. The Department will check the plant on an annual basis or as deemed necessary by the Engineer. Any plant that is relocated, modified or changes ownership shall be recertified before use.

Any completely automatically controlled asphalt plant that, due to the basic design of the plant, does not meet all these Specifications for conventional batch mixing, continuous mixing or drum mixing may be used on a project by project basis provided a uniformly consistent mix meeting all mix requirements can be produced and the plant has been approved in writing.

Any asphalt plant that cannot consistently produce a high quality mix meeting these Specifications will be in non-compliance with these Specifications and may have its certification revoked.

Upon a malfunction of required automatic equipment on a batch mixing plant, the plant may continue to operate manually for the following 2 consecutive working days, provided acceptable mixture is being produced.

When a malfunction of required automatic equipment on a drum mixer or continuous plant occurs, manual operation of the plant will not be allowed except that if, in the opinion of the Engineer, an emergency traffic condition exists, the plant may be allowed to operate manually until the unsafe traffic condition is corrected. All mix produced by manual operation will be subject to Section 609.

610-6 HOT MIX STORAGE SYSTEMS

When a storage system is used, provide a system capable of conveying the mix from the plant to the storage bin and storing the mix without a loss in temperature, segregation or oxidation of the mix. Limit storage time to the ability of the storage system to maintain the mix within the Specification requirements. Material may be stored in storage bins without an approved heating system for no more than 24 hours.

Provide a continuous type or skip bucket type conveyor system. Enclose continuous type conveyors so that the mix temperature is maintained within specification requirements. Provide a system designed in such manner as to prevent segregation of the mix during discharge from the conveyor into the bins and equipped with discharge gates that will not cause segregation of the mix while loading the mix into trucks.

610-7 HAULING OF ASPHALT MIXTURE

Transport the mixture from the mixing plant to the point of use in vehicles that have tight, clean, smooth beds approved by the Department, that have been sprayed with an approved release agent material to prevent the mixture from adhering to the beds. Remove excess release agent before loading. Cover each load of mixture with a solid, waterproof tarp constructed of canvas, vinyl, or other suitable material. Provide a 3/8 inch to 5/8 inch diameter hole on each side of the vehicle body near the center of the body and above the bed of the vehicle for the purpose of inserting a thermometer.

Assure temperature of the mixture immediately before discharge from the hauling vehicle is within a tolerance of ±25°F of the specified JMF mix temperature.

610-8 SPREADING AND FINISHING

Apply tack coat in accordance with Section 605.

Mixtures produced simultaneously from different plant sources cannot be intermingled by hauling to the same paver on the roadway unless the mixtures are being produced from the same material sources and same JMF.

As referenced in Section 9.6.3 of the *Asphalt QMS Manual*, use the automatic screed controls on the paver to control the longitudinal profile. Where approved by the Engineer, the Contractor has the option to use either a fixed or mobile string line.

Perform this work in accordance with and using equipment meeting Section 9 of the *Asphalt QMS Manual.*

Use a material transfer vehicle (MTV) when placing all asphalt concrete plant mix pavements which require the use of asphalt binder grade PG 76-22 and for all types of OGFC, unless otherwise approved. Use a MTV for all surface mix regardless of binder grade placed on Interstate and US routes that have 4 or more lanes and median divided. Where required above, use the MTV when placing all full width travel lanes and collector lanes. Use MTV for all ramps, loops, Y-line travel lanes, full width acceleration lanes, full width deceleration lanes and full width turn lanes that are greater than 1,000 feet in length. Use a MTV meeting Section 9.5(E) of the *Asphalt QMS Manual.*

Place asphalt concrete base course material in trench sections with asphalt pavement spreaders made for the purpose or with other equipment approved by the Engineer.

Request the Engineer to waive the requirement for use of pavers for spreading and finishing where irregularities or obstacles make their use impractical. Spread, rake and lute the mixture by hand methods or other approved methods in these areas.

Operate the paver as continuously as possible. Pave intersections, auxiliary lanes and other irregular areas after the main line roadway has been paved, unless otherwise approved. Place a wedge course at locations ahead of the paving operation as required by the Engineer.

Repair any damage caused by hauling equipment across structures at no additional cost to the Department.

610-9 COMPACTION

Immediately after the asphalt mixture has been spread, struck off and surface and edge irregularities adjusted, thoroughly and uniformly compact the pavement. Compact the mix to the required degree of compaction for the type of mixture being placed.

Provide sufficient number and weight of rollers, except as noted, to compact the mixture to the required density while it is still in a workable condition. Obtain approval of equipment used in compaction from the Engineer before use. Where uniform density is not being obtained throughout the depth of the layer of material being tested, change the type and/or weight of the compaction equipment as necessary to achieve uniform density even though such equipment has been previously approved.

Compact all final wearing surfaces, except OGFC, using a minimum of two steel-wheel tandem rollers, unless otherwise approved. Pneumatic-tire rollers with two tandem axles and smooth tread tires may be used for intermediate rolling.

Limit rolling for OGFC to one coverage with a tandem steel-wheel roller weighing a maximum of 10 tons, with additional rolling limited to one coverage with the roller where necessary to improve the riding surface.

Steel-wheel tandem vibratory rollers specifically designed for the compaction of asphalt pavements may be used on all layers 1 inch or greater in thickness during the breakdown and intermediate rolling phase. Do not operate vibratory rollers in the vibratory mode during the finish rolling phase on any mix type or pavement course, OGFC or on PADC.

When vibratory rollers are used, use rollers that have variable amplitude and frequency capabilities and that are designed specifically for asphalt pavement compaction. Provide rollers equipped with controls that automatically disengage the vibration mechanism before the roller stops when being used in the vibratory mode.

The Engineer may prohibit or restrict the use of vibratory rollers where damage to the pavement being placed, the underlying pavement structure, drainage structures, utilities or other facilities is likely to occur or is evident.

Do not use rolling equipment that results in excessive crushing of the aggregate or excessive displacement of the mixture.

In areas inaccessible to standard rolling equipment, thoroughly compact the mixture by the use of hand tampers, hand operated mechanical tampers, small rollers or other approved methods.

Use rollers that are in good condition and capable of being reversed without backlash to compact the mixture. Operate rollers with the drive wheels nearest the paver and at uniform speeds slow enough to avoid displacement of the mixture. Equip steel-wheel rollers with wetting devices that will prevent the mixture from sticking to the roller wheels.

Begin compaction of the material immediately after the material is spread and shaped to the required width and depth. Carry out compaction in such a manner as to obtain uniform density over the entire section. Perform compaction rolling at the maximum temperature at which the mix will support the rollers without moving horizontally. Complete the compaction (including both intermediate rolling) before the mixture cooling below a workable temperature. Perform finish rolling to remove roller marks resulting from the compaction rolling operations.

610-10 DENSITY REQUIREMENTS

TABLE 610-7
DENSITY REQUIREMENTS

Mix Type	Minimum % G_{mm} (Maximum Specific Gravity)
S4.75A	85.0[A]
SF9.5A	90.0
S9.5X, I19.0X, B25.0X	92.0

A. Compaction to the above specified density will be required when the S4.75A mix is applied at a rate of 100 lbs/sy or higher.

Compact the asphalt plant mix to at least the minimum percentage of the maximum specific gravity listed in Table 610-7, except as noted in Section 10.3.4 of the *Asphalt QMS Manual.*

Compaction with equipment other than conventional steel drum rollers may be necessary to achieve adequate compaction. Occasional density sampling and testing to evaluate the compaction process may be required. The Contractor shall maintain minimum test frequencies as established. Should the Contractor's density testing frequency fail to meet the minimum frequency as, all mix without required density test representation shall be considered unsatisfactory and if allowed to remain in place, will be evaluated for acceptance in accordance with Article 105-3.

610-11 JOINTS

(A) Transverse Joints

When the placing of the mixture is to be suspended long enough to permit the mixture to become chilled, construct a transverse joint.

If traffic will not pass over the end of the paving, a butt joint will be permitted, provided proper compaction is achieved. If traffic will pass over the joint, construct a sloped wedge ahead of the end of the full depth pavement to provide for proper compaction and protection of the full depth pavement. Construct the joint square to the lane alignment and discard all excess material. Place a paper parting strip beneath this wedge to facilitate joint construction unless waived by the Engineer.

Before paving operations are resumed, remove the sloped wedge and cut back into the previously constructed pavement to the point of full pavement depth. Coat the exposed edge of the previously constructed pavement with tack coat.

When laying of the mixture is resumed at the joint, complete and then test the construction of the joint in accordance with Article 610-12 while the mixture is still in a workable condition.

(B) Longitudinal Joints

Tack the exposed edge of all longitudinal joints before placing the adjoining pavement.

Form longitudinal joints by allowing the paver to deposit the mixture adjacent to the joint to such depth that maximum compaction can be obtained along the joint. Pinch the joint by rolling immediately behind the paver.

When multi-lane multi-layer construction is required, offset the longitudinal joints in each layer from that in the layer immediately below by approximately 6 inches. Construct the joints in the final layer, where possible, between designated travel lanes of the final traffic pattern.

610-12 SURFACE REQUIREMENTS AND ACCEPTANCE

Construct pavements using quality-paving practices as detailed herein. Construct the pavement surface smooth and true to the plan grade and cross slope. Immediately correct any defective areas with satisfactory material compacted to conform with the surrounding area.

Pavement imperfections resulting from unsatisfactory workmanship such as segregation, improper longitudinal joint placement or alignment, non-uniform edge alignment or excessive pavement repairs will be unsatisfactory. Pavement imperfections will be evaluated for acceptance in accordance with Article 105-3.

When directed due to unsatisfactory laydown or workmanship, operate under the limited production procedures. Limited production for unsatisfactory laydown is defined as being restricted to the production, placement, compaction and final surface testing (if applicable) of a sufficient quantity of mix necessary to construct only 2,500 feet of pavement at the laydown width.

Remain on limited production until such time as satisfactory laydown results are obtained or until three consecutive 2,500 feet sections have been attempted without achieving satisfactory laydown results. If the Contractor fails to achieve satisfactory laydown results after three consecutive 2,500 feet sections have been attempted, cease production of that mix type until such time as the cause of the unsatisfactory laydown results can be determined. As an exception, the Engineer may grant approval to produce a different mix design of the same mix type if the cause is related to mix problems rather than laydown procedures.

Mix placed under the limited production procedures for unsatisfactory laydown or workmanship will be evaluated for acceptance in accordance with Article 105-3.

Each pavement layer will be tested by the Contractor and the Engineer using a 10 foot stationary straightedge furnished by the Contractor. Any location on the pavement selected by the Department shall be tested as well as all transverse joints. Apply the straightedge parallel to the centerline of the surface. Do not exceed 1/8 inch variation of the surface being tested from the edge of the straightedge between any two contact points. Correct areas found to exceed this tolerance by removal of the defective work and replacement with new material, unless other corrective measures are permitted. Provide the work and materials required in the correction of defective work.

610-13 FINAL SURFACE TESTING AND ACCEPTANCE

On portions of this project where the typical section requires two or more layers of new pavement, perform smoothness acceptance testing of the longitudinal profile of the finished pavement surface using either an Inertial Profiler or a North Carolina Hearne Straightedge (Model No. 1). Smoothness acceptance testing using the inertial profiler is not required on ramps, loops and turn lanes.

Use an Inertial Profiler (Option 1) to perform smoothness acceptance testing of the longitudinal profile of the finished pavement surface. Furnish an inertial profiler(s) necessary to perform this work. Maintain responsibility for all costs related to the procurement, handling, and maintenance of these devices.

Furnish and operate the Hearne straightedge (Option 2) to determine and record the longitudinal profile of the pavement on a continuous graph.

Before beginning any paving operations, the Contractor shall select one of the above options and submit documentation to the Engineer on the selected option for smoothness acceptance.

(A) Option 1 - Inertial Profiler

Use an Inertial Profiler to measure the longitudinal pavement profile for construction quality control and smoothness acceptance. Use a profiler with line laser technology as single-point laser technology will not be allowed. Produce International Roughness Index (IRI) and Mean Roughness Index (MRI) values for measuring smoothness.

Use testing and recording software to produce electronic inertial road profiles in a format compatible with the latest version of FHWA's ProVAL (Profile Viewing and Analysis) software.

The Inertial Profiler shall be calibrated and verified in accordance with the most current version of AASHTO M 328. Provide certification documentation that the profiler meets AASHTO M 328 to the Engineer before the first day the Inertial Profiler is used on the project.

Configure the profiler to record the actual elevation of the pavement surface. Do not use the profiler's internal IRI calculation mode. The profile data shall be filtered with a cutoff wavelength of 300 feet. The interval at which relative profile elevations are reported shall be 2 inches.

Provide IRI data in accordance with most current version of ASTM E1926. Use personnel trained to record and evaluate IRI data.

Provide a competent operator, trained in the operation of the Inertial Profiler Operation of the Inertial Profiling system shall conform to AASHTO R 57.

Provide the user selected Inertial Profiler settings to the Engineer for the project records. Certification of the Inertial Profiling system shall conform to AASHTO R 56.

Remove all objects and foreign material on the pavement surface prior to longitudinal pavement profile testing.

Operate the profiler at any speed as per the manufacturer's recommendations to collect valid data. Operate the Inertial Profiler in the direction of the final traffic pattern. Collect IRI data from both wheel paths during the same run. Define a "wheel path" as the 3 feet from the edge of the travel lane. MRI values are the average of the IRI values from both wheel paths. When using an inertial profiler that collects a single trace per pass, take care to ensure that the measurements from each trace in a travel lane start and stop at the same longitudinal locations. Unless otherwise specified, multiple runs are not necessary for data collection.

Operate the automatic triggering method at all times unless impractical. A tape stripe or traffic cone wrapped with reflective material may be used to alert the profiler's automatic triggering sensor to begin data collection. The profiler shall reach the intended operating speed before entering the test section. The runup and runout distances should be sufficient to obtain the intended operating speed and to slow down after testing is completed.

Divide the pavement surface for the project into sections which represent a continuous placement (i.e. the start of the project to bridge, intersection to intersection). Terminate a section 50 feet before a bridge approach, railroad track, or similar interruption. (Separate into 0.10-mile sections).

The evaluation of the profiles will be performed on a section basis. A section is 0.10 mile of a single pavement lane. For any section, which is less than 0.10 mile in length, the applicable pay adjustment incentive will be prorated on the basis of the actual length.

Mark the limits of structures and other special areas to be excluded from testing using the profiler's event identifier such that the exact locations can be extracted from the profile data file during processing.

Unless otherwise authorized by the Engineer, perform all smoothness testing in the presence of the Engineer. Perform smoothness tests on the finished surface of the completed project or at the completion of a major stage of construction as approved by the Engineer. Coordinate with and receive authorization from the Engineer before starting smoothness testing. Perform smoothness tests within 7 days after receiving authorization.

Any testing performed without the Engineer's presence, unless otherwise authorized, may be ordered retested at the Contractor's expense.

After testing, transfer the profile data from the profiler portable computer's hard drive to a write once storage media (Flash drive, USB, DVD-R or CD-R) or electronic media approved by the Engineer. Label the disk or electronic media with the Project number, Route, file number, date, and termini of the profile data. Submit the electronic data on the approved media to the Engineer immediately after testing and this media will not be returned to the Contractor.

Submit a report with the documentation and electronic data of the evaluation for each section to the Engineer within 10 days after completion of the smoothness testing. The report shall be in the tabular format for each 0.10 segment or apportion thereof with a summary of the MRI values and the localized roughness areas including corresponding project station numbers or acceptable reference points. Calculate the pay adjustments for all segments in accordance with the formulas in Sections (1) and (2) shown below. The Engineer shall review and approve all pay adjustments unless corrective action is required. Submit the electronic files compatible with ProVAL and the evaluation in tabular form with each 0.10 mile segment occupying a row. Include each row with the beginning and ending station for the section, the length of the section, the original IRI values from each wheel path, and the MRI value for the section. Each continuous run for a section will occupy a separate table and each table will have a header that includes the following: the project contract number, county, the roadway number or designation, a lane designation, the JMF used for the final lift, the dates of the smoothness runs, and the beginning and ending station of the continuous run. Summarize each table at the bottom.

Traffic control and all associated activities included in the pavement smoothness testing of the pavement surface will be the responsibility of the Contractor.

(1) Acceptance for New Construction

IRI and MRI numbers recorded in inches per mile will be established for each 0.10 mile section for each travel lane of the surface course designated by the contract. Areas excluded from testing by the profiler will be tested using a 10 foot straightedge in accordance with Article 610-12.

Table 610-7 provides the acceptance quality rating scale of pavement based on the final rideability determination.

TABLE 610-8
MRI PRICE ADJUSTMENT PER 0.10-MILE SECTION

MRI after Completion (Inches Per Mile)	Price Adjustment Per Lane (0.10-Mile Section)
45.0 and Under	$200.00
45.1-55.0	PA = 600 – (10 * MRI)
55.1-70.0	Acceptable (No Pay Adjustment)
70.1-90.0	PA = 650 – (10 * MRI)
Over 90.1	Corrective Action Required

This price adjustment will apply to each 0.10-mile section or prorated for a portion thereof, based on the Mean Roughness Index (MRI), the average IRI values from both wheel paths.

When corrections to the pavement surface are required, the Engineer shall approve the Contractor's method of correction. Methods of correction shall be milling and inlay, remove and replace or other methods approved by the Engineer. To produce a uniform cross section, the Engineer may require correction to the adjoining traffic lanes or shoulders. Corrections to the pavement surface, the adjoining traffic lanes and shoulders will be at no cost to the Department.

Where corrections are made after the initial smoothness testing, the pavement will be retested by the Contractor to verify that corrections have produced the acceptable ride surface. No incentives will be provided for sections on which corrective actions have been required. The Contractor will have one opportunity to perform corrective action(s).

(2) Localized Roughness

Areas of localized roughness shall be identified through the "Smoothness Assurance Module (SAM)" provided in the ProVAL software. Use the SAM report to optimize repair strategies by analyzing the measurements from profiles collected using inertial profilers. The ride quality threshold for localized roughness shall be 165 inches per mile for any sections that are 15 feet to 100 feet in length at the continuous short interval of 25 feet. Submit a continuous roughness report to identify each section with project station numbers or reference points outside the threshold and identify all localized roughness, with the signature of the Operator included with the submitted IRI trace and electronic files.

The Department will require that corrective action be taken regardless of final IRI. Re-profile the corrected area to ensure that the corrective action was successful. If the corrective action is not successful, the Department will assess a penalty or require additional corrective action.

$$\mathbf{PA} = (165 - \mathrm{LR\#})\ 5$$

Where:

PA = Pay Adjustment (dollars)

LR# = The Localized Roughness number determined from SAM report for the ride quality threshold

Corrective work for localized roughness shall be approved by the Engineer before performing the work and shall consist of either replacing the area by milling and inlaying or other methods approved by the Engineer. Any corrective action performed shall not reduce the integrity or durability of the pavement that is to remain in place. Milling and inlay or any corrective actions shall meet the specifications requirements for ride quality over the entire length of the correction. Notify the Engineer five days before commencement of the corrective action.

Localized roughness correction work shall be for the entire traffic lane width. Pavement cross slope shall be maintained through corrective areas.

(B) Option 2 - North Carolina Hearne Straightedge

Push the straightedge manually over the pavement at a speed not exceeding 2 miles per hour. For all lanes, take profiles in the right wheel path approximately 3 feet from the right edge of pavement in the same direction as the paving operation, unless otherwise approved due to traffic control or safety considerations. As an exception, lanes adjacent to curb and gutter, expressway gutter, or shoulder berm gutter may be tested in the left wheel path. Make one pass of the straightedge in each full width travel lane. The full lane width should be comparable in ride quality to the area evaluated with the Hearne Straightedge. If deviations exist at other locations across the lane width, use a 10 foot non-mobile straightedge or the Hearne Straightedge to evaluate which areas may require corrective action. Take profiles as soon as practical after the pavement has been rolled and compacted, but no later than 24 hours following placement of the pavement, unless otherwise authorized by the Engineer. Take profiles over the entire length of final surface travel lane pavement exclusive of Y-line travel lanes less than or equal to 1,000 feet in length, ramps less than or equal to 1,000 feet in length, turn lanes less than or equal to 1,000 feet in length, structures, approach slabs, paved shoulders, loops and tapers or other irregular shaped areas of pavement, unless otherwise approved by the Engineer. Test in accordance with this provision all mainline travel lanes, full width

acceleration or deceleration lanes, Y-line travel lanes greater than 1,000 feet in length, ramps, full width turn lanes greater than 1,000 feet in length and collector lanes.

At the beginning and end of each day's testing operations, and at such other times as determined by the Engineer, operate the straightedge over a calibration strip so that the Engineer can verify correct operation of the straightedge. The calibration strip shall be a 100 foot section of pavement that is reasonably level and smooth. Submit each day's calibration graphs with that day's test section graphs to the Engineer. Calibrate the straightedge in accordance with the current NCDOT procedure titled *North Carolina Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index.* Copies of this procedure may be obtained from the Department's Pavement Section in the Construction Unit.

Plot the straightedge graph at a horizontal scale of approximately 25 feet per inch with the vertical scale plotted at a true scale. Record station numbers and references (bridges, approach slabs, culverts, etc.) on the graphs. Distances between references/stations shall not exceed 100 feet. Have the operator record the Date, Project No., Lane Location, Wheel Path Location, Type Mix and Operator's Name on the graph.

Upon completion of each day's testing, evaluate the graph, calculate the Cumulative Straightedge Index (CSI) and determine which lots, if any, require corrective action. Document the evaluation of each lot on a QA/QC-7 form. Submit the graphs along with the completed QA/QC-7 forms to the Engineer, within 24 hours after profiles are completed, for verification of the results. The Engineer will furnish results of their acceptance evaluation to the Contractor within 48 hours of receiving the graphs. In the event of discrepancies, the Engineer's evaluation of the graphs will prevail for acceptance purposes. The Engineer will retain all graphs and forms.

Use blanking bands of 0.2 inch, 0.3 inch and 0.4 inch to evaluate the graph for acceptance. The 0.2 inch and 0.3 inch blanking bands are used to determine the Straightedge Index (SEI), which is a number that indicates the deviations that exceed each of the 0.2 inch and 0.3 inch bands within a 100 foot test section. The Cumulative Straightedge Index (CSI) is a number representing the total of the SEIs for one lot, which consist of not more than 25 consecutive test sections. In addition, the 0.4 inch blanking band is used to further evaluate deviations on an individual basis. The CSI will be determined by the Engineer in accordance with the current procedure titled *North Carolina Hearne Straightedge - Calibration and Determination of Cumulative Straightedge Index.*

The pavement will be accepted for surface smoothness on a lot by lot basis. A test section represents pavement one travel lane wide not more than 100 feet in length. A lot will consist of 25 consecutive test sections, except that separate lots will be established for each travel lane, unless otherwise approved by the Engineer. In addition, full width acceleration or deceleration lanes, ramps, turn lanes and collector lanes will be evaluated as separate lots. For any lot that is less than 2,500 feet in length, the applicable pay adjustment incentive will be prorated on the basis of the actual lot length. For any lot which is less than 2,500 feet in length, the applicable pay adjustment disincentive will be the full amount for a lot, regardless of the lot length.

If during the evaluation of the graphs, five lots require corrective action, then proceed on limited production for unsatisfactory laydown in accordance with Article 610-12. Proceeding on limited production is based upon the Contractor's initial evaluation of the straightedge test results and shall begin immediately upon obtaining those results. Additionally, the Engineer may direct the Contractor to proceed on limited production in accordance with Article 610-12 due to unsatisfactory laydown or workmanship.

Limited production for unsatisfactory laydown is defined as being restricted to the production, placement, compaction and final surface testing of a sufficient quantity of mix necessary to construct only 2,500 feet of pavement at the laydown width. Once this lot is complete, the final surface testing graphs will be evaluated jointly by the Contractor and the Engineer. Remain on limited production until such time as acceptable laydown results are obtained or until three consecutive 2,500 foot sections have been attempted without achieving acceptable laydown results. The Engineer will determine if normal production may resume based upon the CSI for the limited production lot and any adjustments to the equipment, placement methods, and/or personnel performing the work. Once on limited production, the Engineer may require the Contractor to evaluate the smoothness of the previous asphalt layer and take appropriate action to reduce and/or eliminate corrective measures on the final surface course. Additionally, the Contractor may be required to demonstrate acceptable laydown techniques off the project limits before proceeding on the project.

If the Contractor fails to achieve satisfactory laydown results after three consecutive 2,500 foot sections have been attempted, cease production of that mix type until such time as the cause of the unsatisfactory laydown results can be determined.

As an exception, the Engineer may grant approval to produce a different mix design of the same mix type if the cause is related to mix problem(s) rather than laydown procedures. If production of a new mix design is allowed, proceed under the limited production procedures detailed above.

After initially proceeding under limited production, the Contractor shall immediately notify the Engineer if any additional lot on the project requires corrective action. The Engineer will determine if limited production procedures are warranted for continued production.

If the Contractor does not operate by the limited production procedures as specified above, the 5 lots, which require corrective action, will be considered unacceptable and may be subject to removal and replacement. Mix placed under the limited production procedures for unsatisfactory laydown will be evaluated for acceptance in accordance with Article l05-3.

The pay adjustment schedule for the Cumulative Straightedge Index (CSI) test results per lot is in Table 610-8.

TABLE 610-9
PAY ADJUSTMENT SCHEDULE FOR CUMULATIVE STRAIGHTEDGE INDEX
(Obtained by adding SE Index of up to 25 consecutive 100 ft test sections)

CSI[A]	Acceptance Category	Corrective Action	Pay Adjustment Before Corrective	Pay Adjustment After Corrective Action
0-0	Acceptable	None	$300 Incentive	None
1-0 or 2-0	Acceptable	None	$100 Incentive	None
3-0 or 4-0	Acceptable	None	No Adjustment	No Adjustment
1-1, 2-1, 5-0 or 6-0	Acceptable	Allowed	$300 Disincentive	$300 Disincentive
3-1, 4-1, 5-1 or 6-1	Acceptable	Allowed	$600 Disincentive	$600 Disincentive
Any other Number	Unacceptable	Required	Per CSI after Correction(s) (not to exceed 100% Pay)	

A. Either Before or After Corrective Actions

Correct any deviation that exceeds a 0.4 inch blanking band such that the deviation is reduced to 0.3 inch or less.

Corrective actions shall be performed at the Contractor's expense and shall be presented for evaluation and approval by the Engineer prior to proceeding. Any corrective action performed shall not reduce the integrity or durability of the pavement that is to remain in place. Corrective action for deviation repair may consist of overlaying, removing and replacing, indirect heating and rerolling. Scraping of the pavement with any blade type device will not be allowed as a corrective action. Provide overlays of the same type mix, full roadway width, and to the length and depth established by the Engineer. Tapering of the longitudinal edges of the overlay will not be allowed.

Corrective actions will not be allowed for lots having a CSI of 4-0 or better. If the CSI indicates Allowed corrective action, the Contractor may elect to take necessary measures to reduce the CSI instead of accepting the disincentive. Take corrective actions as specified if the CSI indicates required corrective action. The CSI after corrective action shall meet or exceed Acceptable requirements.

Where corrective action is allowed or required, the test section(s) requiring corrective action will be retested, unless the Engineer directs the retesting of the of the entire lot. No disincentive will apply after corrective action if the CSI is 4-0 or better. If the retested lot after corrective action has a CSI indicating a disincentive, the appropriate disincentive will be applied.

Test sections and/or lots that are initially tested by the Contractor that indicate excessive deviations such that either a disincentive or corrective action is necessary, may be re-rolled with asphalt rollers while the mix is still warm and in a workable condition, to possibly correct the problem. In this instance, reevaluation of the test section(s) shall be completed within 24 hours of pavement placement and these test results will serve as the initial test results.

Incentive pay adjustments will be based only on the initially measured CSI, as determined by the Engineer, before any corrective work. Where corrective actions have been taken, payment will be based on the CSI determined after correction, not to exceed 100% payment.

Areas excluded from testing by the N.C. Hearne Straightedge will be tested by using a non-mobile 10-feet straightedge. Assure that the variation of the surface from the testing edge of the straightedge between any 2 contact points with the surface is not more than 1/8 inch. Correct deviations exceeding the allowable tolerance in accordance with the corrective actions specified above, unless the Engineer permits other corrective actions.

Furnish the North Carolina Hearne Straightedge(s) necessary to perform this work. Maintain responsibility for all costs relating to the procurement, handling, and maintenance of these devices. The Department has entered into a license agreement with a manufacturer to fabricate, sell and distribute the N.C. Hearne Straightedge. The Department's Pavement Construction Section may be contacted for the name of the current manufacturer and the approximate price of the straightedge.

610-14 DENSITY ACCEPTANCE

The Department will evaluate the asphalt pavement for density acceptance after the asphalt mix has been placed and compacted using the Contractor's QC test results, the Department's QA test results (including verification samples) and by observation of the Contractor's density QC process conducted in accordance with Section 610 of the *Asphalt QMS Manual*. Minimum density requirements for all mixes will be as specified in Table 610-7. Density acceptance will be as provided in Section 10 of the *Asphalt QMS Manual*.

A failing lot for density acceptance purposes is defined as a lot for which the average of all test sections, and portions thereof, fails to meet the minimum specification requirement. If additional density sampling and testing, beyond the minimum requirement, is performed and additional test sections are thereby created, then all test results shall be included in the lot average. In addition, any lot or portion of a lot that is obviously unacceptable will be rejected for use in the work.

If the Engineer determines that a given lot of mix that falls in the New category does not meet the minimum specification requirements but the work is reasonably acceptable, the lot will be accepted at a reduced pay factor in accordance with the following formula. The reduced pay factor will apply only to the mix unit price.

$$\textbf{Reduced Pay Factor} = 100 + \left[\left(\frac{Actual\ \ Density - Specified\ \ Density}{2} \right) x30 \right]$$

Where:

Actual Density = the lot average density, not to exceed 2.0% of the specified density

Specified Density = the density in Table 610-6 or as specified in the contract

All failing lots in the Other category will be evaluated for acceptance in accordance with Article 105-3.

Any density lot not meeting minimum density requirements detailed in Table 610-6 will be evaluated for acceptance in accordance with Article 105-3. If the lot is determined not to be acceptable, the mix will be removed and replaced with mix meeting and compacted to the requirement of these *Standard Specifications.*

610-15 MAINTENANCE

Maintain the plant mix pavement in an acceptable condition until final acceptance of the project. Immediately repair any defects or damage that may occur. Perform maintenance to damaged or defective pavement and repeat as often as may be necessary to keep the base or pavement in an acceptable condition.

610-16 MEASUREMENT AND PAYMENT

Hot Mix Asphalt Pavement will be paid at the contract unit price per ton that will be the actual number of tons of each type of hot mix asphalt pavement incorporated into the completed and accepted work in accordance with Article 106-7.

No direct payment will be made for providing and using the materials transfer vehicle or any associated equipment, as the cost of providing same will be included in the contract unit bid price per ton for the mix type to be placed.

Any reduction in pay due to failing density will be in addition to any reduction in pay due to failing mix property test results on the same mix.

A high frequency of asphalt plant mix or density deficiencies may result in future deficient asphalt being excluded from acceptance at an adjusted contract unit price in accordance with Article 105-3. This acceptance process will apply to all asphalt produced or placed and will continue until the Engineer determines a history of quality asphalt production and placement is reestablished.

Furnishing asphalt binder will be paid as provided in Article 620-4 for *Asphalt Binder for Plant Mix* for each grade required.

Provide the work and materials required in the correction of defective work or sand seal base course as required at no cost to the Department. If the Engineer has such work performed with Department forces and equipment, the cost of such work performed by Department forces will be deducted from monies due or to become due to the Contractor.

No direct payment will be made for final surface testing covered by this section. Payment at the contract unit prices for the various items covered by those sections of the *Standard Specifications* directly applicable to the work constructed will be full compensation for all work covered by Article 610-13 including, but not limited to, performing testing in accordance with this Specification, any corrective work required as a result of this testing and any additional traffic control as may be necessary.

Payment will be made under:

Pay Item	Pay Unit
Asphalt Concrete Base Course, Type B25.0B	Ton
Asphalt Concrete Base Course, Type B25.0C	Ton
Asphalt Concrete Intermediate Course, Type I19.0B	Ton
Asphalt Concrete Intermediate Course, Type I19.0C	Ton
Asphalt Concrete Intermediate Course, Type I19.0D	Ton
Asphalt Concrete Surface Course, Type S4.75A	Ton
Asphalt Concrete Surface Course, Type SF9.5A	Ton
Asphalt Concrete Surface Course, Type S9.5B	Ton
Asphalt Concrete Surface Course, Type S9.5C	Ton
Asphalt Concrete Surface Course, Type S9.5D	Ton

SECTION 620
ASPHALT BINDER FOR PLANT MIX

620-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, furnishing of asphalt binder, with anti-strip additive when required, at an asphalt plant and incorporating the asphalt binder and anti-strip additive into the asphalt plant mix.

620-2 MATERIALS

Refer to Division 10.

Item	Section
Anti-strip Additives	1020-8
Asphalt Binder, All Grades	1020-2
Silicone	1020-9

The asphalt binder for the mixture will be accepted at the source subject to Article 1020-1.

Use additives from the NCDOT APL. Submit a sample and manufacturer's data to the Engineer for approval before use, if proposing to use a brand not on the NCDOT APL.

620-3 GENERAL REQUIREMENTS

The requirements of Section 610 that pertain to handling of asphalt binder will be applicable to the work covered by this section.

Add silicone to all asphalt binder used in surface courses and open-graded asphalt friction course, unless otherwise directed. The amount of silicone added will range from one ounce per 2,000 gal of asphalt binder to one ounce per 2,500 gal. Add silicone to the asphalt binder at the plant site unless added at the source and it is so noted on the delivery ticket.

Do not heat the asphalt binder to a temperature in excess of the supplier’s recommendation while stored or when being used in production of mix at the asphalt plant.

Introduce the actual quantity of asphalt binder at the established percentage shown on the applicable JMF into the mix by the plant weighing or metering system. No working tolerance for asphalt binder percentage will be allowed during production.

When required, incorporate an anti-strip additive. It may be either chemical additive mixed with the asphalt binder or hydrated lime added to the aggregate or a combination of both. Furnish the brand name of the type (lime or chemical), supplier and shipping point of anti-strip additive. Note on the asphalt binder delivery ticket the rate (or quantity), brand of chemical additive when added at the supplier’s terminal. Introduce and mix chemical anti-strip additive into the asphalt binder at either the supplier's terminal or at the asphalt plant site at the dosage required by the JMF. Use in-line blending equipment at either location. When added at the asphalt plant, use equipment that meets Sections 5 and 6 of the *Asphalt QMS Manual*. When added at the supplier's terminal, use equipment that in-line blends with a constant flow of the additive for a minimum of 80% of the asphalt binder loading time. When hydrated lime is used, use equipment to introduce the lime that meets Sections 5 and 6 of the *Asphalt QMS Manual*. Thoroughly mix chemical anti-strip additive and asphalt binder together before incorporating into the asphalt plant mix.

620-4 MEASUREMENT AND PAYMENT

Asphalt Binder for Plant Mix and *Polymer Modified Asphalt Binder for Plant Mix* will be measured and paid as the theoretical number of tons required by the applicable JMF based on the actual number of tons of plant mix completed and accepted on the job.

Such price and payment will be full compensation for all work covered by this section.

There will be no direct payment for anti-strip additive. Payment at the contract unit prices for the various asphalt plant mix items will be full compensation for the work.

Adjustments will be made to the payments due the Contractor for each grade of asphalt binder when it has been determined that the monthly average terminal F.O.B. Selling Price of asphalt binder, Grade PG 64-22, has fluctuated from the Base Price Index for Asphalt Binder included in the contract. The methods for calculating a base price index, for calculating the monthly average terminal F.O.B. selling price and for determining the terminals used are in accordance with procedures on file with the Construction Unit.

When it is determined that the monthly selling price of asphalt binder on the first business day of the calendar month during which the last day of the partial payment period occurs varies either upward or downward from the base price index, the contract unit price for asphalt binder for plant mix will be adjusted. The adjusted contract unit price will be determined by adding the difference between the selling price and the base price index to the contract unit bid price for asphalt binder.

The adjusted contract unit price will then be applied to the theoretical quantity of asphalt binder authorized for use in the plant mix placed during the partial payment period involved, except that where recycled plant mix is used, the adjusted unit price will be applied only to the theoretical number of tons of additional asphalt binder materials required by the JMF.

Adjusted contract unit prices for all grades of asphalt binder, including additional asphalt binder materials in recycled mixtures, will be based on the average selling price and base price index for asphalt binder, Grade PG 64-22, regardless of the actual grade required by the JMF.

In determining the adjusted contract unit price for any material specified in this section the following formula will be used:

$$\mathbf{A} = \mathbf{B + (D - C)}$$

Where:

A = Adjusted Contract Unit Price
B = Contract Unit Price
C = Base Price Index
D = Monthly Average Terminal F.O.B. Selling Price

In the event the Department is unable to secure an F.O.B. selling price from at least 4 terminals in a given month, payment will be at the contract unit price for each ton of asphalt binder used in the work during that month.

Payment will be made under:

Pay Item	**Pay Unit**
Asphalt Binder for Plant Mix	Ton
Polymer Modified Asphalt Binder for Plant Mix	Ton

SECTION 650
OPEN-GRADED ASPHALT FRICTION COURSE

650-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, construction of a plant mixed open-graded asphalt friction course (OGFC) properly laid upon a prepared surface in accordance with these Specifications and in conformity with the lines, grades, thickness and typical sections shown on the plans; producing, weighing, transporting, placing and rolling the plant mix as specified in Section 610; furnishing the asphalt binder, anti-strip additive, fiber stabilizing additive and all other materials for the plant mix; furnishing and applying tack coat as specified; providing QC as specified in Section 609 as modified for OGFC; surface testing of the completed pavement; furnishing scales; making any repairs or corrections to the friction course that may become necessary and maintaining the friction course until final acceptance of the project.

650-2 MATERIALS

Refer to Division 10.

Item	Section
Anti-strip Additives	1020-8
Asphalt Binder, Performance Grade	1020-2
Coarse Aggregate	1012-1(B)
Fiber Stabilizing Additives	1020-10
Fine Aggregate	1012-1(C)
Mineral Filler	1012-1(D)
Reclaimed Asphalt Shingles (RAS)	1012-1(E)

650-3 COMPOSITION OF MIXTURE (MIX DESIGN AND JOB MIX FORMULA)

(A) General

Design the open-graded asphalt friction course using a mixture of coarse and fine aggregate, asphalt binder, mineral filler, fiber stabilizing additive and other additives as required to produce a mix meeting Table 650-1.

At least 20 days before start of asphalt mix production, submit the mix design and proposed JMF targets for each required mix type and combination of aggregates to the Engineer for review and approval. The mix design shall be prepared by a mix design technician approved by the Department in an approved mix design laboratory. Prepare the mix design in accordance with Article 610-3 and the Department's mix design procedures. Copies of these procedures can be obtained through the Materials and Tests Unit.

The mix design and JMF target values will be established within the mix design criteria specified in Table 650-1 for the particular type of mixture to be produced.

(B) Mix Design Criteria

Design open-graded asphalt friction course (OGFC) mixtures conforming to the gradation requirements and other mix design criteria in Table 650-1 for the mix type specified.

Use the asphalt binder grade shown in Table 650-1 for the mix type specified. RAS may be used in accordance with Subarticle 610-3(A).

Use an anti-strip additive in all OGFC mixes. It may be hydrated lime or a chemical additive or both. Add chemical anti-strip additive at a rate of 0.5% by weight of asphalt binder. Add hydrated lime at a rate of 1.0% by weight of dry aggregate. Use an approved source and grade. Add the anti-strip additive to the asphalt binder in accordance with Article 620-3.

If needed to prevent asphalt draindown, incorporate a fiber stabilizing additive into all OGFC types. Add the fiber at a dosage rate by weight of the total mix as approved.

In addition to the required mix design submittal, the Contractor shall prepare and deliver gyratory compactor specimens to the Department's Central Asphalt Laboratory for Cantabro durability testing. The Contractor shall prepare these specimens using lab produced mix in accordance with NCDOT procedures. Provide the samples at least 20 days before the anticipated beginning placement of OGFC mixture.

TABLE 650-1 OGFC DESIGN CRITERIA	
Grading Requirements	**Total Percent Passing**
Sieve Size (mm)	*Type FC-1 Modified*
19.0	-
12.5	100
9.50	75 - 100
4.75	25 - 45
2.36	5 - 15
0.075	1.0 - 3.0
Asphalt Binder Grade	PG 76-22
Binder Content, %	5.5 - 8.0
Mixing Temperature at the Asphalt Plant[A]	300 – 325°F
Air Voids, % minimum	18.0
Cantabro Loss, % maximum	20.0
Draindown, % maximum	0.3

A. The JMF mix temperature shall be within the ranges shown unless otherwise approved.

650-4 PLANT EQUIPMENT

Use plant equipment in accordance with Article 610-5 and the requirements herein.

When fiber stabilizing additives are used as an ingredient of the mixture, use a separate feed system capable of accurately proportioning the required quantity into the mixture and in such a manner that uniform distribution will be obtained. Interlock the proportioning device with the aggregate feed or weigh system so as to maintain the correct proportions for all rates of production and batch sizes. Accurately control the proportion of fibers to within ± 10% of the amount required. Provide flow indicators or sensing devices for the fiber system that are interlocked with plant controls such that mixture production will be interrupted if introduction of the fiber fails.

When a batch type plant is used, add the fiber to the aggregate in the weigh hopper or as approved. Increase the batch dry mixing time by 8 to 12 seconds, or as directed, to assure the fibers are uniformly distributed before the injection of asphalt binder into the mixer.

When a continuous mix or dryer-drum type plant is used, add the fiber to the aggregate and uniformly disperse at the point of injection of asphalt binder. Add the fiber in such a manner that it will not become entrained in the exhaust system of the drier or plant.

650-5 CONSTRUCTION METHODS

Produce, transport to the site and place the OGFC in accordance with Section 610, except as otherwise provided below.

Do not place OGFC between October 31 and April 1 of the next year, unless otherwise approved. The minimum air and road surface temperature for placing Type FC-1 Modified mix will be 60°F.

Before starting production of the mix, stockpile all aggregates for a sufficient period of time to facilitate the drainage of free moisture.

Clean the existing surface in an acceptable manner before placement of any asphalt material.

Remove all existing raised pavement markers as directed and repair any damaged areas caused by the removal. Use an approved dense graded mixture of similar type material for the repair.

Apply tack coat in accordance with Section 605 and the following:

(A) Use Asphalt Binder, Grade PG 64-22 tack coat material or as approved.

(B) Uniformly apply the tack coat material at a rate of application 0.06 to 0.08 gal/sy, as directed.

Spread and finish the friction course as specified in Article 610-8. Roll the friction course as specified in Article 610-9.

Perform this work in accordance with and using equipment meeting Section 9.5 of the *Asphalt QMS Manual.*

Use a Material Transfer Vehicle (MTV) when placing all types of OGFC. Use a MTV meeting Section 9.5(E) of the *Asphalt QMS Manual.*

Remove and replace any part of the finished friction course that shows non-uniform distribution of asphalt binder, aggregate or fiber at no additional cost to the Department.

Coordinate plant production, transportation and paving operations such that uniform continuity of operation is maintained. If spreading operations are interrupted, the Engineer may require that a transverse joint be constructed any time the mixture immediately behind the paver screed cools to less than 250 ºF.

For end of project joints, provide a transition area consisting of one load of mixture per lane, or as directed. Taper the mixture in thickness from 3/8 inch at the end of the project to the typical thickness (approximately 3/4 inch) within the maximum distance of spread for one load of mixture. For ramps and gore areas, taper the mixture in thickness from that at the edge of the mainline, approximately 3/4 inch to 3/8 inch at the point of the ramp transverse joint. Construct the ramp transverse joint at a point specified by the plans or as directed.

650-6 QUALITY MANAGEMENT SYSTEM

Produce the OGFC in accordance with Section 609, with the following exceptions.

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

Accumulative Production Increment	Number of Samples per Increment
500 tons	1

Record the following data on the standardized control charts and in accordance with the requirements of Section 7.4 of the *Asphalt QMS Manual*:

(a) Aggregate Gradation Test Results:
1. 2.36 mm
2. 0.075 mm Sieves

(b) Binder Content, %, P_b

650-7 MEASUREMENT AND PAYMENT

Open-Graded Asphalt Friction Course, Type FC-1 Modified will be measured and paid as the actual number of tons of friction course incorporated into the completed and accepted work. The friction course will be measured by being weighed in trucks on certified platform scales or other certified weighing devices.

Furnishing asphalt binder for the mix will be paid as provided in Article 620-4 for *Asphalt Binder for Plant Mix*. Adjustments in contract unit price due to asphalt binder price fluctuation will be made in accordance with Section 620.

No direct payment will be made for providing and using the materials transfer vehicle or any associated equipment, as the cost of providing same shall be included in the contract unit bid price per ton for the mix type to be placed.

Payment will be made under:

Pay Item	Pay Unit
Open-Graded Asphalt Friction Course, Type FC-1 Modified	Ton

SECTION 652
PERMEABLE ASPHALT DRAINAGE COURSE, TYPES P-78M AND P-57

652-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, the construction of a plant mixed permeable asphalt drainage course (PADC) properly laid upon a prepared surface in accordance with these Specifications and in conformity with the lines, grades, thickness and typical sections shown on the plans; producing, weighing, transporting, placing and rolling the plant mix as specified in Section 610; furnishing the asphalt binder, anti-strip additive and all other materials for the plant mix; furnishing and applying tack coat as specified in Section 605; furnishing scales; providing QC as specified in Section 609 as modified for PADC; making any repairs or corrections to the friction course that may become necessary; and maintaining the friction course until final acceptance of the project.

652-2 MATERIALS

Refer to Division 10.

Item	Section
Anti-strip Additives	1020-8
Asphalt Binder	1020-2
Coarse Aggregate	1012-1(B)
Fine Aggregate	1012-1(C)

The coarse aggregate shall meet Article 1012-1 except that that portion of the coarse aggregate retained on the No. 4 sieve shall contain at least 60% by weight of crushed pieces having two or more mechanically induced fractured faces.

652-3 COMPOSITION OF MIXTURE

(A) General

Formulate the PADC from a mixture of crushed aggregate, asphalt binder, anti-strip additive and other additives as required to produce a mix meeting Table 652-1.

At least 10 days before start of asphalt mix production, submit the mix design and proposed JMF targets for each required mix type and combination of aggregates to the Engineer for review and approval. The JMF will be established in accordance with Article 610-3. Establish the asphalt binder content at the midpoint of the range specified in Table 652-1 or as approved.

(B) Mix Design

Design PADC mixtures conforming to the gradation requirements and other mix design criteria in Table 652-1 for the mix type specified.

Use the asphalt binder grade shown in Table 652-1 for the mix type specified or as approved.

Use an anti-strip additive in all PADC mixes. It may be hydrated lime or a chemical additive or both. Add chemical anti-strip additive at a rate of 0.5% by weight of asphalt binder. Add hydrated lime at a rate of 1.0% by weight of dry aggregate. Use an approved source and grade.

The mixing temperature at the asphalt plant will be established on the JMF. The JMF mix temperature shall be within the ranges shown in Table 652-1 unless otherwise approved.

TABLE 652-1
PERMEABLE ASPHALT DRAINAGE COURSE
GRADATION AND MIX DESIGN CRITERIA

Sieve Size (mm)	Total Percent Passing	
	Type P-78M	Type P-57
37.5	-	100
25.0	-	95 - 100
19.0	100	-
12.5	95 - 100	25 - 60
9.50	75 - 100	-
4.75	20 - 45	10 - 20
2.36	3 - 15	5 - 10
0.075	1.0 - 3.0	1.0 - 3.0
Asphalt Binder Content, %	2.5 - 3.5	2.0 - 3.0
Mixing Temperature at Plant	240 - 270°F	260 - 290°F

652-4 CONSTRUCTION METHODS

Produce, transport to the site and place the asphalt plant mix in accordance with Section 610, except as otherwise provided herein.

Incorporate the asphalt binder into the asphalt plant mix in accordance with Section 620. Add the anti-strip additive to the asphalt binder in accordance with Article 620-3.

A prime coat or tack coat will not be required.

When the PADC is placed in trench sections, the rolling equipment and rolling sequences required by Article 610-9 will not apply.

Following placement of the PADC mixture to the appropriate line, grade and thickness, begin rolling when the mat has cooled sufficiently to support the weight of an 8 to 12 ton steel-wheel tandem roller. Mat temperature at the time of initial rolling shall be approximately 175°F to 225°F. The maximum number of roller passes shall be three. Consolidate the drainage layer sufficiently with rolling so as to support the weight of equipment that will place the next layer of pavement. Do not compact the drainage layer to the extent that it is not free draining or that the aggregate is crushed. Density acceptance testing is not required for this layer.

No construction traffic will be allowed to travel on any PADC layer. Only equipment necessary to place the next layer of pavement will be allowed on the drainage layer.

Do not place PADC that will not be covered with the next layer of pavement during the same calendar year or within 15 days of placement if the PADC is placed in January or February.

652-5 QUALITY MANAGEMENT SYSTEM FOR ASPHALT PAVEMENTS

Produce the PADC in accordance with the Section 609, with the following exceptions.

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

Accumulative Production Increment	Number of Samples per Increment
500 tons	1

Record the following data on the standardized control charts and in accordance with the requirements of Section 7.4 of the *Asphalt QMS Manual*:

(a) Aggregate Gradation Test Results:
1. 12.5 mm (Type P-57 Only)
2. 9.5 mm (Excluding Type P-57)
3. 4.75 mm
4. 2.36 mm
5. 0.075 mm Sieves

(b) Binder Content, %, P_b

652-6 MEASUREMENT AND PAYMENT

Permeable Asphalt Drainage Course, Type ____ will be paid as the actual number of tons of drainage course incorporated into the completed and accepted work. The drainage course will be measured by being weighed in trucks on certified platform scales or other certified weighing devices.

Asphalt Binder for Plant Mix will paid in accordance with Article 620-4.

Payment will be made under:

Pay Item	Pay Unit
Permeable Asphalt Drainage Course, Type P-78M	Ton
Permeable Asphalt Drainage Course, Type P-57	Ton

SECTION 654
ASPHALT PLANT MIX, PAVEMENT REPAIR

654-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, repairing of existing pavement with asphalt plant mix in order to provide a safe, passable and convenient condition for traffic, or to replace pavement removed in order to remove or to place pipe lines.

Perform the work by cutting the existing pavement to a neat vertical joint and uniform line; removing and disposing of pavement, base and subgrade material as approved or directed; coating the area to be repaired with a tack coat; furnishing, placing and compacting asphalt plant mix; and replacing of the removed material with asphalt plant mix.

Make the repairs in accordance with the plans, or as approved or directed.

654-2 MATERIALS

Where a pavement repair detail is not shown in the plans, use an approved asphalt plant mix.

Where a pavement repair detail is shown in the plans, the type of plant mix shall be in accordance with the pavement repair detail except where the Specifications permit the substitution of another type of plant mix or where approved.

In areas where the existing pavement is not to be resurfaced, the Contractor will not be allowed to substitute a different type of surface course from that shown on the pavement repair detail.

654-3 CONSTRUCTION METHODS

(A) General

Perform repair of existing pavement as approved or directed. Coordinate the work with all other work and operations necessary to maintain traffic.

(B) Pipe Removal or Installation

Where traffic is to be maintained, perform the removal or installation of pipe in sections so that half the width of the roadway will be available to traffic. Immediately upon completion of the entire pipeline removal or installation, repair the pavement.

654-4 MEASUREMENT AND PAYMENT

Asphalt Plant Mix, Pavement Repair will be paid as the actual number of tons of asphalt plant mix, complete in place, used to make completed and accepted repairs, except for those repairs made necessary by the contractor's negligence. The asphalt plant mixed material will be measured by being weighed in trucks on certified platform scales or other certified weighing devices.

Any requirements included in the contract that provide for adjustments in compensation due to variations in the price of asphalt cement will not be applicable to payment for the work covered by this section.

Payment will be made under:

Pay Item	Pay Unit
Asphalt Plant Mix, Pavement Repair	Ton

SECTION 657
SEALING EXISTING PAVEMENT CRACKS AND JOINTS

657-1 DESCRIPTION

The work consists of sealing existing longitudinal and transverse pavement cracks and joints with hot applied joint sealer at locations as directed by the Engineer. The Contractor will not be required to seal the existing edge joints.

657-2 MATERIALS

Refer to Division 10.

Item	Section
Hot Applied Joint Sealer	1028-2

657-3 CONSTRUCTION METHODS

Install the sealant so that it forms a complete watertight bond with a high degree of elasticity, with maximum flexibility and longevity under extreme temperature ranges.

Clean cracks and joints using a hot compressed air lance to blast out any vegetation, dirt, dampness and loose materials from the cracks and joints. Equip the air compressor with suitable traps and filters to remove moisture and oil from the compressed air. Use the hot air lance to dry and warm the adjacent pavement immediately before sealing. Direct flame dryers are not allowed.

Heat and apply the sealant material according to the manufacturer's recommendations. Use a portable melting kettle for heating the material that is equipped with indirect heating (air-jacketed flow) and is capable of constantly agitating the joint sealer to maintain a uniform temperature. Equip the kettle with either mechanically operated paddles and/or a continuous circulating pump to maintain agitation. Use heating equipment capable of controlling the sealant material temperature within the manufacturer's recommended temperature range and that is thermostatically-control calibrated between 200°F to 600°F. Locate a thermometer on the kettle so the Engineer can safely check the temperature of the sealant material. Overheating of the sealant material will not be permitted.

Apply sealant in the prepared cracks and joints within the manufacturer's recommended temperature range, using a pressure screed shoe to completely fill the crack or joint, leaving a sealed 2 inch overband. Excessive overbanding or waste of sealant materials will not be tolerated. Immediately squeegee the crack seal material to minimize the height of the overband. All sealed cracks and joints shall have a minimum of 1/8 inch depth of sealant installed.

Do not apply the hot applied joint sealer when the surface temperature of the pavement is below 32°F. Follow manufacturer's recommendations.

After the crack or joint has been sealed, promptly remove any surplus sealer on the pavement. Do not permit traffic over the sealed cracks and joints without approval by the Engineer. When approved by the Engineer, place sand or other approved material over the crack or joint to prevent tracking.

657-4 MEASUREMENT AND PAYMENT

Sealing existing pavement cracks and joints will be measured and paid as the actual number of pounds of material that has satisfactorily been used to seal pavement cracks and joints in the designated highway. Any material spilled, used in excessive overbanding, wasted, misapplied or unsatisfactorily used in any way will be deducted in determining quantities for payment. The Engineer will determine the quantity, if any, to be deducted. The Engineer's decision on the quantity to be deducted will be final and binding.

Payment will be made under:

Pay Item	Pay Unit
Sealing Existing Pavement Cracks and Joints	Pound

SECTION 660
ASPHALT SURFACE TREATMENT

660-1 DESCRIPTION

Perform the work covered by this section including, but not limited to, furnishing, hauling, spreading and rolling the emulsion and aggregate consisting of one or more applications of liquid asphalt material and one or more applications of aggregate cover coat material on a prepared surface; and maintaining and repairing the asphalt surface treatment (AST).

660-2 MATERIALS

Refer to Division 10.

Item	Section
Aggregates for Asphalt Surface Treatment	1012-2
Emulsified Asphalt, Grade CRS-2L	1020-3
Emulsified Asphalt, Grade CRS-2P	1020-3
Fine Aggregate	1014-1
Mineral Filler	1012-1(D)
Water	1024-4

Before any asphalt surface treatment is placed, obtain from the asphalt supplier and furnish to the Engineer a Certification of Compatibility of the emulsion with the aggregate proposed for use.

660-3 WEATHER AND SEASONAL LIMITATIONS

Do not place any asphalt surface treatment between October 15 and April 1, except for asphalt surface treatment that is to be overlaid immediately with asphalt plant mix.

Apply AST only when the surface to be treated is dry and when the air or surface temperatures, measured at the location of the AST operation away from artificial heat, is 50°F and rising. Do not place AST when air temperature is 98°F and rising.

When placing AST that is to be immediately overlaid with asphalt plant mix, the seasonal and temperature limitations of Article 610-4 shall apply.

Do not apply asphalt material when the weather is foggy or rainy.

660-4 SURFACE PREPARATION

Clean the surface to be treated of dust, dirt, clay, grass, and any other deleterious matter before application of the AST.

660-5 ACCEPTANCE OF ASPHALT MATERIALS

The acceptance of asphalt materials will be in accordance with Article 1020-1.

660-6 APPLICATION EQUIPMENT

Use asphalt application equipment that meets Article 600-5.

Apply aggregate by the use of a self-propelled, pneumatic-tire aggregate spreader capable of maintaining a specified rate with a uniform application for the width of asphalt material being covered. Tailgate spreaders will not be permitted. Areas that are inaccessible to the aggregate spreader shall be covered by hand spreading or other acceptable methods.

660-7 AGGREGATE TYPE AND APPLICATION RATES

Contractor shall provide aggregate types and rates as specified in the contract.

660-8 CONSTRUCTION METHODS

For any type of AST work, demonstrate that all equipment has been calibrated in the presence of the Engineer with a minimum 100 foot test section. If approved by the Engineer, test section may be incorporated into the production section. If the test section is not feasible, submit a calibration plan to the Engineer with detailed information on equipment and a designated area for calibration.

(A) Asphalt Seal Coat

Use the type of seal coat as required by the contract. Seal coat aggregates shall be drained of free moisture and have an amount passing the #200 sieve no greater than 1.5% in accordance with Table 1005-1 before use. Place the seal coat in full-lane widths.

Adjust the aggregate rates to provide a sufficient quantity of cover material to be spread over the surface of the seal coat preventing traffic damage, where it is necessary to permit traffic on sections of a completed seal coat.

Perform rolling of each layer immediately after the aggregate has been uniformly spread. Rolling will consist of at least three complete coverages with one pneumatic-tire roller followed by at least one complete coverage with a 5 to 8 ton steel-wheel roller. All roller coverages shall be completed within 5 minutes of the asphalt emulsion being placed. Do not allow crushing of the aggregate or picking up of the material by the rollers.

The use of a combination steel-wheel and pneumatic-tire roller will be permitted instead of the 5 to 8 ton steel-wheel roller.

After the aggregate is thoroughly seated, broom all excess aggregate off of the surface of the seal coat after 3 calendar days but no more than 7 calendar days. If necessary, use a vacuum truck as directed by the Engineer. Traffic may be permitted on the seal coat immediately after the rolling is complete.

Clean driveways, ditches, turn lanes, and areas adjacent to the AST construction of excess aggregate, excess emulsion run off, over spray or debris from construction.

Blotting sand may be required as directed by the Engineer and shall be applied in accordance with Section 818.

The construction of the various types of seal coats will be in accordance with the following additional requirements:

(1) Single Seal

Apply emulsion to the existing surface followed immediately by an application of aggregate as specified in the contract. Uniformly spread the full required amount of aggregate in one application and correct all non-uniform areas before rolling.

Immediately after the aggregate has been uniformly spread, perform rolling as previously described.

(2) Double Seal

Apply emulsion to the existing surface followed immediately by an application of aggregate as specified in the contract ensuring each is uniformly placed over the existing surface and rolled as previously described.

Immediately after the first application of seal aggregate has been made uniform and rolled, apply the second application of the required amount of emulsion and seal coat aggregate and roll as previously described.

(3) Triple Seal

Follow the procedure outlined in Subarticle 660-8(A)(2) and apply emulsion and aggregate as a third layer and roll as previously described.

(4) Sand Seal

Place the fully required amount of asphalt material in one application and immediately cover with the seal coat aggregate. Uniformly spread the fully required amount of aggregate in one application and correct all non-uniform areas before rolling.

Immediately after the aggregate has been uniformly spread, perform rolling.

Broom excess aggregate material from the surface of the seal coat.

When the sand seal is to be constructed for temporary sealing purposes only and will not be used by traffic, use other grades of asphalt material meeting the requirements of Articles 1020-5 and 1020-6.

(B) Asphalt Mat and Seal

Construct the mat coat in accordance with Subarticle 660-8(A) using the size aggregate required by the contract.

Construct the seal coat in accordance with Subarticle 660-8(C) using the type seal required by the contract.

(C) Asphalt Mat Coat for Soil Subgrade

The surface on which the mat coat is to be applied shall be approved by the Engineer before the mat coat emulsion is applied.

Place a string line guide for application equipment. Place the mat coat in full-lane widths.

Existing surface shall be damp prior to placement of the mat coat.

Immediately follow the application of emulsion with the spreading of the aggregate. No more than 5 minutes can elapse from the time the emulsion is applied and the rolling is completed when using CRS-2L or CRS-2P.

Mat coat aggregate shall be drained of free moisture and have an amount passing the #200 sieve no greater than 1.5% in accordance with Table 1005-1 before use. Spread the aggregate uniformly at the required rate and correct all non-uniform areas before rolling.

Roll immediately after the aggregate is uniformly spread. Rolling consists of at least three complete coverages with two 5 to 10 ton steel-wheel rollers. Continue rolling until the aggregate is thoroughly keyed into the emulsion. Do not allow crushing of the aggregate or picking up of the material by the rollers. A combination steel-wheel and pneumatic-tire roller will not be permitted. Use two individual steel-wheel rollers. The three coverages shall be completed within 5 minutes of the spraying of the emulsion.

At the discretion of the Engineer, at the beginning of each emulsion application, spread a paper over the end of the previously completed mat coat and begin the asphalt application on the paper. After application, remove and dispose of the paper.

After the aggregate is thoroughly seated, traffic may be permitted on the mat coat after the rolling is complete. No brooming shall be performed on the mat coat.

Correct defects or damage to the mat coat before the application of seal coat or plant mix overlay. The seal coat or plant mix may be applied the same day the mat coat is placed provided the mat coat has been satisfactorily applied and rolled.

(D) Asphalt Mat Coat for Pavement Surfaces

For mat coats with an asphalt overlay, construct the mat coat in accordance with Subarticle 660-8(C). The same grade of emulsion used for the mat coat may be used for the tack coat of the asphalt overlay.

For mat coats constructed on existing pavement surfaces, construct the mat coat in accordance with Subarticle 660-8(C) using the size aggregate required by the contract and the application rates specified in the contract.

660-9 TEMPORARY TRAFFIC CONTROL (TTC)

All AST operations shall be conducted in daylight hours.

Provide temporary traffic control for the asphalt surface treatment operations in accordance with the contract and in accordance with the provision RWZ-1 TEMPORARY TRAFFIC CONTROL (TTC) found elsewhere in the proposal except the following sections do not apply:

TRAFFIC OPERATIONS, Drop-Off Requirements and Time Limitations

TRAFFIC OPERATIONS, Project Requirements

Install advance/general warning work zone signs according to the Detail Drawing titled *Signing for Asphalt Surface Treatment* provided in the plans.

660-10 WARRANTY

The AST shall be warranted by the project payment and performance bonds for a period of 12 months.

(A) Warranty Period

The Department will conduct an inspection of the work and provide written acceptance in accordance with Article 105-17. Written acceptance of the work will constitute the start date for the 12 month AST warranty period.

(B) Situations Affecting the Warranty

During the warranty period, the Contractor will not be held responsible for distresses that are caused by factors not related to materials and workmanship. These include, but are not limited to, chemical and fuel spills, vehicle fires, base failures, and snow plows. Other factors considered to be beyond the control of the Contractor, which may contribute to pavement distress, will be considered by the Engineer on a case by case basis upon receipt of a written request from the Contractor. Maintaining traffic on the pavement surface prior to the Engineer's acceptance will not be a condition for voiding the warranty.

(C) Emergency Repairs

If, in the opinion of the Department, a pavement condition covered by the warranty requires immediate attention for the safety of the traveling public, the Contractor will be notified immediately. If the Contractor cannot perform the work in a timely manner, the Department may directly perform or have the corrective work performed by another entity at the Contractor's expense. Any emergency work performed will not alter the requirements, responsibilities, or obligations of the warranty.

(D) Warranty Performance Criteria

TABLE 660-1
PERFORMANCE CRITERIA

Surface Defects	Severity	Extent (Per Lot)
Surface Patterns	Alternate lean and heavy lines streaking over the entire pavement surface.	Greater than 20% of a lot affected; distress spotted evenly over the lot or over localized areas within the lot.
Bleeding/ Flushing	Distinctive appearance (with excess asphalt binder already free).	Greater than 20% of the wheel tracks within a lot affected.
Loss of Cover Aggregate	Large patches of cover aggregate lost from the pavement surface.	Greater than 20% of a lot affected; distress spotted evenly over the lot or over localized areas within the lot.

Lot – A 1,000 foot section of pavement or portion thereof, a lane width wide, on which AST is constructed on a single map.

The beginning point of the first lot will be the beginning point of each day's operation or the beginning of a map, whichever is applicable.

The Department will review the AST and advise the Contractor of any required corrective work in writing prior to expiration of the warranty period.

The Department will approve all materials and methods used in warranty work.

The Department will determine if warranty work performed by the Contractor meets the contract and provide written acceptance of the warranty work when complete.

The Chief Engineer will review any disputes for corrective work covered under the warranty.

660-11 MAINTENANCE

Maintain the asphalt surface treatment in an acceptable condition until final acceptance of the project.

660-12 MEASUREMENT AND PAYMENT

Asphalt Surface Treatment: Single Seal, Double Seal, Triple Seal, Mat and Single Seal, Mat and Double Seal, Sand Seal, and Mat Coat, No.___Stone. All AST will be measured and paid at the contract unit price per square yard. Payment at the above prices will be made for replacing any satisfactorily completed AST when such replacement has been made necessary by defects in subgrade or base constructed by others.

Emulsion for Asphalt Surface Treatment will be measured by the actual surface area of application and the specified application rate (gallon/sy) and paid at the contract unit price per gallon, which price will be full compensation for all materials including modifiers and additives, tack coat, labor, tools, equipment, and all other incidentals necessary to complete the work.

Vacuum truck will be measured and paid on a weekly basis for each week or any portion thereof that the Engineer directs the use of a vacuum truck.

Price adjustments herein shall apply concurrently; however, price adjustment will not apply in the event the material is rejected.

Furnishing and applying prime will be paid as provided in Article 600-9 for *Prime Coat.*

If included in the contract, furnishing and applying blotting sand will be paid as provided in Article 818-4 for *Blotting Sand.*

Adjustment for *Emulsion for AST* will be paid per the following formula:

$$A = B + ((D - C) / 235)\ 0.65$$

Where:

A = Adjusted Contract Unit Price of *Emulsion for AST* per gallon
B = Contract Unit Price of *Emulsion for AST* per gallon
C = Base Price Index of PG 64-22 per ton
D = Monthly Average Terminal F.O.B. Selling Price for PG 64-22 per ton

See Price Adjustment – Asphalt Binder Special Provision found elsewhere in this proposal for the base price index of PG 64-22 per ton.

Payment will be made under:

Pay Item	**Pay Unit**
Asphalt Surface Treatment, Single Seal	Square Yard
Asphalt Surface Treatment, Double Seal	Square Yard
Asphalt Surface Treatment, Triple Seal	Square Yard
Asphalt Surface Treatment, Mat and Single Seal	Square Yard
Asphalt Surface Treatment, Mat and Double Seal	Square Yard
Asphalt Surface Treatment, Sand Seal	Square Yard
Asphalt Surface Treatment, Mat Coat, No. __Stone	Square Yard
Emulsion for Asphalt Surface Treatment	Gallon
Vacuum Truck	Per Week

SECTION 661
ULTRA-THIN BONDED WEARING COURSE

661-1 DESCRIPTION

Produce and place an Ultra-thin Bonded Wearing Course (UBWC), including an application of a warm Polymer-Modified Emulsion Membrane (PMEM) followed immediately with an UBWC hot mix asphalt overlay. Spray PMEM immediately before applying hot mix asphalt.

The Contractor may elect to use an alternate method for the placement of the UBWC. As an alternate to spraying PMEM prior to placement of the asphalt mixwith a spray paver, the Contractor may use a non-tracking hot-applied polymer asphalt tack coat material prior to placement of the asphalt mix. If the alternate method is selected, submit documentation and proposed plan to the Engineer prior to beginning any work.

Provide and conduct the QC and required testing for acceptance of the UBWC in accordance with the contract.

661-2 MATERIALS

Refer to Division 10.

Item	Section
Anti-strip Additives	1020-8
Coarse Aggregate	1012-1(B)
Fine Aggregate	1012-1(C)
Mineral Filler	1012-1(D)
Polymer Modified Asphalt Binder	1020-2
Polymer-Modified Emulsion Membrane (PMEM)	1020-4

Use either PG 70-28 or PG 76-22 binder conforming to Section 620 in the asphalt mix design. Ensure that the asphalt binder is compatible with the PMEM (or alternate) and the existing pavement.

Use an approved non-tracking hot applied polymer asphalt tack coat found on NCDOT's APL for *Non-Tracking Asphalt Tack Coat.* .

661-3 COMPOSITION OF MIX

Do not use crystalline limestone, crystalline-dolomitic limestone or marble for aggregates and do not use reclaimed asphalt pavement (RAP). Use a mixture of coarse and fine aggregate, asphalt binder, mineral filler and other additives when required. Size, uniformly grade and combine in such proportions such that the resulting mixture meets the gradation and physical requirements of Tables 661-1 and 661-2.

At least 20 days before start of asphalt mix production, submit the mix design and proposed JMF targets for each required mix type and combination of aggregates to the Engineer for review and approval. Establish the JMF target values within the mix design criteria specified in Table 661-2 for the particular type mixture.

Determine and certify compatibility of all asphalt emulsion, asphalt binder and aggregate components.

TABLE 661-1 UBWC GRADATION CRITERIA	
Sieves (mm)	**% Passing by Weight**
12.5	100
9.50	85 - 100
4.75	28 - 44
2.36	17 - 34
1.18	13 - 23
0.600	8 - 18
0.300	6 - 13
0.150	4 - 10
0.075	3.0 - 7.0

TABLE 661-2 UBWC MIX DESIGN CRITERIA	
Property	**Requirement**
Asphalt Content, %	5.0 (minimum)
Draindown Test, AASHTO T 305	0.1% max
Moisture Sensitivity, AASHTO T 283[A]	85% min
Application Rate, lb/sy	70 lb/sy
Approximate Application Depth, in.	5/8"
Asphalt PG Grade, AASHTO M 320	PG 70-28 or PG 76-22

A. Specimens for AASHTO T 283 testing are to be compacted using the gyratory compactor. The mixtures shall be compacted using 100 gyrations to achieve specimens approximately 95 mm in height. Use mixture and compaction temperatures recommended by the binder supplier.

661-4 CONSTRUCTION METHODS

(A) Equipment

Use asphalt mixing plants in accordance with Article 610-5. Furnish paving machine with the following capabilities:

(1) Self-priming paving machine capable of spraying the PMEM, applying the hot asphalt concrete overlay and screeding the surface of the mat to the required profile and cross section in one pass at any rate between 30 and 92 feet per minute.

(2) Receiving hopper, feed conveyor, storage tank for PMEM material, PMEM emulsion single variable-width spray bar and a variable width, heated, vibratory-tamping bar screed.

(3) Screed with the ability to be crowned at the center both positively and negatively and have vertically and horizontally adjustable extensions to accommodate the desired pavement profile and widths.

(4) Sprayer system capable of accurately and continuously monitoring the rate of spray and providing a uniform application across the entire width to be overlaid.

(5) Use pavers equipped with an electronic screed control that will automatically control the longitudinal profile and cross slope of the pavement. Control the longitudinal profile through the use of either a mobile grade reference(s), including mechanical, sonic and laser grade sensing and averaging devices, an erected string line(s) when specified, joint matching shoe(s), slope control devices or the approved methods or combination of methods. Unless otherwise specified, use a mobile grade reference system capable of averaging the existing grade or pavement profile over at least a 30 feet distance or by non-contacting laser or sonar type ski with at least four referencing stations mounted on the paver at a minimum length of 24

feet. Establish the position of the reference system such that the average profile grade is established at the approximate midpoint of the system. The transverse cross slope shall be controlled as directed by the Engineer.

Use an erected fixed stringline for both and longitudinal profile and cross slope control when required by the contract. When an erected fixed string line is required, furnish and erect the necessary guide line for the equipment. Support the stringline with grade stakes placed at maximum intervals of 25 feet for the finished pavement grade.

Use the 30 feet minimum length mobile grade reference system or the non-contacting laser or sonar type ski with at least four referencing stations mounted on the paver at a minimum length of 24 feet to control the longitudinal profile when placing the initial lanes and all adjacent lanes of all layers, including resurfacing and asphalt in-lays, unless other specified or approved. A joint matching device (short 6 inch shoes) may be used only when approved.

Use the automatic slope control system unless otherwise approved. The Engineer may waive the use of automatic slope controls in areas where the existing surface (subgrade, base, asphalt layer, etc.) exhibits the desired cross slope of the final surface. The Engineer may also waive the use of automatic slope controls in areas where the use of such equipment is impractical due to irregular shape or cross section (such as resurfacing). When the use of the automatic slope controls is waived, the Engineer may require the use of mobile grade references on either or both sides of the paver. Manual screed operation will be permitted in the construction of irregularly shaped and minor areas, subject to approval. Waiver of the use of automatic screed controls does not relieve the Contractor of achieving plan profile grades and cross slopes.

In the case of malfunction of the automatic screed control equipment, the paver may be manually operated for the remainder of the workday provided this method of operation produces acceptable results. Do not resume work thereafter until the automatic system is functional.

The Engineer will waive the requirement for use of pavers for spreading and finishing where irregularities or obstacles make their use impractical. Spread, rake and lute the mixture by hand methods or other approved methods in these areas.

Operate the paver as continuously as possible. Pave intersections, auxiliary lanes and other irregular areas after the main line roadway has been paved, unless otherwise approved.

Compact the wearing course with a steel double drum asphalt roller(s) with a minimum weight of 10 tons. Maintain rollers in reliable operating condition and equip with functioning water system and scrapers to prevent adhesion of the fresh mix onto the roller drums. Supply adequate roller units and compact promptly following the placement of the material.

Request approval of equipment before the start of any work. Maintain all equipment and tools in satisfactory working condition at all times.

(B) Surface Preparation

Perform the following items before the commencement of paving operations.

(1) Protect and cover manhole covers, drains, grates catch basins and other such utility structures with plastic or building felt before paving and reference for location and adjustment after paving.

(2) Remove thermoplastic traffic markings symbols, characters or other markings greater than 1/4 inch in thickness on the existing pavement.

(3) Clean and completely fill pavement cracks and joints greater than 1/4 inch wide. Do not overband the existing cracks and joints. Apply sealant per manufacturer's recommendation.

(4) Fill surface irregularities greater than 1 inch deep with a material approved by the Engineer.

(5) Thoroughly clean the entire pavement surface, giving specific attention to accumulated mud and debris. Pressurized water and/or vacuum systems may be required to ensure a clean surface.

(C) Application of Ultra-thin Bonded Wearing Course

Produce, transport to the site and place the UBWC in accordance with Section 610, except as otherwise provided below.

Use only one asphalt binder PG grade for the entire project, unless the Engineer gives written approval.

Do not place UBWC between October 31 and April 1 and when the air and surface temperature is less than 60°F.

Apply the UBWC mixture at the rate per square yard as shown in Table 661-2 for the mix type shown in the plans.

Spray the PMEM at a temperature of 140°F to 180°F. Provide a uniform application across the entire width. Use a target application rate of 0.20 gal/sy and adjust according to the mix design, existing pavement type and condition for the specified project, and the manufacturer's recommendations. Ensure the rate of application is approved by the Engineer before beginning work.

Do not allow wheels or other parts of the paving machine to touch the PMEM before the hot mix asphalt concrete wearing course is applied.

Place the hot asphalt concrete wearing course over the full width of the PMEM. Apply the hot mix asphalt concrete at a temperature of 300°F to 330°F and within a maximum of 3 seconds immediately after the application of the membrane.

Before opening to traffic, allow the pavement to sufficiently cool after the rolling operation to resist damage to the pavement.

For the alternate method, use distributor equipment to uniformly place the non-tracking hot applied polymer asphalt tack coat in accordance with Section 605 and shall be applied at a temperature in accordance with the manufacturer's recommendations and at a target residual application rate of 0.12 ± 0.02 gal/sy. For placing the asphalt mix, use of a spray paver is not required.

(D) Compaction

Compact the wearing course with at least two passes of a steel double drum asphalt roller before the material temperature has fallen below 185°F. Do not allow the rollers to remain stationary on the freshly placed asphalt concrete. Compact immediately following the placement of UBWC. A release agent (added to the water system) may be required to prevent adhesion of the fresh mix to the roller drum and wheels. Compact in the static mode.

661-5 QUALITY MANAGEMENT SYSTEM FOR ASPHALT PAVEMENTS

Produce the ultra-thin hot mix asphalt in accordance with Section 609 with the following exceptions.

Sample and test the completed mixture from each mix design per plant per year at the following minimum frequency during mix production:

Accumulative Production Increment	Number of Samples per Increment
500 tons	1

Record the following data on the standardized control charts and in accordance with the requirements of Section 7.4 of the *Asphalt QMS Manual*:

(a) Aggregate Gradation Test Results:
   1. 2.36 mm
   2. 0.075 mm Sieves

(b) Binder Content, %, P_b

661-6 MEASUREMENT AND PAYMENT

Ultra-thin Bonded Wearing Course will be measured and paid by the actual number of tons of mixture incorporated into the completed and accepted work. The hot mix asphalt pavement will be measured by being weighed in trucks on certified platform scales or other certified weighing devices. Application of Ultra-thin Hot Mix Asphalt shall be included in the per ton pay item for *Ultra-thin Bonded Wearing Course*.

Polymer Modified Asphalt Binder for Plant Mix will be paid in accordance with Article 620-4. Asphalt binder price adjustments when applicable will be based on Grade PG 64-22, regardless of the grade used.

Where PG 76-22 is being used in the production of ultra-thin, the grade of asphalt binder to be paid will be PG 70-28, unless otherwise approved.

For the alternate method, *Ultra-thin Bonded Wearing Course* will be measured and paid by the actual number of tons of mixture incorporated into the completed and accepted work. The hot mix asphalt pavement will be measured by being weighed in trucks on certified platform scales or other certified weighing devices. Non-tracking hot applied polymer asphalt tack coat shall be included in the per ton pay item for *Ultra-thin Bonded Wearing Course*. No other pay item shall be associated with this alternate method.

The above prices and payments will be full compensation for all work covered by this section including, but not limited to, furnishing all materials, producing, weighing, transporting, placing and compacting the polymer modified asphalt emulsion; maintaining the ultra-thin bonded wearing course until final acceptance of the project; performing QC as specified in the contract; and making any repairs or corrections to the surface of the pavement or adjacent landscape that may become necessary.

Payment will be made under:

Pay Item	**Pay Unit**
Ultra-thin Bonded Wearing Course	Ton

SECTION 665
MILLED RUMBLE STRIPS ON ASPHALT CONCRETE SHOULDERS

665-1 DESCRIPTION

Construct rumble strips on asphalt concrete shoulders in accordance with the plans and as directed by the Engineer. Work includes, but is not limited to, furnishing all labor, equipment and all incidentals necessary to complete the work satisfactorily and disposing of milled material.

665-2 EQUIPMENT

Provide equipment consisting of a rotary-type cutting head with an outside diameter of no more than 24 inches and at least 16 inches long. Provide a cutting head that has the cutting tips arranged to provide a relatively smooth cut. Provide a cutting head on its own independent suspension from that of the power unit to allow the tool to self align with the slope of the shoulder or any irregularities in the shoulder surface.

Provide a cutting tool equipped with guides to provide consistent alignment of each cut in relation to the roadway and to provide uniformity and consistency throughout the project.

665-3 CONSTRUCTION METHODS

Demonstrate the ability to achieve desired surface inside each depression without tearing or snagging the asphalt before beginning the work.

Provide rumble strips that have finished dimensions of 7 inches ± 1/2 inch wide in the direction of travel and are at least 16 inches long measured perpendicular to the direction of travel. Provide rumble strips having depressions with a concave circular shape with a minimum 1/2 inch depth at center (no more than an allowable depth 5/8 inch). Place rumble strips in relation to the roadway according to the patterns shown in the plans.

Material resulting from the operation becomes the property of the Contractor. Remove and dispose of this material in accordance with Section 802.

At the end of each working day remove all equipment to a location where it does not present a traffic hazard, clean pavement and reopen work area to traffic.

665-4 MEASUREMENT AND PAYMENT

Milled Rumble Strips (Asphalt Concrete) will be measured and paid at the contract unit price per linear foot for the actual number of linear feet of shoulder, measured longitudinally along the surface of each shoulder, where rumble strips have been constructed.

Payment will be made under:

Pay Item	Pay Unit
Milled Rumble Strips (Asphalt Concrete)	Linear Foot

SUPPLEMENTAL SPECIFICATION 10

DIVISION 15
UTILITY CONSTRUCTION

SECTION 1500
GENERAL UTILITY REQUIREMENTS

1500-1 DESCRIPTION

Construct various utilities as required by the contract or as directed.

Apply the applicable provisions of the rules and regulations of the NCDEQ to the construction of water lines and sanitary sewer lines. Perform all work in accordance with the applicable plumbing codes.

1500-2 COOPERATION WITH THE UTILITY OWNER

The utility owner owns the existing utility facilities and will own the new utility facilities after acceptance by the Department. The Department owns the construction contract and has administrative authority. Communications and decisions between the contractor and utility owner are not binding upon the Department or this contract unless authorized by the Engineer. Agreements between the utility owner and contractor for work that is not part of this contract or is secondary to this contract are allowed, but are not binding upon the Department.

Provide access for Department personnel and the owner's representatives to all phases of construction. Notify Department personnel and the utility owner 2 weeks before commencement of any work and one week before service interruption. Keep utility owners' representatives informed of work progress and provide opportunity for inspection of construction and testing.

Except in an emergency, do not operate any of the controls on the existing systems without prior approval of the owner.

Notify the utility owner at least 24 hours in advance of all arrangements for temporary service and for agreement with the owner as to the time that service may be interrupted.

1500-3 UTILITY LOCATIONS AND CONTRACTOR'S RESPONSIBILITY

The plans depict the best available information for the location, size and type of material for all existing utilities. Make investigations for determining the exact location, size and type of material of the existing facilities as necessary for the construction of the proposed utilities and for avoiding damage to existing facilities. Repair any contractor caused damage of existing facilities to the original or better condition at no additional cost to the Department.

1500-4 WEEKEND, NIGHT AND HOLIDAY WORK

Make connections between existing and proposed utilities at times most convenient to the public, without endangering the utility service and in accordance with the utility owner's requirements. Make connections on weekends, at night and on holidays, if necessary.

1500-5 RELATION OF WATER MAINS TO SEWERS

Lay water mains at least 10 feet laterally from existing or proposed sewers. If local conditions or barriers prevent a 10 foot separation, lay the water main with at least 18 inches vertical separation above the top of the sewer pipe either in a separate trench or in the same trench on a bench of undisturbed earth.

When a proposed water main crosses over a proposed or existing sewer, lay the water main with at least 18 inches vertical separation above the top of the sewer. If local conditions or barriers prevent an 18 inch vertical separation, construct both the water main and the sewer for a distance of 10 feet on each side of the point crossing with ferrous pipe having water main quality joints.

When a proposed water main crosses under a proposed or existing sewer, construct both the water main and the sewer of ferrous materials with joints that are equivalent to water main standards for a distance of 10 feet on each side of the point of crossing. Center the section of water pipe at the point of crossing.

1500-6 PROTECTION OF PEDESTRIAN AND VEHICULAR TRAFFIC

During the progress of the work, keep sidewalks and crossings open for the passage of pedestrians. Take necessary measures to keep roadways open for traffic unless lane or roadway closures are approved.

Construct and maintain adequate and approved bridges over excavations as necessary for the purpose of accommodating pedestrians or vehicles.

When open cut installation is allowed across a roadway and traffic is to be maintained, construct the installation in sections so that half the width of the roadway will be available to traffic. Provide all traffic control measures necessary to provide for safe traffic passage.

1500-7 SUBMITTALS AND RECORDS

Deliver only approved materials to the project. Provide sufficient information as required under Sections 105 and 106 to demonstrate the materials meet the specifications and intended use. Provide 2 copies to the utility owner and 6 copies to the Engineer or provide electronic submittals if accepted by the Engineer. Identify each item's intended use. As a minimum, the submitted information shall show the material description, brand name, stock number, size, rating and manufacturing specification.

Provide working drawings of thrust restraint designs and connection details along with schedules for performing the work.

Provide as-built plans of the installed utility. The plans shall include notations of the size and type material installed, coordinates of utility controls and horizontal and vertical locations of the piping. Provide 2 copies to the utility owner and 2 copies to the Engineer.

1500-8 LOCATING AND MARKING

Tape a continuous locator wire along the top of all piping. Mechanically fasten locator wire to valve boxes, meter boxes, fire hydrants, manhole covers and other above grade appurtenances. Install marking tape 18 inches to 24 inches below finished grade above all pipelines.

1500-9 PLACING PIPELINES INTO SERVICE

Make final connections of the new work to the existing mains where indicated in the plans, as required to fit the actual conditions or as directed. Provide sufficient work crews, equipment and materials on site to assure quick and efficient connections.

Schedule and notify owners and customers in advance of any interruptions of water service with ample time to make arrangements. Limit interruption of service to water customers to no more than 8 hours. Provide temporary connections as needed to maintain service. Obtain approval from the NCDEQ-Water Resources Section prior to placing a new water line into service. Use backflow prevention assemblies for temporary connections to isolate new water lines from existing water line.

1500-10 MEASUREMENT AND PAYMENT

The general utility construction work will be incidental and will be paid at the contract unit prices of the various utility items included in the contract.

SECTION 1505
EXCAVATION, TRENCHING, PIPE LAYING AND BACKFILLING FOR UTILITIES

1505-1 DESCRIPTION

Perform all excavation, undercut, foundation conditioning, pipe laying, bedding, backfill and pavement, sidewalk and driveway repair necessary for installation of utilities.

1505-2 MATERIALS

Refer to Division 10.

Item	Section
Portland Cement Concrete, Class B	1000
Select Material	1016

Use Class III, IV, V or VI select material for foundation conditioning and bedding.

1505-3 CONSTRUCTION METHODS

Excavate, trench, lay pipe, bed and backfill utilities in conformance with the applicable requirements of Division 1, Division 2 and Articles 300-1, 300-4 and 300-6. Comply with AWWA and ASTM standards along with the product manufacturer requirements for installing utilities.

(A) Shoring

Excavate trenches and pits for the installation of utilities that are safe for the workers and roadway users and that protect the roadway and other property from damage. Provide appropriate groundwater and surface water controls to stabilize the excavation and foundation and to provide a clean working area.

(1) Worker Safety

Provide any necessary shielding or shoring to protect workers.

(2) Roadway Users

Provide shielding or shoring as required under Section 150 or as required elsewhere in the contract.

(3) Roadbed and Foundation Protection

Provide shoring of excavations less than one horizontal to one vertical from existing or proposed pavement to prevent failure or weakening of the roadbed. Provide plans and designs demonstrating the methods and techniques proposed and their adequacy. Provide engineered shoring systems as required for the actual conditions.

(4) Building and Structure Protection

Provide shoring of excavations less than one horizontal to one vertical from existing structures and buildings, on or off the right of way, to prevent foundation damage. Provide plans and designs demonstrating the methods and techniques proposed and their adequacy. Provide engineered shoring systems as required for the actual conditions.

(B) Foundation Conditioning

Undercut and replace weak or saturated soils below the pipe trench with select material to provide a firm foundation.

(C) Bedding

Provide excavations with sufficient width for placing and compacting bedding around the utility. Bed utilities in select material. Place bedding material to stable ground on both sides and to at least 2 inches below and above the pipe bells. Provide at least 6 inches of bedding material between rock and piping. Shape the bottom of trenches to fit the pipe. Compact bedding material completely in the pipe haunches. Provide recesses in the bedding to accommodate pipe joints.

(D) Pipe Laying

Lay pipe in accordance with the specifications and the manufacturer's recommendations. Except where necessary in making connections with other lines or as authorized by the Engineer, lay pressurized pipe with the bells facing in the direction of laying.

Where possible, keep joints exposed for visual inspection during testing.

During the progress of the work and until the completion and final acceptance, keep the pipelines and their appurtenances clean throughout and remove any obstructions or deposits. Provide secure watertight seals on pipe when work is not in progress.

Lay gravity sewer pipe upgrade with the spigot ends pointing in the direction of flow. Lay each pipe to form a close concentric joint with the adjoining pipe and to prevent sudden offsets of the flow line.

(E) Thrust Restraint

Provide thrust restraint for pressurized pipelines and appurtenances. When shown in the plans, construct as specified with modifications to match the actual field conditions. When not shown, engineer the thrust restraint system with a factor of safety of 1.25 for the test pressure specified and for the actual field conditions.

Provide thrust restraint on the existing piping system as necessary.

Use joint restraint methods, such as integral restraining bells and spigots, restraining retainer glands, restraining gaskets or restraining clamps and lugs with tie rods. Use concrete reaction backing and thrust collars where joint restraint is impractical.

Where any section of a main is provided with concrete thrust restraint for fittings, controls or hydrants, perform the hydrostatic pressure test after the concrete reaches appropriate strength.

(F) Backfilling

Backfill in accordance with Article 300-7 and compact to the density required by Subarticle 235-3(C).

1505-4 REPAIR OF PAVEMENTS, SIDEWALKS AND DRIVEWAYS

Repair sidewalks and driveways that are disturbed by excavation and trenching to an original or better condition in accordance with Section 848.

Use asphalt plant mix to repair or replace pavement damaged by utility work. Perform all work in accordance with Section 654. Immediately upon completion of the utility removal or installation, make repairs to the pavement.

1505-5 CONCRETE ENCASEMENT OF UTILITY LINES

Encase existing or proposed utility lines in concrete for protection in areas as shown on the utility plans or as directed. Place the concrete completely around the line with a minimum thickness of 6 inches.

1505-6 MEASUREMENT AND PAYMENT

Foundation Conditioning material will be measured and paid as provided in Article 300-9.

Asphalt Plant Mix for pavement repair will be measured and paid as provided in Article 654-4.

Class B Concrete for Encasing Utility Lines will be measured and paid in cubic yards of concrete, measured in place.

__" *Concrete Sidewalk* and __" *Concrete Driveways* will be measured and paid in accordance with Article 848-4.

Trenching, excavation, pipe laying, bedding, backfilling and disposal of unsuitable materials for utility construction are included in the contract price for the applicable utility item and no separate measurement or payment will be made.

The following work and items are included in the contract price for the applicable utility item and no separate measurement or payment will be made for items (A) through (F) below:

(A) Undercut or Wet Excavation,

(B) Dewatering of Excavation,

(C) Shoring and Sheeting (except temporary shoring for maintenance of traffic covered elsewhere in the contract and protection of structures and buildings),

(D) Thrust Restraint,

(E) Bedding Material, or

(F) Select Material for Backfill.

Payment will be made under:

Pay Item	Pay Unit
Class B Concrete for Encasing Utility Lines	Cubic Yard

SECTION 1510
WATER LINES

1510-1 DESCRIPTION

Provide water lines suitable for use in transporting potable water.

1510-2 MATERIALS

Refer to Division 10.

Item	Section
Water Pipe and Fittings	1036

The Contractor may use any of the water pipe specified under Section 1036 except where a particular type pipe is specified in the plans or required by environmental regulations or Departmental policy. The Contractor shall verify that the pipe is appropriate for the test pressure of the system and the external loading.

Use ductile iron fittings on water lines 4 inches or larger.

Use #12 AWG solid-copper wire with blue insulation for the utility locator wires.

Use 2 inch plastic marking tape colored blue with "Caution Water Line" or similar wording, permanently printed at 36 inch centers.

Protect steel rods and other metal clamps and lugs by galvanizing or painting with approved bituminous paint.

1510-3 CONSTRUCTION METHODS

(A) General

Meet the installation standards of AWWA or ASTM for water line construction.

Apply Section 1505 for excavation, trenching, pipe laying and backfill to water line installation.

Install small diameter pipe (4 inches or less) under existing pavement by a trenchless method at no additional cost to the Department.

Connect the ends of the water service piping using AWWA C800 type couplings or fittings. Make NPT screw joints with a double wrap of a polytetrafluoroethylene (PTFE) tape and torque as required by the manufacturer.

Store plastic pipe out of direct sunlight until burying. All plastic pipe showing discoloration or deterioration will be rejected for use and replaced with suitable pipe as specified under Article 106-9.

Install water lines with 36 inches to 42 inches of cover to finished grade unless otherwise directed or approved. Install water lines with greater cover for short distances to accommodate utility controls, to make tie-ins to existing facilities, to eliminate high points in the pipeline or to provide clearance between existing and proposed utilities, drainage, other obstacles or actual field conditions.

(B) Testing and Sterilization

Perform pressure and leakage tests and sterilization on newly installed water mains and altered water mains prior to placing such pipelines into service. Provide all equipment, piping, controls, pumps, water and safety devices necessary for performing the tests and sterilization.

Obtain clean water for cleaning, testing and sterilization from approved sources. Provide connections to potable water sources with approved backflow preventors until acceptance of all test results.

Perform tests using clean water and provide certified results demonstrating leakage less than the following amount when pressurized at 200 ± 5 psi for 2 hours.

$$\mathbf{W} = LD\sqrt{P} \div 148{,}000$$

Where:

W = allowable leakage in gallons per hour
L = length of pipeline tested, in feet
D = nominal diameter of the pipe, in inches
P = average test pressure during the leakage test, in lb/sq.in.

Repair using approved methods or replace pipe, controls or appurtenances as necessary to reduce leakage below acceptable levels. Additionally, repair any leaks that are visible after 2 hours duration.

Clean water lines by flushing with water at least 2.5 feet per second velocity. Remove all debris and dirt from water mains larger than 4 inches by passing a medium density foam pig with abrasive strips through the lines.

Sterilize water lines in accordance with Section 1003 of the Rules Governing Public Water supply and AWWA C651 Section 4.4.3, the Continuous Feed Method. Provide a

chlorine solution with between 50 parts per million and 100 parts per million in the initial feed. If the chlorine level drops below 10 parts per million during a 24 hour period, then flush, refill with fresh chlorine solution, and repeat for 24 hours. Provide certified bacteriological and contaminant test results from a state-approved or state-certified laboratory. Operate all valves and controls to assure thorough sterilization. Testing, cleaning and sterilization shall be performed consecutively.

Dispose of waste water in accordance with all environmental regulations.

For short sections (less than 100 feet) and tie-in sections of water lines perform visual tests for leakage after installation instead of separate pressure and leakage tests. Sterilize according to AWWA C651 Sections 4.6 and 4.7.

Provide copies of the test results to the Engineer and to the water line owner.

Flush with clean water until the residual chlorine is reduced to the same level as in the existing water mains.

Place new water lines into service after approval of all testing and flushing and authorization by the Engineer.

1510-4 MEASUREMENT AND PAYMENT

Water lines of the various sizes will be measured from end to end in place with no deduction for length through valves or other fixtures and paid by the horizontal linear foot.

The quantity of *Ductile Iron Water Pipe Fittings* will be measured and paid per pound based on the published weights for ductile iron fittings, exclusive of the weights of any accessories, as listed in the "DI Fittings Weight Chart" located on the Utilities Unit web site. If the Contractor elects to use compact ductile iron water pipe fittings, measurement will be based on the weight of standard size ductile iron water pipe fittings. Any fitting not listed will be measured based on the published weights for ductile iron fittings listed in ANSI/AWWA C-110/A21.10. This is limited to pressure pipe 4 inches or larger.

If the contract does not include such pay items, measurement will not be made and the work will be incidental to other contract pay items.

Payment will be made under:

Pay Item	**Pay Unit**
__" Water Line	Linear Foot
Ductile Iron Water Pipe Fittings	Pound

SECTION 1515
UTILITY CONTROLS

1515-1 DESCRIPTION

Provide appropriate control devices, valves, meters, backflow prevention assembly and hydrants on water lines and force main sewers.

1515-2 MATERIALS

Refer to Division 10.

Item	**Section**
Sanitary Sewer	1034
Water	1036

Deliver only approved materials to the project.

Air release valves shall meet AWWA C512. In addition, air release valves for sanitary sewer force mains shall have long bodies, shall be equipped with back flushing connections and shall have a hood over the outlet.

Double check valves (DCV) and Reduced Pressure Zone principal (RPZ) backflow prevention assemblies shall be listed on the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research list of approved backflow devices. Line stops consist of a sleeve, temporary valve and closure cap. The sleeve and cap shall meet applicable AWWA standards, shall be made of cast iron or stainless steel, shall be pressure rated at 200 psi and shall be sized for the type pipe to be tapped. The temporary valve shall be suitable for contact with potable water with NSF certification and designed to match the actual field conditions.

Line stop bypass pipe shall be pressure rated at 200 psi, shall be NSF certified and shall be adequately restrained.

Use screw or slip type valve boxes with a base to fit the valve yoke and a removable plug cap with the word “Water” or “Sewer” cast therein.

Precast manholes in accordance with Section 1525.

1515-3 CONSTRUCTION METHODS

Apply Section 1505 for excavation, trenching, pipe laying and backfill.

Place two 4 inch x 8 inch x 16 inch concrete blocks beneath valves and fire hydrants for support.

When necessary, due to project staging, install valves, meters and fire hydrants as appropriate for the current grade and make adjustments to finished grade as work progresses.

Provide enclosures with positive drainage for utility controls.

(A) Valves

Install all valves with an approved valve box set flush with the ground or pavement. Place a 24 inch diameter precast concrete ring flush with the ground around all valve boxes not in pavement.

Test and sterilize tapping valves before making the tap. Do not allow cuttings to enter the tapped main.

(B) Meters

Install water meters adjacent to the right of way or as shown in the plans.

Place meter boxes with the top of the meter box flush with finished grade of the project.

(C) Backflow Prevention Assembly

Install backflow prevention assembly off the highway right of way or as shown in the plans.

Licensed installers shall test and certify RPZ backflow preventer installations. Enclose RPZ backflow prevention assembly above grade in a hot box.

Enclose DCV backflow prevention assembly below grade in a precast concrete vault with positive drainage or above grade in a hot box.

Install the hot box on a 4 inch thick concrete slab that is 6 inches larger than the box and 2 inches to 4 inches above finished grade.

(D) Fire Hydrants

Install fire hydrants outside of the vehicle recovery area of the roadway, adjacent to the right-of-way line or in protected areas.

Connect fire hydrants to the main with a 6 inch valve and branch line having at least as much cover as the distribution main. Set hydrants plumb with the pumper nozzle facing the roadway and with the breakaway safety flange between 1 inch and 4 inches above the

finished surrounding grade. Except where otherwise approved, place hydrants into service as soon as practicable. Place at least 7 cf of clean crushed stone around the base of the hydrant to insure drainage of the hydrant barrel.

Where necessary, remove the hydrant shoe and replace with the appropriate type to connect a relocated hydrant to the new pipe. Furnish and install or remove hydrant extension pieces to provide the proper bury of the pipe and hydrant.

(E) Line Stops

Provide line stop valves to temporarily shut down the flow in pressurized pipes. Provide line stops to temporarily dead end a pipeline when there are no available working valves on the existing piping. Provide line stops with bypass to isolate a section of the existing pipeline while maintaining the flow.

After line stop valves are removed, permanently cap the tapping sleeve and backfill the entire excavation with compacted select material.

(F) Air Release Valves

Install air release valves at the high point of pressurized pipelines. Place a precast manhole around air release valves.

(G) Miscellaneous Controls

Install corporation stops with tapping saddles for connecting 2 inches or smaller water lines to larger water lines. Install corporation stops at 45 ± 10 degrees from vertical on the larger line.

To aid in testing and flushing, install corporation stops at all elevated points along the pipeline to bleed off all entrapped air.

1515-4 MEASUREMENT AND PAYMENT

Valves, Water Meters, Fire Hydrants, Line Stops and other items listed in the pay items will be measured and paid per each for the appropriate size and type. *Fire Hydrant Leg* will be paid per linear foot.

The term *Relocate* in a pay item means to physically move the existing item, either vertically or horizontally, using the appropriate materials to place the item into working order. Measurement and payment will be made per each for the appropriate size and type. When relocating a fire hydrant, valves will only be paid for if there is no properly functioning existing valve.

No additional compensation will be made for adjustments due to project staging on new or relocated items.

Reconnect Water Meter means to transfer or replace the piping from a new water line to an existing water meter that is not relocated. Measurement and payment for meters will be made per each.

__*"Water Service Line* will be paid per linear foot for pipes 2 inches or greater.

Water Service Line will be paid per linear foot for pipes less than 2 inches

Valve boxes, meter boxes, hot boxes, vaults and manholes for protecting and servicing utility controls are incidental to the appropriate pay item.

A line stop with bypass consists of installing line stops on opposite ends of the piping to be isolated, tapping the piping beyond the line stops and providing temporary bypass piping between the taps. The entire assembly of valves and piping will be measured as one unit and paid per each.

Corporation stops or other items to aid in testing and flushing of the piping are incidental items.

If the contract does not include such pay items, measurement will not be done and the items will be incidental to other contract pay items. All piping, controls, certifications, appurtenances and other miscellaneous items necessary to place the new or relocated item in proper working condition are incidental.

Payment will be made under:

Pay Item	Pay Unit
__" Valve	Each
__" Tapping Sleeve and Valve	Each
__" Air release Valve	Each
__" Blow Off	Each
__" Water Meter	Each
Relocate Water Meter	Each
Reconnect Water Meter	Each
__" DCV Backflow Prevention Assembly	Each
Relocate __" DCV Backflow Prevention Assembly	Each
__" RPZ Backflow Prevention Assembly	Each
Relocate __" RPZ Backflow Prevention Assembly	Each
Fire Hydrant	Each
Relocate Fire Hydrant	Each
__" Line Stop	Each
__" Line Stop with Bypass	Each
Fire Hydrant Leg	Linear Foot
__" Water Service Line	Linear Foot
Water Service Line	Linear Foot

SECTION 1520
SANITARY SEWER

1520-1 DESCRIPTION

Provide sanitary sewers suitable for transporting sewage.

1520-2 MATERIALS

Refer to Division 10.

Item	Section
Sanitary Sewer Pipe and Fittings	1034

Use any pipe specified under Section 1034 except where a particular type pipe is specified in the plans or required by environmental regulations or Departmental policy. Verify the pipe is appropriate for the test pressure of the system and the external loading.

Use ductile iron fittings on pressurized (force main) pipelines 4 inches or larger.

Use screw type plastic or brass clean-out covers.

Use #12 AWG solid-copper wire with green insulation for the utility locator wires.

Use 2 inch plastic marking tape colored green with “Caution Sewer Line,” or similar wording, permanently printed at 36 inch centers.

1520-3 CONSTRUCTION METHODS

Apply Section 1505 for excavation, trenching, pipe laying and backfill to sanitary sewer installation.

Assemble pipe in accordance with the recommendations of the manufacturer.

Install PVC pipe in accordance with approved bedding methods.

Install vitrified clay sewer pipe in accordance with ASTM C12.

Install 4 inch minimum diameter sanitary sewer clean-outs flush with finished grade on 4 inch and 6 inch service lines. Provide clean-outs at the right-of-way line and at changes in direction. Do not locate clean-outs within the roadway pavement or shoulders. Provide clean-outs no more than 50 feet apart when beyond the roadway shoulders.

Use ductile iron pipe for sewers with 10% or greater slope.

Install sewer lines entering manholes with the crown at or higher than the sewer line leaving the manhole.

Install small diameter pipe (4 inches or less) under existing pavement by a trenchless method at no additional compensation.

(A) Gravity Sanitary Sewer

Construct gravity sanitary sewers in conformance with *NCDEQ Gravity Sewer Minimum Design Criteria*.

(1) Pipe Installation

Use fittings or saddles to connect service lines to the sewer main.

Maintain sewer flow at all times. Use temporary diversions or pumping to maintain flow when connecting proposed sewers to existing sewers. Use engineered temporary pumping systems capable of handling full pipe flow. Use pumping systems with automatic reliable operation or constantly tended manual operation.

(2) Testing

Perform tests on newly installed sewers and altered sewers before placing into service. Provide all equipment, piping, controls, pumps, water and safety devices necessary for performing the tests.

Test all 24 inches and smaller gravity sewer lines for leakage using infiltration, exfiltration, or air test. Perform visual inspection on gravity sewer lines larger than 24 inches. Perform line and grade testing and deflection testing on all gravity sewer lines.

(a) Infiltration

For sewer lines greater than 3 feet below groundwater, measure the amount of water infiltrating into the pipeline between manholes in at least 24 hours. Repair leaks or replace piping when the rate of infiltration exceeds the following equation:

$$\mathbf{W} = 0.000789LD$$

Where:

W = maximum allowable leakage in gallons per hour
L = length of pipeline tested, in feet
D = nominal diameter of the pipe, in inches

(b) Exfiltration

For sewer lines above groundwater, perform an exfiltration test on the pipeline between manholes. Repair leaks or replace piping when the rate of exfiltration exceeds maximum allowable leakage calculated in Subarticle 1520-3(A)(2)(a).

The exfiltration test shall consist of securely plugging the pipe at the lower manhole and filling the pipeline with water. Allow the water to sit for 24 hours in clay or concrete pipes. Raise the water level in the upstream manhole

to 3 feet above the top of pipe. After 4 hours, measure the amount of water required to bring the water level back to the level at the start of the test and record the time.

Perform exfiltration tests through a series of manhole to manhole segments to limit the length of pipe tested to between 300 feet and 1,500 feet. Shorter sections may be tested with longer test times. No additional leakage allowance for manholes permitted.

(c) Air Test

Instead of hydrostatic testing, sewer lines 24 inches in diameter or smaller may be air tested in accordance with ASTM C828, ASTM C924 and the following. Securely plug the sewer pipe at the manholes. Fill the pipe with air to 4.0 psi and hold this pressure for 5 minutes. Reduce the pressure to 3.5 psi. Measure the time for the pressure to drop 1.0 psi to the new pressure of 2.5 psi. Exceed the minimum test time in Table 1520-1 for the appropriate nominal pipe diameter.

TABLE 1520-1
AIR TEST TIME

Pipe Size (Inches)	Test Time (Minutes/100 ft)	Pipe Size (Inches)	Test Time (Minutes/100 ft)
8	1.2	18	2.4
10	1.5	21	3.0
12	1.8	24	3.6

(d) Visual Inspection

Visually inspect sewer lines larger than 24 inches from the inside using approved cameras. Correct any leakage, rolled gaskets or defects.

(e) Line and Grade

Test all sewers for straight alignment by lamping or using a laser.

(f) Deflection Testing

Perform deflection tests on all flexible pipes. Conduct the test after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system. As an alternative to waiting 30 days to permit stabilization of the soil-pipe system, provide certified soil testing verifying the backfill of the trench has been compacted to at least 95% maximum density.

No pipe shall exceed a deflection of 5%. If deflection exceeds 5%, relay the pipe.

The rigid ball or nine-point mandrel used for the deflection test shall have a diameter not less than 95% of the base inside diameter or average inside diameter of the pipe depending on which is specified in the ASTM, to which the pipe is manufactured. The pipe shall be measured in compliance with ASTM D2122. The test shall be performed without mechanical pulling devices.

(B) Force Main Sanitary Sewer

Construct force main sewers in conformance with *NCDEQ Minimum Design Criteria for the Fast-Track Permitting of Pump Stations and Force Mains*.

(1) Installation

Install lines with 36 inches to 42 inches of cover to finished grade unless otherwise directed or approved. Install lines with greater cover for short distances to accommodate utility controls, to make tie-ins to existing facilities, to eliminate high

points in the pipeline or to provide clearance from existing or proposed utilities, drainage, other obstacles or actual field conditions.

Provide automatic air release valves at all high points.

(2) Testing

Perform pressure and leakage tests on newly installed force mains and altered sewers before placing such pipelines into service. Provide all equipment, piping, controls, pumps, water and safety devices necessary for performing the tests and sterilization.

Test all new sewer force mains with clean water at 200 ± 5 psi for a 2 hour duration. Vent all high points and expel all air. Provide certified results demonstrating leakage less than:

$$\mathbf{W} = 0.000106LD$$

Where:

W = allowable leakage in gallons per hour
L = length of pipeline tested, in feet
D = nominal diameter of the pipe, in inches

Repair leaks using approved methods or replace pipe, controls or appurtenances as necessary to reduce leakage. Additionally, repair any leaks that are visible after 2 hours duration.

1520-4 MEASUREMENT AND PAYMENT

__" *Sanitary Gravity Sewer* and __" *Force Main Sewer* will be measured from end to end in place with no deduction for length through manholes, valves or fittings and paid per linear foot for the appropriate size. Where two different sizes enter or go from a manhole, each size will be measured to the center of the manhole. Unless otherwise shown in the plans, branch connections, ells or other fixtures will be included in the length measurement. All fittings will be incidental on *Sanitary Gravity Sewer*.

Sanitary Sewer Clean-Out will be measured and paid per each.

Sewer Service Line will be paid per linear foot.

The quantity of *Ductile Iron Sewer Pipe Fittings* will be measured and paid per pound based on the published weights for ductile iron fittings, exclusive of the weights of any accessories, as listed in the "DI Fittings Weight Chart" located on the Utilities Unit web site. If the Contractor elects to use compact ductile iron sewer pipe fittings, measurement will be based on the weight of standard size ductile iron sewer pipe fittings. Any fitting not listed will be measured based on the published weights for ductile iron fittings listed in ANSI/AWWA C-110/A21.10. This is limited to pressure pipe 4 inches or larger.

Payment will be made under:

Pay Item	**Pay Unit**
__" Sanitary Gravity Sewer	Linear Foot
__" Force Main Sewer	Linear Foot
Sanitary Sewer Clean-Out	Each
Sewer Service Line	Linear Foot
Ductile Iron Sewer Pipe Fittings	Pound

SECTION 1525
UTILITY MANHOLES

1525-1 DESCRIPTION

Provide utility manholes on water and sanitary sewer lines.

1525-2 MATERIALS.

Refer to Division 10.

Item	Section
Brick	1040-1
Concrete Block	1040-2
Curing Agents	1026
Gray Iron Castings	1074-7(B)
Grout, Type 2	1003
Mortar	1040-9
Portland Cement Concrete	1000
Precast Concrete Units	1077
Reinforcing Steel	1070
Select Materials	1016
Steps	1074-8
Structural Steel	1072

Use precast concrete manholes with monolithic bottoms which conform to ASTM C478, AASHTO M 199 and are as shown in the plans or in *Roadway Standard Drawings*. Use ASTM C443 gaskets or AASHTO M 198 flexible sealants for joints between precast manhole sections. Use resilient connectors for piping conforming to ASTM C923. Use ASTM A48, Class 35 cast iron or Grade 60 steel reinforcement steps with polypropylene plastic coating.

Use manhole frames and covers made of cast iron conforming to ASTM A48 Class 35, which are traffic bearing, have machined contact surfaces and are sized as shown. Use covers with two 1 inch diameter air vents for vented manholes and use solid, non-vented covers with gaskets for watertight installation. Use covers with “Sanitary Sewer” or “Water” cast in large letters as appropriate for the type of utility.

Use Type 2 grout with properties that meet Table 1003-2 in the *Grout Production and Delivery* provision except provide grout with a plastic consistency in accordance with ASTM C1107.

1525-3 CONSTRUCTION METHODS

Apply Section 1505 for excavation, trenching, pipe laying and backfill.

Make connections of pipe to manholes in cored or precast holes using a resilient connector. Use horseshoe type holes only when approved. For horseshoe type holes wrap the pipe with a butyl rubber gasket and fill the space between the pipe and manhole with a non-shrinking grout.

Provide an outside drop assembly on manholes for sewer pipes entering with 2.5 feet or more vertical drop. Inside drop assemblies may be used for connections to existing manholes when the drop exceeds 5 feet and the manhole diameter is greater than 4 feet.

In sewer manholes over 3 feet in depth, provide steps spaced 16 inches on center. Install steps in line with the effluent opening unless otherwise specified.

Construct invert channels to confine and direct the flow through sanitary sewer manholes. Use smooth finished invert channels that provide easy transition from inlet to outlet. Finish the benches or shelves to a non-slip texture and slope toward the invert channel. Precast invert channels are recommended but not required.

On deep manholes, a transition type manhole may be used provided there is at least 6 feet from the manhole bench to the transition cone.

Construct manholes with the top of the cover as shown in Table 1525-1.

TABLE 1525-1
MANHOLE CONSTRUCTION

Location	Top height above finished grade
Roadway pavement, Driveways, Sidewalks, Parking lots	Flush ± 1/4"
Vehicle Recovery Area	Flush ± 3"
Manicured Areas, such as lawns	Flush to + 2" with concrete pad
Flood Zones less than 3 ft above finished grade	1 ft above 100 year flood elevation
Flood Zones greater than 3 ft above finished grade	2 ft above finished grade with watertight frame and cover and vent pipe to 1 ft above 100 year flood
Other areas	2 ft above finished grade

For manholes installed before finished grading or paving, construct the top flush with the current grade to provide access during all phases of construction and adjust as grading and paving work progresses in accordance with Section 858.

(A) Cast-In-Place Concrete, Brick and Block Masonry

Construct concrete manholes in accordance with Section 825 with an ordinary surface finish. Construct brick masonry in accordance with Section 830. Furnish and place reinforcing steel in accordance with Section 425. Construct block masonry in accordance with Section 834 except that reinforcing will not be required.

Where necessary to fit field conditions, vary the dimensions of the manhole and footings as directed.

(B) Installation of Precast Units

Assemble precast manhole units in accordance with the manufacturer's instructions and grout together to form a sound structural unit. Fill all lifting holes with grout. Where it is necessary to use cast-in-place, brick masonry or block masonry construction as part of the structure, apply Subarticle 1525-3(A) to such construction.

(C) Fittings and Connections

Where fittings enter the manhole, place them as the work is built up, thoroughly bonded and accurately spaced and aligned.

Make pipe connections so that the pipe does not project beyond the inside wall of the manhole and grout smooth and uniform surfaces on the inside of the manhole.

Set metal frames for covers in full mortar beds and mechanically secure by an approved method.

(D) Testing

Vacuum test all manholes before grouting and backfilling. Test according to ASTM C1244.

1525-4 MEASUREMENT AND PAYMENT

The height of the manhole will be measured and paid to the nearest tenth of a foot from the inside bottom (invert) of the manhole to the final finished top of the manhole ring.

Utility manholes will be measured and paid by appropriate diameter per each for manholes of 0 to 6 feet height and per linear foot of height over 6 feet. Adjustment of existing manholes

will be measured and paid in accordance with Article 858-4. Drop assemblies will be incidental to the work being performed.

Payment will be made under:

Pay Item	Pay Unit
__' Dia Utility Manhole	Each
Utility Manhole Wall __' Dia	Linear Foot

SECTION 1530
ABANDON OR REMOVE UTILITIES

1530-1 DESCRIPTION

Abandon or remove utility facilities.

1530-2 MATERIALS

Refer to Division 10.

Item	Section
Flowable Fill	1000-6
Portland Cement Concrete	1000
Select Materials	1016

1530-3 CONSTRUCTION METHODS

Apply Section 1505 for excavation, trenching, pipe laying and backfill.

(A) Abandoning Pipe

Abandon utility pipes shown in the plans or designated by the Engineer by emptying the pipeline contents and plugging the ends with grout or flowable fill. Prepare grout to a consistency that will flow and be vibrated in order for the mix to flow uniformly into the pipe to be filled. Use the construction methods in Article 340-3.

Fill or remove the following abandoned utility pipes:

(1) Pipe larger than 24 inches.

(2) Pipe located within the roadway typical section or the project slope stake line and one of the following:

(a) Pipe 12 inches to 24 inches diameter located less than 20 feet below finished grade.

(b) Pipe 6 inches to 12 inches diameter located less than 12 feet below finished grade and not made of cast iron, ductile iron, HDPE or PVC.

(c) Located below groundwater table that could become a conduit for water movement.

Excavate, remove and dispose of properly any abandoned pipe to be removed. Backfill the resulting trench and properly compact using local excavated material or select backfill as required.

Fill abandoned pipe with grout or flowable fill to at least 90% full or completely when on railroad right of way.

Remove any abandoned utility pipe exposed by grading operations to a minimum depth of 12 inches below subgrade elevation of the proposed roadbed or completed grading template.

Plug all abandoned utility pipes. Use grout to plug all abandoned utility pipes at the entrance to all manholes whether the manhole is to be abandoned or not. Use grout to

plug all abandoned water mains after new mains are placed in service. Abandon valves by removing valve box and backfilling with approved material.

(B) Abandoning Manholes

Abandon utility manholes in the construction limits by removing the top of the manhole to the manhole spring line or to an elevation of 2 feet below the roadway subgrade, whichever is greater and filling the manhole barrel with approved material.

Plug connecting utility pipes before filling or removing the manhole.

Remove the manhole taper, wall and base on all manholes to be removed.

Removed frames and covers become the property of the Contractor for proper disposal.

(C) Remove Water Meter

Remove water meters by disconnecting and plugging the water service piping at the source main and plugging the piping at the right-of-way line. Return the meter to the utility owner. Dispose of all other parts, piping and boxes.

(D) Remove Fire Hydrant

Remove fire hydrants by disconnecting and plugging the hydrant leg piping as close to the water main as possible. If the hydrant valve is within 4 feet of the main, close the valve, plug the outlet side of the valve and remove the valve box.

Removed hydrants become the property of the Contractor for proper disposal.

1530-4 MEASUREMENT AND PAYMENT

Utility pipe that is abandoned by filling or removal will be measured and paid by the linear foot for the size of pipe. Utility pipe that is abandoned by plugging the ends only and leaving in place will not be measured or paid. Abandoned valves will not be measured and paid. Grout used for plugging of abandoned utility pipe is incidental to the work being performed. Utility pipe that is removed by other work of the contract will be incidental to the other work.

Abandon Utility Manhole will be measured and paid per each.

Remove Utility Manhole will be measured and paid per each.

Remove Water Meter and *Remove Fire Hydrant* will be measured and paid per each.

Payment will be made under:

Pay Item	**Pay Unit**
Abandon __" Utility Pipe	Linear Foot
Abandon Utility Manhole	Each
Remove Utility Manhole	Each
Remove Water Meter	Each
Remove Fire Hydrant	Each

SECTION 1540
ENCASEMENT

1540-1 DESCRIPTION

Furnish and install encasement or casing pipes. For the purposes of this specification the words encasement, casing, encasement pipe and casing pipe are interchangeable.

1540-2 MATERIAL

Refer to Division 10.

Item	Section
Concrete Pipe	1034-3
Flowable Fill	1000-6
Grout	1003
PVC Pipe	1034-2
Select Materials	1016
Steel Encasement Pipe	1036-4(B)
Treated Timber	1082-3
Clay Pipe	1034-1

Other pipe as designed by an engineer licensed by the State of North Carolina.

Submit material certifications and obtain approval from the Engineer before installation.

1540-3 CONSTRUCTION METHODS

(A) Open Cut

Apply Section 1505 for excavation, trenching, pipe laying and backfill.

(B) Welding

Weld in accordance with Article 1032-5.

(C) Encasements for Future Use

Mark encasements for future use with a treated wooden marker post. Place wooden marker post at the right of way or at the ends of encasements if encasements extend beyond the right of way. Encasements 24 inches and larger require certification of durability and a design life of 100 years.

(D) Carrier Pipe Installation

Install carrier pipe through casing using spacers or insulators to support the carrier pipe. Place spacers at intervals sufficient to support the carrier pipe without sagging. Install spacers sized to raise the carrier pipe bells above the encasement pipe invert.

Seal ends of casing with concrete, brick or other approved materials. Ensure drainage of encasement by leaving a 1 inch diameter weep hole in the seal of the lower end of the encasement.

(E) Casing Pipe Fill

Pump or place flowable fill; grout; or Class III, Class IV or Class V select materials into the annular void between the carrier pipe and casing pipes 24 inches or larger. Otherwise, certification of durability and a design life of 100 years is required.

1540-4 MEASUREMENT AND PAYMENT

__" *Encasement Pipe* will be measured from end to end and paid at the contract unit price per linear foot for each size.

Payment will be made under:

Pay Item	Pay Unit
__" Encasement Pipe	Linear Foot

SECTION 1550
TRENCHLESS INSTALLATION OF UTILITIES

1550-1 DESCRIPTION

Install pipe using a trenchless method. Pipe refers to the specified pipe, which may be the primary carrier pipe or an encasement pipe. Shoring means the earth support system used for installing the pipe. The terms for encasement, casing, encasement pipe and casing pipe are interchangeable.

An engineer licensed by the State of North Carolina shall design the method and certify the work will not damage the roadway above or endanger the roadway user.

1550-2 MATERIAL

Refer to Division 10.

Item	Section
Concrete	1000
Encasement Pipe	1540
Flowable Fill	1000-6
Structural Timber	1082
Structural Steel	1072
Treated Timber	1082-3

Use pipe joints that are modified to suit the installation method. Provide engineering calculations for piping and shoring. Submit material certifications and obtain approval from the Department's Engineer before installation.

Use steel or concrete liner plates. Steel tunnel liner plates shall meet Sections 16 and 25 in *AASHTO LRFD Bridge Design Specifications*. Concrete liner plates shall meet AASHTO specifications.

Drilling fluids consist of water, bentonite and polymer additives.

Other materials will be considered with adequate design and quality control.

1550-3 CONSTRUCTION METHODS

(A) General

Apply Section 1505 for excavation, trenching, pipe laying and backfill.

Install the pipe to the lines and grades shown in the plans. Use workers that are skilled in the method of construction. Construct with good workmanship by skilled workers along with proper safety precautions.

Locate ends of trenchless construction and pits beyond the vehicle recovery area of the roadway. The vehicle recovery area may be reduced using acceptable traffic control methods.

(B) Design

Contract plans will show a trenchless method including but not limited to length, profile and bore pit locations based on available information. The Contractor's design shall confirm this method is appropriate for the field conditions and for the specified pipe. Subsurface information in the vicinity of the trenchless installation may be available in accordance with Section 102-7.

Assess soil conditions expected during trenchless operations.

Design the method to minimize the vertical movement of the pipe or the completed roadway section. Use methods of construction and installation that will not disturb the soils outside of the immediate vicinity of the pipeline or pits.

Before construction, provide detailed plans for the method of installation certified by an engineer licensed by the State of North Carolina. Provide certified calculations demonstrating the method of installation as safe and of minimal risk. Provide certified calculations of the structural adequacy of all materials. The design shall meet *AASHTO LRFD Bridge Design Specifications*. An engineer licensed by the State of North Carolina shall certify changes or modifications to the designed method as needed for actual field conditions.

(C) Water Control

Provide groundwater control and removal as appropriate for the method of excavation and installation. Remove the groundwater using an engineered dewatering system provided in the design submittal. Keep surface waters out of the excavation and pits.

(D) Shoring

Provide temporary or permanent shoring, as needed. Provide temporary shoring to maintain the hole or pit excavation for the duration of the work. Casing pipe 24 inches and larger, tunnel liner, and shoring that is not certified for permanent use is considered temporary. Fill the annular space between the specified pipe and temporary shoring. Provide permanent shoring when desired or specified to maintain the open hole for an indefinite time. Permanent shoring requires certification of durability and a design life of 100+ years.

Fill all voids around the excavation and shoring with structural fill material as work progresses.

Either work continuously (24 hours/day and 7 days/week) on the operations from the time the excavation begins through the filling of voids or use an engineered system for shoring the excavation during work stoppage.

(E) Pre-Construction Meeting

The Contractor shall conduct a pre-construction meeting with the Department's Engineer to review the proposed method for installation of the pipe. Conduct the meeting at least 48 hours before beginning installation. The meeting shall consist of, but is not limited to:

(1) Presentation of the construction methods for understanding by all involved,

(2) Presentation of methods for filling any potential voids around the pipe,

(3) Demonstrating that appropriate equipment and materials are on site,

(4) Providing a progress schedule, and

(5) Demonstrating ability to react to failures or roadway settlement or heave.

1550-4 TRENCHLESS METHODS

(A) Bore and Jack

For bore holes up to 6 inches in diameter in stable ground, the hole may be augured and the pipe pushed or jacked through the cleaned out hole. For bore holes greater than 6 inches, provide continuous support of the hole by simultaneously jacking the pipe or casing into the hole.

Use equipment suitably sized and designed to simultaneously bore or drill the soil or rock while pushing or jacking pipe on a controlled grade. Position the cutter head within one diameter of the leading edge of the pipe. In cohesive, dense and dry soils and rock, position the cutter head in front of the leading edge. In non-cohesive or loose soils, position the cutter head inside the pipe.

Dry bore only, do not use jetting or wet boring methods. Use drilling fluids only on the outside of pipe for lubrication or hole stabilization.

Minimize over bore, match cutter diameter to the outside diameter of the encasement pipe. Limit overbore to the O.D. + 2 inches.

Provide steering controls as necessary to maintain line and grade.

If conditions allow and with the approval of the Engineer, the Contractor may elect to use the pipe ramming method in lieu of bore and jack. Payment for the pipe ramming method will be paid as bore and jack.

(B) Directional Drilling

For drilled holes up to 6 inches in diameter in stable ground, the hole may be drilled and reamed followed by pulling the pipe into the hole within 8 hours. For drilled holes greater than 6 inches, simultaneously pull the pipe or casing into the hole as reaming occurs

When under pavement or within a one horizontal to one vertical distance from pavement, maintain the depth of cover in Table 1550-1.

TABLE 1550-1
DEPTH OF COVER FOR DIRECTIONAL DRILLING

Drilled Hole Diameter	Minimum Depth of Cover
2" to 6"	6 ft
> 6" to 15"	12 times the hole diameter
> 15" to 36"	15 ft

Begin bores at locations that allow transitioning the bore to meet the above depths.

Use drilling fluids as appropriate for the type soils. Pump drilling fluids only while drilling or reaming. Monitor flow rates to match the amount leaving the bore hole. Do not increase pressure or flow to free stuck drillheads, reamers or piping.

Limit drilled or reamed holes to 1.5 x O.D. for pipe 12 inches or less and O.D. + 6 inches for pipes larger than 12 inches.

(C) Tunneling

Tunnel using hand mining, mechanical excavation, tunnel boring machine (TBM), microtunneling, or other accepted tunneling method. Use tunnel shields or fore poling along with benched excavation and breast boarding as appropriate for the field conditions. Alternatively, the Contractor's engineer may certify that the soils are self-supporting of the dead and live loads and design tunneling methods as appropriate.

Provide active support to the tunnel walls. Shore tunnel walls using liner plates, steel ribs with lagging or other engineered method or by jacking piping into place.

Limit over excavation to 2 inches larger than the liner or shield. Grout the external voids as work progresses and as specified by the Contractor's engineer.

(D) Pipe Ramming

Use pipe ramming only where soils are homogeneous and free of rock, boulders, stumps and debris. Do not use in the vicinity of quick or liquefiable soils.

Steel bands 1/2 inch thick are allowed on the outside of the leading edge of the pipe or casing to oversize the hole to reduce friction. Steel bands 1/2 inch thick may be used on the inside to compact the spoil and to prevent plugging.

Install at the following minimum depth of cover.

TABLE 1550-2 DEPTH OF COVER FOR PIPE RAMMING	
Pipe or Casing Diameter	**Minimum Depth of Cover**
2" to 6"	4 ft
> 6" to 14"	6 pipe diameters
>14" to 72"	8 ft

Contain spoil within the casing during ramming. After completion, use compressed air or augers to remove the spoil. Clean the interior using a pig. Provide appropriate safety devises. Limit air pressure to less than the rating of the pipe or casing.

Use lubricants and surfactants as needed and ensure vibration induced consolidation of soils does not result in settlement greater than 0.02 feet.

(E) Other Methods

Other methods will be considered on a case by case basis when thoroughly engineered.

(F) Lubrication and Drilling Fluids

Use drilling fluids for lubrication. Do not use water alone.

1550-5 QUALITY CONTROL

The Contractor, at no cost to the Department, shall replace or repair damaged or defective installations. The method to be used shall be designed by the Contractor's engineer and approved by the Engineer.

(A) Ground Movement

Before excavation, establish control points for measuring vertical movement of the road at 10 feet intervals along the centerline and 10 feet each side of the pipeline. A land surveyor licensed in the State of North Carolina shall monitor these points daily until construction is complete.

Cease trenchless operations when measured movement exceeds 0.02 feet. Determine cause of settlement and repair as necessary. Modify trenchless methods as needed.

(B) Leakage

Limit leakage through tunnel walls to minor seepage. All leaks in pipes, casing or other permanent shoring shall be sealed.

(C) Roundness

Provide permanent shoring maintaining at least 95% of nominal diameter in all directions.

(D) External Voids

Fill all external voids greater than 2 inches high or 2 feet wide. Fill with flowable fill, grout or Class II or III select material.

1550-6 MEASUREMENT AND PAYMENT

Bore and Jack of ___" will be measured and paid in linear feet. Measurement will be made horizontally to the nearest tenth of a linear foot.

Directional Drilling of ___" will be measured and paid in linear feet. Measurement will be made horizontally to the nearest tenth of a linear foot.

Tunneling of ___" will be measured and paid in linear feet. Measurement will be made horizontally to the nearest tenth of a linear foot.

Measurement will be made along utility pipes with required trenchless installation. Payment for trenchless installation will be made as additional compensation for utility piping with

contract pay items of the various sizes. No additional payment will be made for access pits or shoring required for the installation. Shoring required for the maintenance of traffic or the protection of building or other structures, on or off the right of way, shall be paid under *Temporary Shoring*. No payment will be made for abandoning defective installations.

Payment will be made under:

Pay Item	**Pay Unit**
Bore and Jack of ___"	Linear Foot
Directional Drilling of ___"	Linear Foot
Tunneling of ___"	Linear Foot

Appendices

Appendix A
Geotechnical Report

Geotechnical Exploration Report

CFPUA Kings Bluff Parallel Raw Water Main
Bladen, Columbus, & Brunswick Co., NC
S&ME Project No. 1306-17-013

PREPARED FOR:
McKim & Creed
243 N. Front Street
Wilmington, North Carolina 28401

PREPARED BY:
S&ME, Inc.
3006 Hall Waters Drive, Suite 100
Wilmington, NC 28405

June 6, 2018

June 6, 2018

McKim & Creed
243 N. Front Street
Wilmington, North Carolina 28401

Attention: Mr. Tony Boahn, P.E.

Reference: **Geotechnical Exploration Report**
CFPUA Kings Bluff Parallel Raw Water Main
Bladen, Columbus, and Brunswick Counties, North Carolina
S&ME Project No. 1306-17-013
NC PE Firm License No. F-0179

Dear Mr. Boahn:

S&ME, Inc. (S&ME) is pleased to submit this geotechnical exploration report for the referenced project. Work was conducted in accordance with our proposal number 13-1700223 dated July 11, 2017, along with the McKim & Creed Subcontract Services Work Order signed July 12, 2017. The purpose of the exploration was to evaluate subsurface conditions as they relate to water main installation. This report presents a summary of pertinent project information, exploration sampling methods, description of subsurface conditions encountered, and geotechnical conclusions and recommendations.

S&ME appreciates the opportunity to provide geotechnical engineering services for this project. If you have any questions or need additional information concerning this report, please contact us.

Sincerely,

S&ME, Inc.

J. Adam Browning, P.E.
Senior Engineer

Keith C. Brown, P.E.
Senior Project Manager
Registration No. 022540

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Appendices

1.0 Project Information

Project information is based on the following sources of information:

- Emails between Mr. Tony Boahn of McKim & Creed and Mr. Keith Brown of S&ME between May 4 and July 7, 2017.
- Site plan showing water main alignment along with creek and wetlands crossings.

We understand that the Cape Fear Public Utility Authority (CFPUA) plans to install a 60-inch diameter raw water main. The raw water main will be installed along a 14-mile existing pipeline easement. Along the alignment are the following:

- 12 NCDOT Road Crossings
- 23 Wetlands/Creek Crossings
- Aerial Crossing of Livingston Creek – Approximately 120 feet with 4 bent locations
- 1 Crossing at the International Paper Rail Yard – Approximately 800 feet

We anticipate that water main installation methods will include cut and cover, bore and jack and a portion along Livingston Creek will be areial. Invert elevations for the water main are anticipated to be approximately 10 feet below the existing ground surface where cut and cover is planned. Along NCDOT road cuts, a similar invert is anticipated except when conflicted by other utilities and a greater depth would then be required. At bore and jack locations construction will included installation of an 84 to 90 inch encasement pipe. Inverts are unknown at the writing of this report. Where bore and jack techniques are performed at road crossings, launching and receiving pits are constructed on either side of the run and could extend to depths of 20 feet below the existing ground surface. At the International Paper Rail Yard, starting and receiving pits could extend to depths of 30 feet below the existing ground surface. The aerial crossing of Livingston Creek will consist of 4 four pile bents. The piles will be either HP 10x57 or 12x53 steel H-Piles. The piles will be concrete encased above the mudline.

S&ME performed the majority of our exploration at either road crossings, wetland areas, creek crossings, the International Rail Yard and Livingston Creek. A portion of the borings were spaced sporadically across anticipated cut and cover alignment areas. The entire alignment is within an existing utility right of way. The actual alignment has not been determined. We anticipate the alignment will consist of open grassed lawn, farm fields, wooded areas, wetland areas and creeks.

2.0 Area Geology

The site is located within the Coastal Plain Physiographic Province of North Carolina. The Coastal Plain Province is typically characterized by marine, alluvial, and eolian sediments that were deposited during periods of fluctuating sea levels and moving shorelines. The soils in this province are typical of those laid down in a shallow sloping near-shore marine environment. Alluvial sands, silts, and clays are typically present near rivers and creeks.

The alignment has varying thicknesses of undifferentiated Quarternary Deposits with possible Tertiary Deposits underlain by the Peedee Formation of the Cretaceous Period. The Peedee Formation is described as sand, clayey sand, and clay, greenish gray to olive black, massive, glauconitic, locally fossiliferous and calcareous. Patches of sandy molluscan-mold limestone are present in the upper part of the formation. The Peedee formation would be expected to trend down from west to east. The top of the Peedee is expected to range from 15 to 0 feet MSL.

3.0 Exploration Program

Field exploration services for this project included a visual site reconnaissance by representatives of S&ME and performance of 91 test borings, including the following:

- 20 Road Crossing Borings (labeled as R-#A, B, or C) to depths of 25 to 30 feet
- 2 Railroad Crossing Borings (labeled as RT-07A and RT-07B) to depths of 50 feet
- 4 Creek Crossing Borings (labeled as C-#A) to depths of 20 to 30 feet
- 47 Wetland Crossing Borings (labeled as W-#A, B, C, D, E, F, G, or H) to depths of 20 to 45 feet
- 18 General Alignment Borings (labeled as A-1 through A-18) to depths of 20 feet

The borings were marked with flags using GPS equipment. Approximate boring locations are shown on the Boring Location Plans in Appendix I.

Borings were performed using a CME 45 and Diedrich D-25 drill rigs and wash bore drilling methods. Split-spoon samples of subsurface soils were taken at approximate 2.5-foot intervals above a depth of 10 feet and 5-foot intervals thereafter. Standard penetration tests were conducted in conjunction with split-spoon sampling in general accordance with ASTM D 1586-11. Boreholes were observed for groundwater at termination of boring and after 24 hours in selected borings. At the completion of drilling operations, the boreholes were backfilled up to the original ground surface with auger cuttings.

Representative split-spoon soil samples were returned to our laboratory for visual classification in accordance with Unified Soil Classification System (USCS) guidelines. Laboratory testing was performed on selected split-spoon samples and included natural moisture content, grain size analyses, and Atterberg limits testing.

Generalized subsurface conditions profiles are included in Appendix I. Boring logs are included in Appendix II. Stratification lines shown on boring logs and the profiles are intended to represent approximate depths of changes in soil types. Naturally, transitional changes in soil types are often gradual and cannot be defined at particular depths. Ground surface elevations shown on the boring logs and profiles were obtained from Google Earth and should be considered approximate.

4.0 Subsurface Conditions

The following is a brief summary of subsurface conditions encountered in the borings. For more detailed information please reference the generalized subsurface conditions profiles in Appendix I and the boring logs in Appendix 2.

Surficial materials encountered in the borings typically consisted of a thin layer of topsoil or soils containing organic material. A wood layer, which extended to an approximate depth of 11.5 feet, was encountered at the ground surface of W-17D. Boring R-12 in a pavement area and encountered 4 inches of asphalt over 5.5 feet of structural fill consisting of medium dense sand (USCS classification SP).

Coastal Plain and Pee Dee formation soils were typically encountered below the surficial materials. These soils consisted of sands (SP, SP-SM, SP-SC, SM, SC), silts (ML, MH), and clays (CL, CH). Standard penetration test (SPT) N-values in these soils ranged from weight-of-rod (W.O.R.) and weight-of-hammer (W.O.H.) to 50 blows with 5 inches of penetration. Typical SPT N-values encountered ranged from about 5 to 20 blows per foot. The soils were visually observed as moist to wet.

In addition to the wood layer encountered in W-17D mentioned above, layers sampled as mostly wood were also encountered in W-09B (8 to 12 feet) and W-23A (8 to 12 feet).

Water level measurements were taken termination of drilling in most borings and after 24 hours in selected borings. Water was observed at approximate depths ranging from the ground surface to 15 feet below the existing ground surface. Water was measured at about 2 to 7.5 feet above the mudline in borings W-17C, W-17D, and W-17F. Water levels at termination of boring in borings drilled using the wash bore method should be considered approximate, due to the use of water during drilling operations. Water elevations can be expected to fluctuate due to seasonal variations in rainfall, evaporation, and other factors. Additionally, perched water may exist during wet periods of the year above less permeable fine-grained materials, such as silts, clays, or rock materials.

5.0 Laboratory Test Results

The following is a brief summary of the laboratory test results. A summary of the laboratory test results along with individual laboratory test records is included in Appendix III.

Natural moisture contents on selected split-spoon samples tested ranged from 13.6 to 56.8 percent.

Grain size analysis testing indicated gravel size particle contents of 0 to 23.2 percent, sand size particle contents of 2.2 to 98.4 percent, and silt/clay size particle contents of 1.6 to 97.8 percent.

Several of the split-spoon samples selected for Atterberg limits testing were determined to be non-plastic. The remaining samples tested indicated liquid limits ranging from 25 to 76 percent, plastic limits ranging from 12 to 28 percent, and plasticity indices ranging from 10 to 52 percent.

6.0 Conclusions and Recommendations

6.1 Excavations

Based on the test borings and anticipated water main installation depths, we expect that the excavations will typically extend through low to moderate consistency soils that can be excavated by conventional excavation equipment. Layers sampled as mostly wood were encountered in W-09B (8 to 12 feet), W-17D (0 to 11.5 feet), and W-23A (8 to 12 feet). Very soft silts and clays and very loose to loose sands, below the groundwater, with caving potential, were encountered within anticipated excavation depths in a significant number borings.

All excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is solely responsible for site safety. This information is provided only as a service, and under no circumstance should S&ME be assumed to be responsible for construction site safety. Excavation shoring and sloping for excavations deeper than 20 feet must be designed by a licensed Professional Engineer employed by the Contractor.

6.1.1 Construction Groundwater Control

Groundwater was encountered in the borings at depths ranging from the ground surface to about 15 feet below the ground surface. Localized zones of perched water may also be present above the excavation depths. Groundwater control will be required for the proposed construction. The means and methods of groundwater control are typically left to the discretion of the Contractor. Excavations should be kept free of surface water and/or groundwater.

Potential groundwater control methods for the temporary construction excavations include open pumping, predrainage dewatering, and cutoff/exclusion. Open pumping utilizes submersible sump pumps in pits or trenches dug below the bottom of the excavation and backfilled with No. 57 stone. Submersible sump pumps placed in perforated or slotted plastic pipe installed in angled pits backfilled with No. 57 stone below the bottom of the excavation, called "stingers", are another type of open pumping. Pumping can be performed on an intermittent basis to remove water from the construction excavation, but should be continuous (24 hours a day) to maintain excavation bottom stability. Predrainage dewatering requires the installation of temporary wells and/or wellpoints within or around the excavations, with continuous (24 hours a day) pumping both before excavation and while the excavations are in use to lower the groundwater adequately beneath the entire excavation areas. Cutoff or exclusion involves the installation of sheetpiling completely around the excavations and open pumping from inside the sheeting during excavation. Predrainage dewatering outside the sheeting can be implemented to reduce groundwater pressure on the sheetpiling and potential leakage of the sheeting at joints.

We anticipate preferential horizontal permeability at the contact between clayey soil layers and overlying sandy soils. This may result in seeps in construction excavation grade. If significant seepage occurs at these contacts that potentially destabilizes the construction excavation slope, it may be necessary to intercept and control the seepage with slope drains.

The responsibility for dewatering of construction excavations and preventing excessive settlement of other site features(adjacent utilities or structures) due to dewatering should lie solely with the contractor. This information is

provided only as a service and under no circumstance should S&ME be assumed to be responsible for the effectiveness of the construction dewatering method(s) selected by the contractor.

6.2 Pipe Bedding and Initial Trench Backfill

We understand that a 60-inch diameter steel pipe will be used. Where open-cut is required, we recommend a minimum of 12 inches of washed stone (NCDOT select material class VI – No. 57 or 67) bedding be used to provide a level bottom for bearing of the pipe. The intent of these bedding procedures is to provide firm uniform bearing conditions for the water main. Soft clays and silts were encountered at the assumed invert elevation of 10 feet below the existing ground surface in the following borings: R-2, W-3A/B, W-5A, W-9A/B, C-3, A-4, W-15A, W-17D/H, R-9A/B, R-10B, A-7A/B, W-23A, W-24A and W-25A/B. Additional undercut and replacement with washed No. 57 stone may be required to achieve stable subgrade upon which to install the pipe. The depth of additional undercut should be determined in the field at the time of construction.

The initial trench backfill above the bedding should consist of CFPUA Class II or III soils defined as GW, GP, SW, SP, GM, GC, SM or SC. The initial trench backfill will include the distance from 1 foot above the pipe down to the pipe bedding. The final backfill, extending from 1 foot above the pipe to ground surface should consist of, CFPUA Class II, III or IV soils defined as GW, GP, SW, SP, GM, GC, SM, SC, ML, MH, CH or CL.

Class V soils are excluded from use as trench backfill and are defined as OL and OH materials. The only exception to this is within wetland areas where these materials may be replaced in the order they were removed from within the final backfill zone.

At NCDOT road crossings, the washed stone used for the bedding should be wrapped in a non-woven filter fabric (Mirafi 140N) to prevent the infiltration of soil fines into the granular material which could otherwise result in the creation of voids and corresponding subsidence of these soils.

6.3 Trench Backfill

After proper bedding, and installation of the water main excavated areas may be backfilled to their design subgrade elevations using suitable soils placed and compacted in accordance with the existing project specifications. The contractor is responsible for any subgrade subsidence.

Initial trench backfill should be placed in 6 to 8 inch loose lifts and compacted to at least 95 percent of the soil's standard Proctor maximum dry density (ASTM D 698) within 3 percent of optimum moisture content. In pavement areas, the backfill should be compacted to at least 95 percent of the soil's standard Proctor maximum dry density (ASTM D 698). This requirement should be increased to 98 percent in the top 12 inches. In non-structural areas, the final backfill zone should be compacted to at least 90 percent of the soil's maximum dry density as determined by ASTM D698. Compactive effort and structural fill must extend the entire width of the trench, contacting the trench sidewalls.

The NCDOT may have specific requirements for compaction levels on their right of way. We suggest that they be contacted regarding any special compaction measures that they may require. We understand that a screenings backfill material is planned to be used where open cuts are performed within NCDOT right-of-ways.

6.3.1 Reuse of On-site Soils

The excavated soils at this site have Unified Soil Classification (USCS) designations of SP, SM, SC, CL, ML and some OL. The onsite soils are significantly wet of optimum moisture content and will require significant drying prior to reuse as compacted structural fill. If drying of the soils is impractical, off site borrow will be required. The contractor should consider stockpiling suitable cut soils for use in the Initial Backfill zone. Along portions of the alignment, no Class II or III soils are present. No Class II or III soils were encountered in the vicinity of borings R-1A, W-1B, W-2A, W-2B. W-3A. W-6A, W-6B, W-7A through A-6, W-17C, W-17D, W-17G, R-8A through W-18A, R-9A through A-11, W-22B through A-14, A-15, W-24A, W-25A through W-26B, A-17 and A-18. Approximately half of a proposed 10 foot excavation did not encounter class II or III soils in the vicinity of borings W-6A, A-10 through W-9A, W-10A through R-6A, A-6, W-17C, W-17D, W-17G, R-8A through W-18A, R-9A through A-11, R-10A through R-11B and A-17. Excluding near surface topsoil materials, Class V soils were encountered in borings W-9B, W-17B and W-23A.

Within wetland areas, it has been S&ME's experience that as a condition of most Army Corps permits, the final backfill zone should be replaced with materials from the excavation. More specifically, it is often asked that material be replaced in the order it was removed.

Off-site borrow should consist of soils having USCS classifications of SM, SC, SP, SW. The borrow should also have a standard Proctor maximum dry density of at least 110 pounds per cubic foot, a maximum plasticity index of 15, and maximum particle size of 2 inches.

6.4 Jack and Bore Considerations

We understand that three crossings will require jack and bore installation methods. Appendix IV of this report includes Jack and Bore Difficulty Comments for crossings at North Carolina Highway 11 South, John Riegel Road, and International Paper's railyard. We have also included Jack and Bore Difficulty Comments for the other NCDOT road crossings in case bore and jack is performed inlieu of cut and cover. S&ME recommends that the contractor submit a ground surface settlement monitoring plan for the International Paper railyard. The plan should identify the locations of settlement monitoring points, reference benchmarks, survey frequency and procedures.

6.5 Foundation Recommendations for Pipe Supports

We understand that an aerial crossing will be required at Livingstone Creek (boring locations W-17A through W-17H). The proposed foundation types are to consist of 12x53 steel H-piles encased in concrete above the mudline. We understand the loads at each support location will consist of 80 kips of vertical loading and 7 kips of horizontal loading.

Based on the subsurface conditions encountered, we recommend the foundations be installed to a minimum depth of 35 feet below the existing ground surface.

6.5.1 Axial Pile Resistance

A steel H-Pile 12x53 was analyzed at a length of 35 feet. At this length, we estimate the pile will support a maximum of 25 kips of design axial load with an adequate safety factor under static loading conditions.

An efficiency factor accounting for capacity reductions caused by group effects of 1.0 should be used for center-to-center pile spacing of three pile diameters or more. Three pile diameters is the minimum recommended spacing. The structural capacity of the piles has not been considered in our analysis and is the responsibility of the structural engineer.

6.5.2 Lateral Pile Resistance

The geotechnical response of a laterally loaded 12x53 H-pile was analyzed using LPILE 9.0. An axial load of approximately 25 kips was applied to the 12x53 H-pile.

A summary of maximum shear and moments at 1-inch of deflection for fixed-head and free-head pile conditions are presented in the following table. The values are based on the 12x53 H-pile oriented along its strong axis. Plots of deflection, shear, and moment versus depth at 1-inch allowable deflections are included in the appendix.

Pile Type	Head Condition	Deflection (in.)	Maximum Shear (kips)	Maximum Moment (in.-kips)
12x53 H-Pile	Fixed	1	5	440
	Free	1	1.6	300

6.5.3 Deep Foundation Construction Considerations

The installation of the piles should be in accordance with the local and state building code requirements. In addition, the installation of all piles should be monitored by the geotechnical engineer. The geotechnical engineer's representative should verify and record the aspects of the installation for general conformance with the project drawings and specifications, including any design information and installation procedures submitted by the foundation subcontractor.

Prior to the start of construction, a wave equation analysis should be performed to verify that the proposed driving system (i.e., hammer type and size) is capable of driving the piles to the desired depth and to establish the driving criteria. It is important for the pile hammer to have enough energy to move the pile at least 30 to 50 blows per foot at the design pile capacity. An impact hammer (air, hydraulic, or diesel) should be used to install the piles and verify that the design compression resistance is achieved. Compression resistance cannot be verified if a vibratory hammer is used. All equipment should be subject to the review of the geotechnical engineer.

Please note that a layer of mostly wood was encountered in W-17D from the ground surface to an approximate depth of 12 feet. Pre-augering may be required in this area in order to install the 12x53 H-pile.

6.6 Pavement Thickness Design for NCDOT Roads

We understand that replacement pavement sections will likely be required for NCDOT roadway crossings. The design replacement section will be based on the traffic loading anticipated for that roadway. NCDOT Roadway Standard Drawing 654.01 indicates a typical replacement section consisting of 2 to 3 inches of S-9.5B or S-9.5C asphalt over 11 inches of B-25.0B or B25.0C asphalt. The actual design replacement section will need to be coordinated with the NCDOT District Engineer in Columbus County.

All pavement materials and construction methods should conform to the 2012 edition of the NCDOT "Standard Specifications for Roads and Structures." Aggregate base course (ABC) stone, if required, should consist of stone meeting the requirements under Section 520 and Section 1010. ABC should be compacted to at least 100 percent of the maximum dry density as determined by the modified Proctor compaction test, AASHTO T-180 as modified by NCDOT. To confirm that the base course stone has been uniformly compacted, in-place density tests should be performed by a qualified soils technician and the area should be thoroughly proofrolled under his observation.

Asphaltic concrete should conform to Section 610 in the 2012 edition of the NCDOT "Standard Specifications for Roads and Structures." Sufficient testing and observation should be performed during pavement construction to confirm that the required thickness, density, and quality requirements of the specifications are followed.

6.7 Temporary Access Roads

We anticipate that the contractor will be responsible for constructing and maintaining temporary access roads during construction. Subgrade repair will likely be required in order to construct temporary access road due to the soft/loose near-surface soils encountered in a significant number of the borings. Subgrade repair measures may include undercut and replacement, raising site grades using compacted structural fill, ABC stone, or ballast, and/or use of a geosynthetic (i.e. geogrid or geotextile). Actual subgrade repair measures required will be dependent on conditions encountered at time of construction. Even with subgrade repair measures, maintenance of the temporary access roads will be required.

7.0 Qualifications of Report

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other representation or warranty either express or implied, is made.

We relied on project information given to us to develop our conclusions and recommendations. If project information described in this report is not accurate, or if it changes during project development, we should be notified of the changes so that we can modify our recommendations based on this additional information if necessary.

Our conclusions and recommendations are based on limited data from a field exploration program. Subsurface conditions can vary widely between explored areas. Some variations may not become evident until

construction. If conditions are encountered which appear different than those described in our report, we should be notified. This report should not be construed to represent subsurface conditions for the entire site.

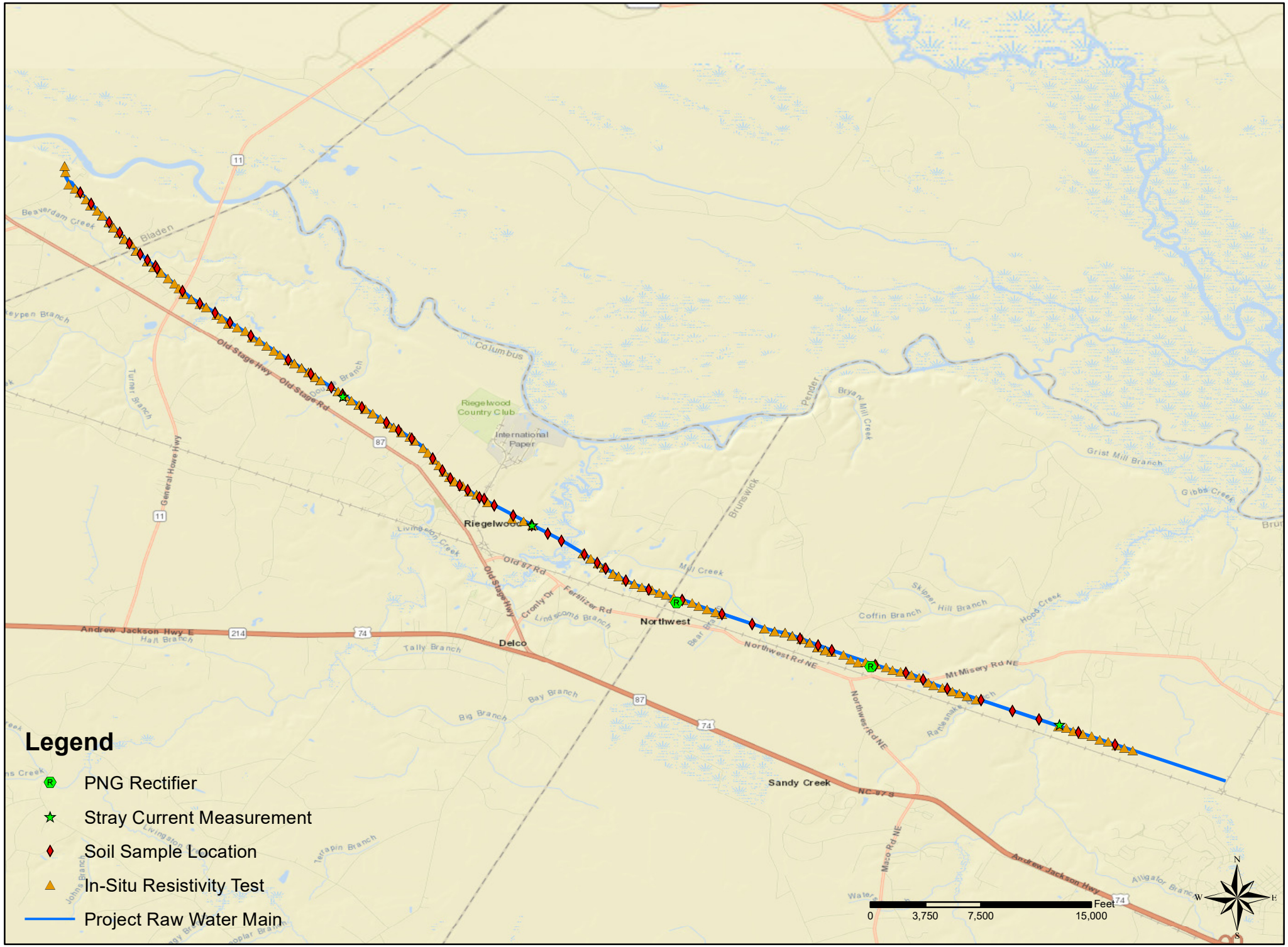
Unless specifically noted otherwise, our field exploration program did not include an assessment of regulatory compliance, environmental conditions or pollutants or presence of any biological materials (mold, fungi, bacteria). If there is a concern about these items, other studies should be performed. S&ME can provide a proposal and perform these services if requested.

S&ME should be retained to review the final plans and specifications to confirm that earthwork, foundation, and other recommendations are properly interpreted and implemented. The recommendations in this report are contingent on S&ME's review of final plans and specifications followed by our observation and monitoring of earthwork and foundation construction activities.

Appendix A

Locations of Field Evaluation

Appendix A - Locations of Field Evaluation



Appendix B
EN Specialty Services Corrosion Control Engineering Study

Preliminary Report

Corrosion Control Engineering Study

Kings Bluff Raw Water Transmission Main

Bladen County, Columbus County, and Brunswick County, North Carolina

Prepared for:

McKim & Creed, Inc.
Cape Fear Public Utility Authority

Reference:

EN Specialty Services Project Number: 1898021.01

August, 2018

Wenxuan Dong
Project Engineer

Yaofu Zhang, P.E.
Sr. Project Manager

SIGNATURE PAGE

Project Name: Kings Bluff Raw Water Transmission Main
Report Title: Corrosion Control Engineering Study Report

Project # 1898021.01
Version 1

Author:

Wenxuan Dong

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Project Engineer

Approved by:

Yaofu Zhang, P.E.
Sr. Project Manager

1 Executive Summary

1.1 Background

EN Specialty Services, LLC. (ENSS) was requested to provide corrosion engineering services for approximately 14 miles of 54-inch Kings Bluff raw water transmission main in North Carolina. This report summarizes the results of the field evaluation.

Based on the design drawings, the new water mains are located in Bladen County, Columbus County, and Brunswick County, North Carolina. The new water mains will be constructed of either welded steel pipe or ductile iron pipe, and the corrosion evaluation and corrosion protection requirements in this report will be based on the two material selections.

Included is an evaluation of the site conditions along the water main alignment and discussions of appropriate corrosion control measures. The evaluations, conclusions, and recommendations in this report are valid only for the sections of alignment evaluated and may not be applied to any other pipelines or right-of-way. The results and recommendations are based on in-situ soil resistivity and stray current data as well as laboratory data from soil samples collected in the field.

The scope of services discussed in this report include:

- Evaluation of in-situ soil resistivity measurements and in-situ pH readings along the alignments of the proposed right-of-way.
- Evaluation of stray current interference.
- Evaluation of soil samples.
- Preparation of a technical report including the test data, data analysis, conclusions, engineering recommendations.

1.2 Summary of Evaluations

This corrosion investigation included an evaluation of potential stray current interference and analysis of soil corrosivity.

Stray current levels were investigated by locating possible stray current sources, contacting owners of oil and gas underground pipelines, and taking measurements directly. Stray current measurements indicated that there are very low levels of interference along the alignment of the water mains, despite the fact that Piedmont Natural Gas (PNG) runs natural gas transmission lines in the vicinity of the water mains. The PNG natural gas transmission lines are protected with impressed current cathodic protection systems, and they are located near (how far??) the project pipe alignment.

Soil corrosivity was evaluated by measuring in-situ soil resistivity, in-situ soil pH, and analyzing soil samples. Laboratory soil corrosivity test results show that the soil resistivity levels ranged from 1,100 to 1,100,000 Ω-cm with pH values ranged from 3.8 to 9.2. The concentration of chlorides ranged from 45 ppm to 160 ppm and the concentration of sulfates ranged from less than 10 ppm to 180 ppm. In-situ soil corrosivity tests show that the soil resistivity ranged from 1,000 to 831,525 Ω-cm in 5 to 10 ft layer with a median of 57,450 Ω -cm. Overall, the soil environment of the proposed water main is considered as "Moderately Corrosive".

To further extend pipe service life and to provide more flexibility for the future, a combination of bonded coating and galvanic cathodic protection are recommended for both the steel and ductile iron pipe options.

2 Methodology

Soil corrosivity is a complex function of oxygen supply, moisture, soluble salts, pH and other factors. For simplicity, soil corrosivity is commonly determined by measuring surrogate parameters including soil resistivity, pH, oxygen reduction (redox) potential and chloride/ sulfate content. Generally, the lower the soil resistivity, the lower the pH environment, the lower the Redox potential, and higher the chloride/sulfate levels, the more corrosive the soil is. In this investigation, soil samples were collected at a depth of 5 to 10 feet. Soil samples were then analyzed in the lab for soil resistivity, pH, Redox potential and chloride/ sulfate content. In-situ resistivity and in-situ pH were measured in the field.

2.1 In-Situ Soil Resistivity Test

The ability of an electrolyte to conduct current is primarily governed by resistivity, which is expressed in Ω-cm. Generally, the lower the resistivity, the more corrosive the environment is. Soil resistivity is directly related to pipe corrosion rate. Changes in soil corrosivity can be well correlated with changes of pipe failure frequencies. More specifically, resistivities below 5,000 Ω-cm are considered to be very corrosive to ductile iron, whereas values above 25,000 Ω-cm are considered mildly corrosive. Common soil resistivity classifications are shown in Table 1, below. Soil resistivity classifications are generally consistent for all ferrous pipe materials.

Table 1 – Soil Corrosivity/Soil Resistivity

Soil Corrosivity	Soil Resistivity (Ω-Cm)	Failures Occurred in DI/STL Pipe
Extremely Corrosive	Less than 1,000	5 Years or Less
Very Corrosive	1,000 to 5,000	15 Years or Less
Corrosive	5,001 to 10,000	20 Years or Less
Moderately Corrosive	10,001 to 25,000	25 Years or Less
Mildly Corrosive	Over 25,000	Over 25 Years

Furthermore, corrosion can be accelerated in areas where resistivity (regarding soils) varies considerably. Variations in soil resistivity create galvanic potential differentials along the structure,

which promote corrosion in areas of lower resistivity. Soil resistivity was measured at the site using the Wenner Four-Pin Method in accordance with ASTM G-57.

The Wenner Four-Pin method utilizes four probes, inserted in the soil at equal spacing. The measured soil resistivity represents an average value to the depth of the pin spacing. The Wenner Four-Pin Method is useful in determining variations in resistivity with depth, often indicating ground water levels or rock layers.

In-situ resistivity measurements were obtained at an approximate 1,000 feet intervals along the alignment of the water main at depths of 5, 10, 15 and 20 feet in order to capture readings at proposed pipe depth. In total, In-situ resistivity measurements were taken at 123 locations along the project water main alignment. The data was analyzed using the Barnes Layer Analysis Equations to determine the resistivity of the soil layers from 0-5 ft, 5-10 ft, 10- 15 ft, and 15-20 ft.

2.2 Laboratory Analysis of Soil Samples

ENSS was provided 55 soil samples at an approximate 1,000 feet interval along the water main alignment. A total of 53 samples were analyzed in the lab (2 of the 55 samples did not have enough soil amount for the analysis).

Resistivity Test

Soil “as-is” resistivity was measured on each soil sample in the lab per standard ASTM G-57. For comparison, the same test was then repeated after the soil was wetted with distilled water to obtain the “wetted” resistivity.

Chloride Concentration Test

Soil chloride concentration was measured on each soil sample in the lab per standard ASTM D-512. Generally, as the chloride concentration increases, the resistivity tends to decrease and the corrosivity increases. Generally, chloride concentrations over 150 ppm indicate heavily contaminated areas that will promote aggressive corrosion. Chloride ions are naturally present in the soil, but high levels are typically due to proximity to tidal salt water areas or to the application of deicing salts on the road during the winter months.

Sulfate Concentration Test

Soil sulfate concentration was measured on each soil sample in the lab per standard ASTM D-516. The sulfates of sodium, magnesium, calcium, and potassium are often found in soils or dissolved in groundwater and can result in accelerated corrosion on ductile iron piping. Generally, sulfate concentrations over 150 ppm indicate heavily contaminated areas that will promote aggressive corrosion.

Sulfide Presence Test

Sulfate reducing bacteria (SRB) are common anaerobic bacteria that corrode ferrous pipes. SRB produce sulfide as their metabolite. Therefore, testing for the presence of sulfide in the soil is a good indicator for identifying microbiologically induced corrosion (MIC).

Laboratory testing was conducted on each soil sample to identify the presence of sulfides. The presence of sulfides was evaluated by applying a 5% HCL solution to the sample. If hydrogen-sulfide is present, the lab technician will note the distinctive rotten egg smell.

pH Level Test

Soil pH levels were measured on each soil sample in the lab per standard ASTM G-51 using a pHTestr® 10 Waterproof pH Tester (Eutech Instruments).

Oxygen Reduction (Redox) Potential Test

The oxygen reduction (redox) potential provides an indication of the potential for anaerobic bacterial corrosion. Laboratory measurements of redox potential were conducted on each soil sample using a ORPTestr 10 Waterproof ORP Tester (Eutech Instruments). Common classifications for redox potentials are shown in Table 2.

Table 2 – Soil Corrosivity/Soil Redox Potential

Soil Corrosivity	Redox Potential (mV)
Very Corrosive	Below 100
Moderately Corrosive	100 to 200
Slightly Corrosive	200 to 400
Non-corrosive	Over 400

2.3 Stray Current Test

Stray DC current interference provides an external driving force for corrosion to proceed further and faster. Common stray DC current sources include impressed current cathodic protection (CP) systems, DC powered trains or street cars, overhead DC transmission systems, and electrical grounding systems. When stray currents present, underground metallic structures, such as water mains, in the area may be detrimentally affected.

In this corrosion investigation, DC potential readings were taken at 3 grounded metallic structures (blow-off valves) along the alignments of the proposed water main with reference to a copper-copper sulfate (CCS) reference electrode, as a qualitative indicator of stray current. Unprotected ferrous structures, typically cast or ductile iron water mains, would be expected to measure structure-to-earth potentials in the range of 0.40 to 0.60 volt with reference to a CCS.

ENSS personnel contacted operators of oil and gas underground pipelines to identify and locate possible impressed current cathodic protection systems in the vicinity of the water mains. Impressed current cathodic protection systems are common sources of stray currents.

3 Evaluation Results

3.1 Soil Corrosivity

Soil corrosivity was evaluated by measuring in-situ soil resistivity and in-situ soil pH, and analyzing soil samples (provided by others). Appendix A indicates the locations of in-situ soil resistivity test, and soil sample collection.

3.1.1 Soil Resistivity

In-situ soil resistivity data is included in Appendix B, and summarized in Table 3 and Table 4.

Table 3 – In-Situ Layer Soil Resistivity Ranges (Ω-cm)

Depth	Low	High	Average	Median
0 to 5 feet	2,675	1,915,000	315,738	85,225
5 to 10 feet	1,000	831,525	129,798	57,450
10 to 15 feet	1,400	952,450	83,712	33,875
15 to 20 feet	1,025	131,800	37,264	23,400

Table 4 – In-Situ Soil Resistivity (5-10 ft depth) Distribution (Ω-cm)

Soil Corrosivity	Soil Resistivity (Ω-cm)	Percentage
Extremely Corrosive	Less than 1,000	1%
Very Corrosive	1,000 to 5,000	3%
Corrosive	5,001 to 10,000	11%
Moderately Corrosive	10,001 to 25,000	37%
Mildly Corrosive	Over 25,000	48%

The laboratory soil resistivity data is summarized in Table 5 and Table 6. Laboratory soil analysis data is included in Appendix C.

Table 5 – Laboratory Soil Resistivity Ranges (Ω-cm)

Sample Condition	Low	High	Average	Median
As-Is	1,100	120,000	28,071	21,000
Wetted	1,100	102,000	22,966	19,000

Table 6 – Laboratory "As-Is" Soil Resistivity Distribution (Ω-cm)

Soil Corrosivity	Soil Resistivity (Ω-cm)	Percentage
Extremely Corrosive	Less than 1,000	2%
Very Corrosive	1,000 to 5,000	13%
Corrosive	5,001 to 10,000	11%
Moderately Corrosive	10,001 to 25,000	32%
Mildly Corrosive	Over 25,000	42%

The laboratory soil analysis data is slightly higher than the values measured in-situ. Overall, the soil environment in which the water mains will be installed is considered to be "Moderately Corrosive".

3.1.2 Moisture Content

The resistivity of "wetted" samples is lower than the resistivity of samples under the "as-is" condition (Table 5), which indicate the moisture content of the soil is high.

3.1.3 Chloride and Sulfate Content

The laboratory chloride and sulfate content in soil boring samples is summarized in Table 7 and Table 8. Chloride and sulfate content data are also included in Appendix C.

Table 7 – Laboratory Chloride and Sulfate Content (ppm)

Sample	Low	High	Average	Median
Chloride	45	160	50	45
Sulfate	< 10	180	24	10

Table 8 – Laboratory Chloride and Sulfate Content Distribution

Soil Corrosivity	Percentage
Chloride > 100 ppm	2%
Sulfate > 100 ppm	4%

3.1.4 pH

Soil pH values were measured both in the laboratory and in the field. The pH values are summarized in Table 9 and also included in Appendix C.

Table 9 – Soil pH Values

Sample	Low	High	Average	Median
Laboratory	3.8	9.2	5.6	4.9

The values of soil pH indicate that the soil environment is corrosive.

3.1.5 Redox Potential

The Redox potential of the soil samples is summarized in Table 10 and Table 11. Soil Redox potential is also available in Appendix C.

Table 10 – Redox Potential of Soil Samples (mV)

Sample	Low	High	Average	Median
Laboratory	79	473	350	366

Table 11 – Soil Redox Potential Distribution

Soil Corrosivity	Redox Potential (mV)	Percentage
Very Corrosive	Below 100	2%
Corrosive	100 to 200	6%
Moderately Corrosive	200 to 400	66%
Mildly Corrosive	Over 400	26%

Laboratory soil Redox potentials indicate that the soil environment is overall “Moderately Corrosive” in terms of anaerobic bacterial corrosion.

3.1.6 Sulfide

No sulfide was found to be present in any of the soil samples. This is consistent with the soil Redox potential measurements. Microbiologically influenced corrosion is not expected to contribute to increased corrosion.

3.2 Stray Current

There are no DC operated transit systems in the immediate vicinity of the water mains. However, it was found that Piedmont Natural Gas runs natural gas transmission lines in the general areas of the water main alignment. Rectifiers of PNG transmission line impressed current systems near the project water main are shown in Appendix A.

The structure-to-earth potentials were obtained on existing utility structures (blow-off valves) near the water main alignments. The DC potentials Delta (the difference between the maximum potential and the minimum potential) range from 1.3 mV to 3.2 mV, which indicate that minimal stray current is impacting the project area. Stray DC current potential data is included in Appendix D, and stray current measurement locations are shown in Appendix A.

4 Discussion and Recommendations

4.1 Overall Discussion

Based on the results of In-Situ soil resistivity and the laboratory soil analysis, the soil environment of the project area is considered overall “Moderately Corrosive” with limited “Extremely Corrosive / Very Corrosive” locations. The findings of stray current investigation indicate that the project water main will not likely be interfered by the nearby Piedmont Natural Gas transmission lines. The new water main however, will require corrosion control to prevent premature failures and to extend overall service life.

Cathodic protection (CP) significantly slows down external corrosion on ferrous pipe and reduces risk of corrosion failures due to corrosive soil and stray current. The cathodic protection design considers the pipe size, soil resistivity, and the pipe's anticipated resistance to earth. The quantity of anodes required is calculated based on those factors. Dielectric, bonded coating systems and electrical isolation elevate the pipe's resistance to earth, and as a result significantly reduce the amount of current necessary to provide fully effective CP in accordance with NACE SP 0169 criteria.

4.2 Recommendations

Electrical bonding and galvanic cathodic protection system are recommended for both steel and ductile iron water mains.

Polyethylene encasement (PE) is not recommended for these water mains. PE would interfere with the operation of the cathodic protection system and will not prevent corrosion from occurring under the loose plastic wrap or at tears in the wrap. In fact, without cathodic protection, corrosion at tears in the wrap could be accelerated. Corrosion due to anaerobic bacteria is likely to develop beneath the PE wrap. Moisture may migrate under the loose polyethylene. In case of a pipe leak, the PE wrap creates a perfect crevice environment for corrosion to proceed. Corrosion under the loose plastic would not be detectable with the corrosion monitoring test facilities nor would it be prevented by any future application of "hot spot" cathodic protection. Corrosion activity under the plastic wrap would not be detected until an actual pipeline failure occurred.

The corrosion protection system for the project water main may include one or more of the following items: electrical bonding of non-welded pipe joints; an external dielectric bonded coating; electrical isolation; anode ground beds; AC mitigation ground mat; permanent reference electrodes; and test facilities.

4.2.1 Pipe Joint Bonding

With the exception of joints where insulating material is specified, all non-welded pipe sections should be electrically bonded with insulated copper cables. The bonding provides electrical continuity between individual pipe sections. Electrical continuity will facilitate surveys to monitor corrosion activity. Pipe

joint bonding is critical to the proper operation of an effective cathodic protection system. Welded joints would not require bonding.

4.2.2 Insulating Joints

Insulating joints are required at all locations where the new pipes are interconnected with existing pipelines. This will eliminate the strong corrosion cell that occurs when new and existing piping or pipes of different metals are electrically connected. Insulating joints should also be provided at all connections to copper air release lines to eliminate accelerated corrosion that will result if ferrous pipes are directly connected to copper.

4.2.3 External Coating

High quality, bonded, dielectric coatings are recommended for steel pipes. The bonded, dielectric coating significantly reduces the surface area of the watermain exposed to the corrosive soil and allows the pipe to be effectively protected by a smaller amount of current.

Polyethylene encasement is not a bonded coating and should not be used because it would interfere with the operation of the cathodic protection system, and it will not prevent corrosion beneath the loose polyethylene encasement.

4.2.4 Electrical Isolation from Concrete Structures

Electrical isolation should be installed at all locations where the new pipe will penetrate new or existing reinforced concrete vaults or other structures. Electrical isolation is critical to providing effective cathodic protection.

4.2.5 Test Stations

Test stations with permanent reference electrodes must be provided to facilitate monitoring of corrosion activity on the watermain and the operating condition of the cathodic protection system. The permanent reference electrodes facilitate the measurement of accurate pipe-to-earth potentials on the pipeline.

4.2.6 Internal Pipe Lining

The new watermain should be provided with a cement mortar lining, or ceramic epoxy for internal corrosion protection.

4.2.7 Trench Backfill

No special backfill material is necessary for corrosion control purposes on this project. The watermain may be backfilled with native soil and/or sand. Stone bedding may also be used, as determined

necessary by the pipeline design engineers. If native soil is used for backfill, it should be clear from deleterious materials such as large, sharp stones, or highly corrosive materials such as fly ash.

4.2.8 Encasement Pipe

Metallic casing should be electrically isolated from the watermain with insulated casing spacers and rubber end seals. The annual space between the tunnel and the watermain should be filled with a high pH (minimum pH of 12) cement grout that does not contain fly ash additives. Corrosion rate probes should also be installed within the casing to monitor the corrosion activity of the watermain inside the grout filled casing.

5 Reference

1. Grigg, N.S. 2007. Main Break Prediction, Prevention and Control. AWWA Research Foundation, Denver, CO.
2. Thomson, J. and et. Al, 2009. Condition Assessment of Ferrous Water Transmission and Distribution Systems State of Technology Review Report. US EPA, Cincinnati, OH.
3. Bardet, J.P. and et. Al, 2010. Expert Review of Water System Pipeline Breaks in the City of Los Angeles during Summer 2009. University of Southern California Center on Megacities, Los Angeles, CA.
4. Ricker, R.E., 2007. Analysis of Pipeline Steel Corrosion Data from NBS (NIST) Studies Conducted Between 1922-1940 and Relevance to Pipeline Management. National Institute of Standards and Technology, Gaithersburg, MD.

Appendix B

In-Situ Soil Resistivity Data

Appendix B - In-Situ Soil Resistivity Data

Test Location/Station Number/Street Location	GPS Coordinates		0 to 5.0 ft. Reading	0 to 5.0 ft. Layer	0 to 10.0 ft. Reading	5.0 to 10.0 ft. Layer	0 to 15.0 ft. Reading	10.0 to 15.0 ft. Layer	0 to 20.0 ft. Reading	15.0 ft. to 20.0 ft. Layer	pH Value
	Latitude	Longitude									
100+00	34.403538	-78.296910	41,175	41,175	44,050	**47,350**	48,825	62,400	49,800	52,900	5.1
104+50	34.402419	78.296770	49,800	49,800	76,600	**165,975**	83,300	100,975	88,100	106,450	5.0
113+00	34.400107	78.296156	526,625	526,625	210,650	**131,650**	132,125	75,700	107,250	68,525	5.3
117+50	34.399367	78.294999	79,475	79,475	72,775	**67,100**	57,450	40,425	49,800	35,575	5.5
121+61	34.398558	78.29405	172,350	172,350	86,175	**57,450**	28,725	12,300	18,000	8,500	5.4
127+22	34.397326	78.292937	39,250	39,250	21,075	**14,400**	22,975	28,075	17,225	9,850	5.0
132+08	34.396185	78.292100	18,200	18,200	17,225	**16,375**	21,550	43,100	19,150	14,375	4.5
137+10	34.395235	78.290894	17,225	17,225	8,225	**5,400**	4,025	2,000	3,825	3,350	4.7
141+60	34.394316	78.289898	86,175	86,175	88,100	**90,100**	57,450	33,875	42,125	23,400	4.8
147+64	34.393045	78.288613	459,600	459,600	344,700	**275,750**	198,200	107,125	80,425	28,900	4.7
151+92	34.392077	78.287813	1,436,250	1,436,250	1,053,250	**831,525**	517,050	256,200	298,750	131,800	5.1
156+73	34.391112	78.286722	35,425	35,425	18,000	**12,075**	11,775	6,975	4,975	1,825	5.2
161+94	34.389913	78.285784	1,340,500	1,340,500	421,300	**249,925**	244,175	132,625	195,325	122,075	5.2
166+86	34.389051	78.284527	37,350	37,350	28,725	**23,350**	14,925	7,625	12,250	7,975	4.5
172+42	34.387732	78.283606	239,375	239,375	72,775	**42,900**	43,100	23,725	49,800	93,350	4.8
181+84	34.385825	78.281493	2,675	2,675	1,450	**1,000**	1,425	1,400	1,300	1,025	5.0
187+22	34.384717	78.280314	1,915,000	1,915,000	1,034,100	**708,300**	1,005,375	952,450	252,775	77,875	4.5
192+83	34.383689	78.278930	74,675	74,675	70,850	**67,400**	54,575	37,400	45,950	31,175	5.0
198+17	34.382638	78.277697	507,475	507,475	191,500	**118,025**	109,150	58,675	53,625	21,225	4.4
203+24	34.381651	78.276511	344,700	344,700	178,100	**120,075**	63,200	27,600	38,300	17,550	4.4
207+37	34.380750	78.275680	54,575	54,575	63,200	**75,050**	60,325	55,300	57,450	50,275	5.2
212+15	34.379698	78.274736	85,225	85,225	63,200	**50,225**	51,700	37,925	42,125	27,075	5.4
217+48	34.378787	78.273352	95,750	95,750	63,200	**47,150**	34,475	18,050	33,325	30,300	4.4
223+23	34.377858	78.271811	50,750	50,750	28,725	**20,025**	8,625	3,600	4,975	2,200	5.3
227+43	34.377270	78.270611	14,375	14,375	10,525	**8,325**	8,625	6,325	4,975	2,200	5.2
235+26	34.375854	78.268658	210,650	210,650	74,675	**45,400**	43,100	23,350	29,100	14,750	4.5
239+17	34.375197	78.267632	17,225	17,225	10,525	**7,575**	8,325	5,875	5,350	2,600	4.6
244+26	34.374194	78.266460	402,150	402,150	287,250	**223,425**	186,725	109,825	95,750	38,900	4.1
249+83	34.373546	78.264784	14,375	14,375	19,150	**28,725**	25,850	86,175	23,375	18,125	4.7
254+92	34.372843	78.263325	172,350	172,350	268,100	**603,225**	261,400	248,950	245,125	206,525	4.1
260+65	34.371688	78.262033	64,150	64,150	51,700	**43,300**	51,700	51,700	42,125	27,075	4.5
265+44	34.370961	78.260711	45,000	45,000	47,875	**51,150**	48,825	50,875	45,950	39,075	4.9
270+65	34.370095	78.259336	90,975	90,975	42,125	**27,425**	43,100	45,150	34,075	20,950	5.1
275+92	34.369171	78.257988	87,125	87,125	63,200	**49,575**	48,825	33,575	36,775	21,125	4.3
280+29	34.368400	78.256880	22,025	22,025	19,150	**16,950**	19,525	20,350	20,675	25,125	4.6
286+34	34.367359	78.255318	17,225	17,225	12,825	**10,225**	9,475	6,225	5,750	2,625	5.0
290+32	34.366753	78.254219	27,775	27,775	34,475	**45,450**	28,725	21,550	21,825	12,700	4.8
295+35	34.365956	78.252856	55,525	55,525	44,050	**36,500**	43,100	41,300	38,300	28,725	5.3
300+36	34.365123	78.251533	75,650	75,650	86,175	**100,125**	68,950	49,250	45,950	22,975	5.4
305+35	34.364222	78.250288	71,825	71,825	55,525	**45,275**	51,700	45,450	45,950	34,475	5.1
309+16	34.363622	78.249253	19,150	19,150	16,075	**13,875**	12,925	9,275	11,875	9,550	5.3
316+40	34.362597	78.247193	85,225	85,225	38,300	**24,700**	23,275	13,025	13,800	6,200	5.0
321+42	34.361621	78.246020	9,575	9,575	8,225	**7,225**	6,025	3,925	6,125	6,425	6.7
326+33	34.360735	78.244793	7,375	7,375	7,850	**8,400**	9,475	16,200	10,350	14,225	6.2
331+09	34.359914	78.243564	6,425	6,425	5,750	**5,200**	4,875	3,750	3,825	2,325	4.8
336+39	34.359065	78.242137	11,500	11,500	13,975	**17,850**	10,925	7,600	8,800	5,575	4.8
340+84	34.358334	78.240954	32,550	32,550	19,150	**13,575**	10,625	5,625	5,350	2,150	5.0
346+01	34.357474	78.239589	38,300	38,300	28,725	**22,975**	18,375	10,700	11,875	5,750	5.2
351+58	34.356510	78.238156	45,000	45,000	34,475	**27,925**	20,400	11,225	12,650	5,900	4.5
356+92	34.355621	78.236748	13,400	13,400	9,000	**6,775**	8,625	7,950	8,425	7,900	4.8
360+96	34.354903	78.235729	22,025	22,025	12,450	**8,675**	12,075	11,375	9,950	6,525	5.3
366+40	34.354027	78.234266	9,575	9,575	8,425	**7,525**	7,175	5,550	4,975	2,600	5.0
372+19	34.353130	78.232682	32,550	32,550	26,800	**22,800**	19,250	12,300	13,800	7,450	5.2
375+85	34.352401	78.231846	14,375	14,375	19,150	**28,725**	19,525	20,350	17,225	12,750	5.1
382+67	34.351103	78.230216	45,950	45,950	34,475	**27,575**	19,825	10,725	9,200	3,525	4.6
386+92	34.350187	78.229347	27,775	27,775	18,200	**13,525**	11,775	6,900	6,125	2,500	5.0
392+66	34.348902	78.228245	3,150	3,150	3,650	**4,300**	4,300	6,825	4,600	5,750	4.3
397+41	34.347829	78.227354	63,200	63,200	53,625	**46,575**	40,225	26,800	38,300	33,525	5.0
402+56	34.346676	78.226367	38,300	38,300	24,900	**18,450**	16,375	9,725	11,500	6,075	5.2
407+17	34.345696	78.225401	30,650	30,650	8,225	**4,750**	2,875	1,250	700	200	4.6
411+54	34.344834	78.224397	12,450	12,450	7,275	**5,150**	1,375	525	1,350	1,225	5.0
416+96	34.344052	78.222867	6,225	6,225	9,775	**22,675**	11,500	17,750	12,250	15,325	4.9
422+31	34.342979	78.221654	12,450	12,450	16,275	**23,500**	13,500	10,075	10,725	6,625	5.0
426+87	34.342385	78.220325	26,800	26,800	19,150	**14,900**	25,000	64,075	20,300	12,975	4.7
434+00	34.340949	78.218267	15,325	15,325	16,650	**18,250**	17,800	20,650	16,475	13,425	6.0
451+63	34.337923	78.213707	10,525	10,525	10,150	**9,800**	8,325	6,125	7,275	5,275	7.0
458+44	34.337467	78.211515	9,100	9,100	11,675	**16,325**	8,625	5,650	6,500	3,750	6.3
464+03	34.336712	78.209899	8,625	8,625	5,350	**3,900**	2,875	1,500	2,300	1,425	5.6
498+39	34.331468	78.200429	17,225	17,225	26,800	**60,325**	25,000	22,000	17,225	8,925	6.1
503+78	34.330526	78.199049	66,075	66,075	30,650	**19,950**	24,125	16,925	8,050	2,675	6.0
509+34	34.329576	78.197606	22,975	22,975	18,950	**16,125**	14,075	9,300	11,875	8,075	5.0
513+54	34.328876	78.196499	22,025	22,025	28,725	**41,300**	37,350	93,350	42,125	68,450	4.5
519+98	34.327678	78.194934	191,500	191,500	118,725	**86,025**	91,925	63,325	84,250	67,400	4.8
523+73	34.327165	78.193852	54,575	54,575	21,075	**13,050**	13,800	8,150	9,575	5,000	4.6
528+43	34.326633	78.192433	14,375	14,375	13,800	**13,250**	16,375	26,200	14,175	10,100	4.8
533+92	34.325753	78.190957	19,150	19,150	16,275	**14,150**	15,500	14,175	16,075	18,100	5.0
538+61	34.325170	78.189567	7,000	7,000	6,700	**6,450**	7,475	9,675	8,050	10,450	5.2
544+79	34.324618	78.187631	27,775	27,775	38,300	**61,700**	51,700	172,350	57,450	86,175	4.5
549+12	34.324127	78.186322	33,525	33,525	24,900	**19,800**	20,675	15,450	15,700	9,125	5.2
553+34	34.323727	78.185008	38,300	38,300	22,975	**16,425**	15,800	9,725	10,350	5,075	4.3
557+83	34.323235	78.183643	44,050	44,050	38,300	**33,875**	27,300	17,325	17,225	8,175	4.5
563+60	34.322749	78.181821	14,375	14,375	19,150	**28,725**	18,675	17,775	18,375	17,575	4.8
568+85	34.322287	78.180169	19,150	19,150	24,900	**35,575**	28,725	41,500	27,575	24,625	5.1
573+06	34.321687	78.178976	39,250	39,250	34,475	**30,725**	34,475	34,475	36,375	43,650	5.2

Test Location/Station Number/Street Location	GPS Coordinates		0 to 5.0 ft. Reading	0 to 5.0 ft. Layer	0 to 10.0 ft. Reading	5.0 to 10.0 ft. Layer	0 to 15.0 ft. Reading	10.0 to 15.0 ft. Layer	0 to 20.0 ft. Reading	15.0 ft. to 20.0 ft. Layer	pH Value
	Latitude	Longitude									
578+21	34.321078	78.177437	22,975	22,975	19,150	**16,425**	24,125	50,275	25,650	31,700	4.8
583+31	34.320554	78.175865	335,125	335,125	306,400	**282,200**	258,525	196,975	191,500	107,725	4.7
587+25	34.320156	78.174652	62,250	62,250	72,775	**87,600**	63,200	50,025	53,625	36,875	4.9
613+18	34.317477	78.166682	9,575	9,575	14,550	**30,325**	16,375	21,825	15,700	13,975	5.2
619+13	34.316934	78.164821	9,575	9,575	12,825	**19,450**	14,925	22,250	13,400	10,250	5.1
625+08	34.316746	78.162859	17,225	17,225	14,175	**12,025**	17,525	33,250	19,525	29,800	4.7
629+64	34.316131	78.161541	10,525	10,525	16,475	**37,750**	18,675	25,500	19,150	20,750	6.3
635+00	34.315518	78.159756	7,575	7,575	10,725	**18,425**	11,500	13,400	10,725	8,925	6.0
639+99	34.314880	78.158290	14,375	14,375	17,425	**22,150**	15,800	13,300	13,400	9,225	5.8
645+51	34.313979	78.156820	16,275	16,275	16,275	**16,275**	13,500	10,075	10,725	6,625	4.0
650+27	34.313454	78.155376	22,975	22,975	19,150	**16,425**	14,375	9,575	10,350	5,625	4.5
653+71	34.313093	78.154319	5,175	5,175	1,925	**1,175**	1,125	600	375	125	3.9
660+87	34.312600	78.152022	18,200	18,200	17,050	**16,025**	15,500	13,150	15,325	14,775	5.7
665+94	34.311714	78.150724	9,575	9,575	12,450	**17,775**	14,650	22,675	14,925	15,875	5.0
670+65	34.311150	78.149320	22,975	22,975	21,075	**19,450**	22,700	26,850	23,375	25,625	4.8
674+85	34.311259	78.147932	31,600	31,600	26,800	**23,275**	28,150	31,275	26,800	23,450	3.9
680+50	34.310802	78.145939	41,175	41,175	28,725	**22,050**	25,000	19,825	21,450	15,050	4.3
686+27	34.310315	78.144118	95,750	95,750	68,950	**53,850**	57,450	43,100	53,625	44,675	4.2
690+41	34.309736	78.142936	53,625	53,625	55,525	**57,600**	54,575	52,750	49,800	39,425	5.3
695+24	34.309426	78.141377	296,825	296,825	137,875	**89,800**	86,175	49,250	53,625	25,125	3.7
701+49	34.308852	78.139423	63,200	63,200	51,700	**43,750**	54,575	61,400	49,800	39,425	1.9
706+26	34.308315	78.137981	64,150	64,150	44,050	**33,525**	40,225	34,250	36,375	28,300	4.1
712+35	34.307437	78.136262	105,325	105,325	53,625	**35,975**	37,350	23,225	36,775	35,150	4.3
715+84	34.306930	78.135280	9,300	9,300	12,825	**20,750**	15,225	24,275	15,700	17,350	7.1
721+13	34.30645	78.133626	53,625	53,625	26,800	**17,875**	19,250	12,300	14,925	8,925	4.7
727+18	34.305823	78.131769	143,625	143,625	59,375	**37,425**	24,425	11,225	13,400	5,700	3.6
731+33	34.30541	78.130485	14,375	14,375	16,075	**18,275**	11,500	7,300	9,575	6,375	6.1
736+09	34.304897	78.129034	41,175	41,175	26,800	**19,875**	17,525	10,350	16,075	12,900	5.5
741+63	34.304280	78.127354	22,025	22,025	16,850	**13,650**	13,225	9,225	9,950	5,725	3.6
791+11	34.299287	78.112092	16,275	16,275	11,100	**8,425**	6,900	3,925	6,500	5,575	6.0
795+82	34.298983	78.110574	14,375	14,375	11,100	**9,050**	12,350	15,925	10,350	6,950	5.3
800+21	34.298418	78.109288	105,325	105,325	86,175	**72,925**	89,050	95,400	68,950	41,100	4.4
806+03	34.297851	78.107482	258,525	258,525	114,900	**73,875**	94,800	70,225	72,775	42,875	3.5
811+10	34.297499	78.105854	12,450	12,450	12,825	**13,250**	15,500	26,650	13,800	10,350	6.3
816+15	34.296836	78.104386	18,200	18,200	28,725	**68,225**	37,350	93,350	34,475	28,000	5.9
821+12	34.296454	78.102803	114,900	114,900	88,100	**71,425**	54,575	31,000	29,100	12,125	5.5
826+43	34.295797	78.101230	22,025	22,025	30,650	**50,325**	37,350	66,375	37,525	38,125	6.1
831+12	34.295270	78.099810	12,450	12,450	17,050	**27,025**	20,400	33,625	21,075	23,375	7.5
836+17	34.294798	78.098238	22,025	22,025	26,800	**34,250**	26,725	26,525	24,125	18,700	6.0

Note 1 Readings in Bold are at Pipe Depth
Note 2 Readings are rounded to nearest 25

Appendix C
NCDOT
Encroachment
Agreements

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

June 21, 2019

COUNTY: Columbus County. N.C.
NCDOT # E063-024-19-00028

SUBJECT: Kings Bluff Water Transmission Main

Mr. Don Betz, Executive Director (Second Party)
Lower Cape Fear Water and Sewer Authority
1107 New Pointe Blvd., Suite 17
Leland, N.C. 28451

Mr. Carel Vandermeyden, Director of Engineering (Third Party)
Cape Fear Public Utility Authority
235 Government Center Drive
Wilmington, N.C. 28403

Gentlemen,

Attached for your files is a copy of the Right of Way Encroachment Contract properly executed. This contract covers the following:

Proposed Road Crossing of Routes NC-11 0.31 miles North of NC-87, SR-1811 (Narrow Gap Road) 0.27 miles North of NC-87, SR-1816 (Riegel Course Road) 0.20 miles North of NC-87, SR-1817 (John L. Riegel Road) 0.29 miles North of NC-87, SR-1818 (Neils Eddy Road) 0.27 miles North of NC-87. with the Construction and/or Erection of, The Cape Fear Public Utility Authorities (Kings Bluff Water Transmission Main) Consisting of a 54" RAW Water Transmission Main.

APPROVED SUBJECT TO: Attached Special Provisions

Sincerely,

Greg Burns, PE,
DIVISION ENGINEER

GB/KLC/sln
Attachments

cc: Kenneth L. Clark, PE (District Engineer)
Barry W. Gelezinsky (County Maintenance Engineer)

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
1194 PRISON CAMP ROAD
WHITEVILLE, NC 28472

Telephone: (910) 642-3760
Fax: (910) 642-2984
Website: www.ncdot.gov

Location:
1194 PRISON CAMP ROAD
WHITEVILLE, NC 28472

ROUTE NC11; SR1811; SR1816; SR1818; SR1817 PROJECT KINGS BLUFF RAW WATER MAIN COUNTY OF STATE OF NORTH CAROLINA COLUMBUS

DEPARTMENT OF TRANSPORTATION

-AND-

LOWER CAPE FEAR WATER AND SEWER AUTHORITY

-AND-

CAPE FEAR PUBLIC UTILITY AUTHORITY

THREE PARTY RIGHT OF WAY ENCROACHMENT AGREEMENT ON PRIMARY AND SECONDARY SYSTEM

THIS AGREEMENT, made and entered into this the 21 day of JUNE, 20 19, by and between the Department of Transportation, party of the first part; and LOWER CAPE FEAR WATER AND SEWER AUTHORITY party of the second part; and CAPE FEAR PUBLIC UTILITY AUTHORITY party of the third part,

WITNESSETH

THAT WHEREAS, the party of the second part desires to encroach on the right of way of the public road designated as Route(s) NC11; SR1811; SR1816; SR1818; SR1817, located NC-11 0.31 miles North of NC-87, SR-1811 0.27 miles North of NC-87, SR-1816 0.20 miles North of NC-87, SR-1817 0.29 miles North of NC-87, NC-11 0.31 miles North of NC-87, SR-1818 0.27 miles North of NC-87.

with the construction and/or erection of: a 54" raw water tranmission main

WHEREAS, it is to the material advantage of the party of the second part to effect this encroachment, and the party of the first part in the exercise of authority conferred upon it by statute, is willing to permit the encroachment within the limits of the right of way as indicated, subject to the conditions of this agreement;

NOW, THEREFORE, IT IS AGREED that the party of the first part hereby grants to the party of the second part the right and privilege to make this encroachment as shown on attached plan sheet(s), specifications and special provisions which are made a part hereof upon the following conditions, to wit:

That the installation, operation, and maintenance of the above described facility will be accomplished in accordance with the party of the first part's latest POLICIES AND PROCEDURES FOR ACCOMMODATING UTILITIES ON HIGHWAY RIGHTS-OF-WAY, and such revisions and amendments thereto as may be in effect at the date of this agreement. Information as to these policies and procedures may be obtained from the Division Engineer or State Utility Agent of the party of the first part.

That the said party of the second part binds and obligates himself to install and maintain the encroaching facility in such safe and proper condition that it will not interfere with or endanger travel upon said highway, nor obstruct nor interfere with the proper maintenance thereof, to reimburse the party of the first part for the cost incurred for any repairs or maintenance to its roadways and structures necessary due to installation and existence of the facilities of the party of the second part, and if at any time the party of the first part shall require the removal of or changes in the location of the said facilities, that the said party of the second part binds himself, his successors and assigns, to promptly remove or alter the said facilities, in order to conform to the said requirement, without any cost to the party of the first part.

That the party of the second part agrees to provide during construction and any subsequent maintenance proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with the latest Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the Division Engineer of the party of the first.

That the party of the second part hereby agrees to indemnify and save harmless the party of the first part from all damages and claims for damage that may arise by reason of the installation and maintenance of this encroachment.

That the party of the second part agrees to restore all areas disturbed during installation and maintenance to the satisfaction of the Division Engineer of the party of the first part. The party of the second part agrees to exercise every reasonable precaution during construction and maintenance to prevent eroding of soil; silting or pollution of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces or other property; or pollution of the air. There shall be compliance with applicable rules and regulations of the North Carolina Division of Environmental Management, North Carolina Sedimentation Control Commission, and with ordinances and regulations of various counties, municipalities and other official agencies relating to pollution prevention and control. When any installation or maintenance operation disturbs the ground surface and existing ground cover, the party of the second part agrees to remove and replace the sod or otherwise reestablish the grass cover to meet the satisfaction of the Division Engineer of the party of the first part.

That the party of the second part agrees to assume the actual cost of any inspection of the work considered to be necessary by the Division Engineer of the party of the first part.

That the party of the second part agrees to have available at the construction site, at all times during construction, a copy of this agreement showing evidence of approval by the party of the first part. The party of the first part reserves the right to stop all work unless evidence of approval can be shown.

Provided the work contained in this agreement is being performed on a completed highway open to traffic; the party of the second part agrees to give written notice to the Division Engineer of the party of the first part when all work contained herein has been completed. Unless specifically requested by the party of the first part, written notice of completion of work on highway projects under construction will not be required.

That in the case of noncompliance with the terms of this agreement by the party of the second part, the party of the first part reserves the right to stop all work until the facility has been brought into compliance or removed from the right of way at no cost to the party of the first part.

That it is agreed by both parties that this agreement shall become void if actual construction of the work contemplated herein is not begun within one (1) year from the date of authorization by the party of the first part unless written waiver is secured by the party of the

second part from the party of the first part.

During the performance of this contract, the second party, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor"), agrees as follows:

a. Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the U. S. Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

b. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

c. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

d. Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.

e. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to,

(1) withholding of payments to the contractor under the contract until the contractor complies, and/or
(2) cancellation, termination or suspension of the contract, in whole or in part.

f. Incorporation of Provisions: The contractor shall include the provisions of paragraphs "a" through "f" in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Department of Transportation to enter into such litigation to protect the interests of the State, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

That when title to the subject that constitutes the aforesaid encroachment passes from the party of the second part and vests in the party of the third part, the party of the third part agrees to assume all responsibilities and rights and to perform all obligations as agreed to herein by the party of the second part.

R/W (166) : Party of the Second Part certifies that this agreement is true and accurate copy of the form R/W (166) incorporating all revisions to date.

IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed the day and year first above written.

DEPARTMENT OF TRANSPORTATION

BY: G. Burns
DIVISION ENGINEER

WITNESS:

Jamie Mabe Fitzsimmons
JAMIE MABE-FITZSIMMONS NOTARY PUBLIC BRUNSWICK CO., NC

WITNESS:

Donna Pape
Donna S. Pape
Clerk to the Board
CAPE FEAR PUBLIC UTILITY AUTHORITY SEAL

Executive Director
Lower Cape Fear Water & Sewer Authority
LOWER CAPE FEAR WATER AND SEWER AUTHORITY NORTH CAROLINA CORPORATE SEAL 6/13/72

Second Party

Director of Engineering
Cape Fear Public Utility Authority

Third Party

SPECIAL PROVISIONS

R/W 16.1

LOWER CAPE FEAR WATER AND SEWER AUTHORITY

1. **WORK ZONE TRAFFIC CONTROL QUALIFICATIONS AND TRAINING PROGRAM**

   Effective July 1, 2010, all flagging operations within NCDOT Right of Way require qualified and trained Work Zone Flaggers.

   Effective July 1, 2011, qualified and trained Work Zone Traffic Control Supervisors will be required on Significant Projects.

   Training for this certification is provided by NCDOT approved training sources and by private entities that have been pre-approved to train themselves. If you have questions, contact our web site at http://www.ncdot.org/doh/preconstruct/wztc/WZTCTrainingProgram/default.html, or contact Stuart Bourne, P.E. with NCDOT Work Zone Traffic Control Unit at (919) 662-4338 or sbourne@ncdot.gov .

1. The encroaching party shall notify the District Engineer's office at telephone number (910) 642-3760) prior to beginning construction and after construction is complete.

2. An executed copy of this encroachment agreement shall be present at the construction site at all times during construction. If safety or traffic conditions warrant such an action, NCDOT reserves the right to further limit, restrict or suspend operations within the right of way.

3. NCDOT does not guarantee the right of way on this road, nor will it be responsible for any claim for damages brought about by any property owner by reason of this installation.

4. The encroaching party is required to contact the appropriate Utility Companies involved and make satisfactory arrangements to adjust the utilities in conflict with the proposed work prior to beginning construction.

5. Excavation within 500 feet of a signalized intersection will require notification by the encroaching party to the Division Traffic Engineer at telephone number (910) 486-1452. All traffic signal or detection cables must be located prior to excavation. Cost to replace or repair NCDOT signs, signals, or associated equipment shall be the responsibility of the encroaching party.

6. The encroaching party shall comply with all applicable Federal, State and local environmental regulations and shall obtain all necessary Federal, State and local environmental permits, including but not limited to, those related to sediment control, stormwater, wetland, streams, endangered species and historical sites.

7. The contractor shall not begin construction until after the traffic control and erosion control devices have been installed to the satisfaction of the District Engineer.

8. Trenching, bore pits and/or other excavations shall not be left open or unsafe overnight.

9. The Contractor shall comply with all OSHA requirements and provide a competent person on site to supervise excavation at all times.

10. All fill areas/backfill shall be compacted to 95% density in accordance with AASHTO T99 as modified by the NCDOT. All material to a depth of 8 inches below the finished surface of the subgrade shall be compacted to a density equal to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by the Department. The subgrade shall be compacted at a moisture content which is approximately that required to produce the maximum density indicated by the above test method. The contractor shall dry or add moisture to the subgrade when required to provide a uniformly compacted and acceptable subgrade.

11. Vegetative cover shall be established on all disturbed areas in accordance with the recommendations of the Division Roadside Environmental Engineer or an approved Erosion Control Plan.

12. Proper temporary and permanent measures shall be used to control erosion and sedimentation in accordance with all local, State and Federal regulations.

13. All materials and workmanship shall conform to the N. C. Department of Transportation's Standards and Specifications Manuals.

14. Strict compliance with the Policies and Procedures for Accommodating Utilities on Highway Rights of Way manual shall be required.

15. The attached plans reflect the corrections and revisions as coordinated with the NCDOT District Office.

16. The resetting of the Control of Access fence shall be in accordance with the applicable NCDOT standard and as directed by the District Engineer.

17. Excavation material shall not be placed on pavement. Drainage structures shall not be blocked with excavation materials. Any drainage structure disturbed or damaged shall be restored to its original condition as directed by the District Engineer.

18. Any disturbed guardrail shall be reset according to the applicable standard or as directed by the District Engineer.

19. All driveways altered during construction shall be returned to a state comparable with the condition of the driveways prior to construction.

20. Right of Way monuments disturbed during construction shall be referenced by a registered Land Surveyor and reset after construction.

21. All roadway signs that are removed due to construction shall be reinstalled as soon as possible.

22. The party of the second part agrees to provide traffic control devices, lane closures, road closures, positive protection and/or any other warning or positive protection devices necessary for the safety of road users during construction and subsequent maintenance. This shall be performed in conformance with the latest NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures and amendments or supplements thereto. When there is no guidance provided in the NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures, comply with the Manual on Uniform Traffic Control Devices for Streets and Highways and amendments or supplements thereto. Information as to the above rules and regulations may be obtained from the NCDOT District Engineer.

23. All lanes of traffic are to be open during the hours of 6:00 A.M. to 9:00 A.M. and from 4:00 P.M. to 7:00 P.M., or as designated by the District Engineer. Traffic shall be maintained at all times.

24. Ingress and egress shall be maintained to all businesses and dwellings affected by the project. Special attention shall be paid to police and fire stations, fire hydrants and hospitals.

25. Any work requiring equipment or personnel within 5' of the edge of any travel lane of an undivided facility and within 10' of the edge of any travel lane of a divided facility shall require a lane closure with appropriate tapers.

26. Work requiring lane or shoulder closures shall not be performed on both sides of the road simultaneously within the same area.

27. During non-working hours, equipment shall be parked as close to the right of way line as possible and be properly barricaded in order not to have any equipment obstruction within the Clear Recovery Area.

28. The utility shall be installed within 5 feet of the right of way line and outside the theoretical 1:1 slope from the edge of pavement to the bottom of the nearest excavation wall. When this is not possible, excavation inside the theoretical 1:1 slope from the existing edge of pavement to the bottom of the nearest excavation wall shall be made in accordance with the following conditions:

a. Positive excavation shoring, such as sheet piling, shall be installed. The design of the shoring shall include the effects of traffic loads. The shoring system shall be designed and sealed by a licensed North Carolina Professional Engineer. Shoring plans and design calculations shall be submitted to the Division Engineer for review and approval prior to construction. **Trench boxes shall not be accepted as positive shoring**.

b. The trench backfill material shall meet the Statewide Borrow Criteria. The trench shall be backfilled in accordance with Section 300-7 of the 2006 NCDOT Standard Specifications for Roads and Structures, which basically requires the backfill material to be placed in layers not to exceed 6 inches loose and compacted to at least 95% of the density obtained by compacting a sample in accordance with ASSHTO T99 as modified by DOT.

c. A qualified NCDOT inspector shall be on the site at all times during construction. The encroaching party shall reimburse NCDOT for the cost of providing the inspector. If NCDOT cannot supply an inspector, the encroaching party (not the utility contractor) should make arrangements to have a qualified inspector, under the supervision of a licensed North Carolina Professional Engineer, on the site at all times. The Professional Registered Engineer shall certify that the utility was installed in accordance with the encroachment agreement and that the backfill material meets the Statewide Borrow Criteria.

d. All trench excavation inside the limits of the theoretical one-to-one slope, as defined by the policy, shall be completely backfilled and compacted at the end of each construction day. No portion of the trench shall be left open overnight.

e. No roadway crossing for a pipeline greater than 2 inches in diameter shall be made in Columbus or Bladen Counties by the method known as driving or thumping, where an air compressor and a pilot shoe are used to compress material and create a bore hole, unless approved by the District Engineer.

29. Directional drilling methods have not been given statewide approval for use on NCDOT right of way. Under no condition shall jetting alone or wet boring with water of utility pipelines be allowed. Directional boring using jetting with a Bentonite (or equivalent material) slurry is approved at a minimum depth of ten (10) feet below the pavement surface [fifteen (15') feet below the surface of partial and/or full control of access roads] and two (2) feet below any ditch line. Directional boring is not allowed in embankment material. Directional boring is allowed beneath embankment material in naturally occurring soil. Any parallel installation utilizing the directional boring method shall be made at a minimum depth of three (3') feet (cover) below the ground surface and outside the theoretical 1:1 slope from the existing edge of pavement except where the parallel installation crosses a paved roadway. All directional bores shall maintain ten (10) feet minimum (clear) horizontal distance from the nearest part of any structure, including but not limited to bridges, footings, pipe culverts or box culverts. All directional bores shall maintain ten (10) feet minimum (clear) vertical and horizontal distance from the nearest part of pipe culverts or box culverts. Directional bores are not allowed beneath bridge footings, culvert wingwall footings or retaining walls. The tip of the drill string shall have a cutter head. Detection wire shall be installed with non-ferrous material. Any changes shall be submitted to the District Engineer for approval prior to construction. For multiple conduit installations (including perpendicular & parallel installations), install conduits with five (5) feet minimum (clear) horizontal separation between each conduit or install multiple conduits within a single duct. An overbore shall not be more than two (2") inches greater than the diameter of the pipe or encasement. An overbore exceeding two (2") inches greater than the diameter of the pipe or encasement will be considered if the encroachment agreement includes a statement signed and sealed by a licensed North Carolina Professional Engineer indicating that an overbore in excess of two (2") inches of the diameter of the pipe or encasement will arch and no damage will be done to the pavement or sub-grade. HDPE pipe installed by directional boring shall not be connected to existing pipe or fittings for one (1) week from the time of installation to allow tensional stresses to relax.

30. Alignment of directional bores at bridges and 48-inch culverts or larger should be (1) one foot off Right of Way. After completion of bore, encroaching party shall provide NCDOT with a certified bore log.

31. All 6" or smaller in diameter plastic gas mains shall meet current NCDOT standards (Polyethylene SDR-11) or the plans shall be sealed, signed and dated by a licensed North Carolina Professional Engineer. All plastic gas mains 8" or greater in diameter shall be sealed, signed, and dated by a licensed North Carolina Professional Engineer.

32. Regulator stations, metering stations, cathodic test stations and anode beds are not permitted within the NCDOT right of way. Header wires are permitted.

33. A performance and indemnity bond in the amount of $200,000.000 shall be posted with the NCDOT District Engineer's Office by the encroaching party prior to beginning any work within the NCDOT right of way. The bond shall be held for a minimum period of one year after completion of the installation and released only upon a final satisfactory inspection by NCDOT.

34. Upon completion of the installation of this encroachment, please summit one hard copy of the As Built plans (noted with any changes) sealed, signed, and dated by a licensed North Carolina Professional Engineer to the District Engineer within 30 days.

35. Vertical clearance of overhead power and communication lines shall meet the National Electrical Safety Code requirements except the minimum vertical clearance shall be 18' for crossings over NCDOT roadways and 15'-6" for parallel installations.

36. All utility access points, such as manholes, splice boxes and junction boxes shall be located at or outside the right of way line. Manholes, splice boxes, junction boxes and vaults shall not be placed in the ditch line, side slopes of the ditches or in the pavement. All manholes, splice boxes, junction boxes and vaults and covers shall be flush with the ground when located within the vehicle recovery area.

37. All utility facilities, including manholes, valve boxes, meter boxes, splice boxes, junction boxes, vaults and access covers, within NCDOT right of way shall have been designed for HS-20 loading rated for continuous traffic. If any proposed structure is not of a design pre-approved by NCDOT, the encroaching party shall submit details and design calculations signed and sealed by a Professional Engineer for approval prior to construction.

38. Any pavement replacement or repair required due to this installation shall be the responsibility of the encroaching party. Pavement repair or replacement shall be in accordance with the requirements of and to the satisfaction of the District Engineer

39. All temporary and final pavement markings are the responsibility of the encroaching party. Final pavement markings and sign plans shall be submitted to the Division Traffic Engineer at telephone number (910) 486-1452 for review and approval prior to installation.

40. Any utility marker required shall be as close to the right of way line as possible. If it is not feasible to install markers at or near the right of way line, written approval specific to the site shall be obtained from the District Engineer prior to installation.

41. Detection tape shall be buried in the trench approximately 1 foot above the fiber optic cable. Where conduit is installed in the right of way and is not of ferrous material, locating tape or detection wire shall be installed with the conduit.

42. Transportation Improvement Project (T.I.P.) ******* is scheduled for construction in the future. Any encroachment determined to be in conflict with the construction of this project shall be removed and/or relocated at the owner's expense. (Continue per spec.)

43. The encroaching party shall submit a letter from the Highway Contractor on NCDOT Project ***** to the NCDOT State Utility Agent stating that this encroachment will not be the basis of a claim for delay or additional cost against the Board of Transportation.

44. The work depicted on the plans and specifications submitted with the encroachment package appears to be an engineering design held out to the public. The engineering work appears to affect public safety and health. As such, the engineering drawings and specifications are required by GS-89C to be properly certified by a licensed North Carolina Professional Engineer. The plans and specifications have not been properly certified by a licensed North Carolina Professional Engineer and the encroaching party may be in violation of GS-89C.

45. In the Future Should NCDOT need to Remove or Replace the Existing Cross Line Pipe as Shown On Plan Drawing Sheet Page 1 of 8, Columbus County Utility Department Agrees to shut off and Remove Temporarily the 20 LF Section of 8" Ductile Iron Water Main at Approx. Station 9+50. Following Replacement of The Storm Drain, NCDOT will give Instructions to Columbus County Utility Department as to where, in Relationship to the Replaced Storm Drain, the 8" Ductile Iron Water Main will be Re-Installed.

SEEDING AND MULCHING: (East)

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

All Roadway Areas

March 1 - August 31		**September 1 - February 28**	
50#	Tall Fescue	50#	Tall Fescue
10#	Centipede	10#	Centipede
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Waste and Borrow Locations

March 1 – August 31		**September 1 - February 28**	
75#	Tall Fescue	75#	Tall Fescue
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

Adventure	Brookstone	Grande	Rebel Jr
Adventure II	Bonanza	Guardian	Rebel II
Airlie	Bonanza II	Houndog	Red Coat
Amigo	Bulldog 51	Inferno	Renegade
Anthem	Chapel Hill	Jaguar	Safari
Anthem II	Chesapeake	Jaguar III	Shelby
Apache	Chieftain	Kentucky 31	Shenandoah
Apache II	Coronado	Kitty Hawk	Southern Choice II
Arid	Crossfire II	Monarch	South Paw
Arid II	Debutante	Montauk	Tempo
Arid III	Duster	Mustang	Titan
Aztec II	Escalade	Olympic	Tomahawk
Barfexas	Falcon	Pacer	Tacer
Barfexas II	Falcon III	Paraiso	Trailblazer
Barrera	Finelawn	Pixie	Tribute
Barrington	Finelawn I	Pyramid	Trooper
Bingo	Finelawn Petite	Quest	Wolfpack
Bravo	Genesis	Rebel	Wrangler

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis.

TEMPORARY SEEDING:

Fertilizer shall be the same analysis as specified for *Seeding and Mulching* and applied at the rate of 400 pounds and seeded at the rate of 50 pounds per acre. Sweet Sudan Grass, German Millet or Browntop Millet shall be used in summer months and Rye Grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

FERTILIZER TOPDRESSING:

Fertilizer used for topdressing on all roadway areas except slopes 2:1 and steeper shall be 10-20-20. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided grade and shall be applied at the rate of 500 pounds per acre. Upon the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 10-20-20 analysis.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis.

SUPPLEMENTAL SEEDING:

The kinds of seed and proportions shall be the same as specified for *Seeding and Mulching*, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding may vary from 25# to 75# per acre. The actual rate per acre will be determined prior to the time of topdressing and the Contractor will be notified in writing of the rate per acre, total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

MOWING:

The minimum mowing height on this project shall be 4 inches.

National Pollutant Elimination System (NPDES)
Stormwater Permit Compliance Certification

I Jess Powell, a duly authorized representative of Cape Fear Public Utility Authority, an industrial/commercial/residential facility requesting attachment to a North Carolina Department of Transportation highway drainage system at Riegelwood, NC in Columbus County, do hereby certify the following:

Check appropriate box and circle type of facility

☑ The Industrial / Commercial / Residential facility does not require an NPDES stormwater permit.

☐ The Industrial / Commercial / Residential facility does require an NPDES stormwater permit. The permit has been obtained and a Stormwater Pollution Prevention Plan (SPPP) is in place. Appropriate structural stormwater best management practices (BMP) are designed and installed as required by the Department of Environment and Natural Resources (DENR) and/or the local governing agency. All structural stormwater BMP's are located outside of NCDOT right –of-way.

I understand if the Department of Transportation determines the facility is not in compliance with NPDES stormwater requirements, the Department will report the noncompliance to the DENR Division of Water Quality. I also understand that falsification of this certification may result in penalty of law against the facility and me as prescribed in the North Carolina General Statutes.

Signature: _____

Date: 6/20/2019

Note: If the applicant has a question as to whether an NPDES stormwater permit is required, he or she may contact the N.C. Division of Water Quality in Raleigh at (919) 733-5083 (ask for Stormwater and General Permits Unit).

Form NPDES-1
May 22, 2006

VERIFICATION OF COMPLIANCE WITH ENVIRONMENTAL REGULATIONS

(Check Appropriate Box)

☐ Permits from the N.C. Department of Environment and Natural Resources and the U.S. Army Corp of Engineers are not required for this project. However, all applicable federal and state regulations have been followed.

☑ The required permits from the N.C. Department of Environment and Natural Resources and the U.S. Army Corp of Engineers have been obtained for this project. Copies of permits and Completion Certificates are attached.

☑ All applicable NPDES Stormwater Permit requirements have been met for this project. (The applicant should contact the N.C. Division of Water Quality in Raleigh to determine if a stormwater permit is required.)

☑ The project is in compliance with all applicable sedimentation and erosion control laws and regulations.

Project Name: Kings Bluff 54" Raw Water Transmission Main

Township: Rieglewood, NC County: Columbus

Project Engineer: McKim & Creed Phone No.: 910-343-1048

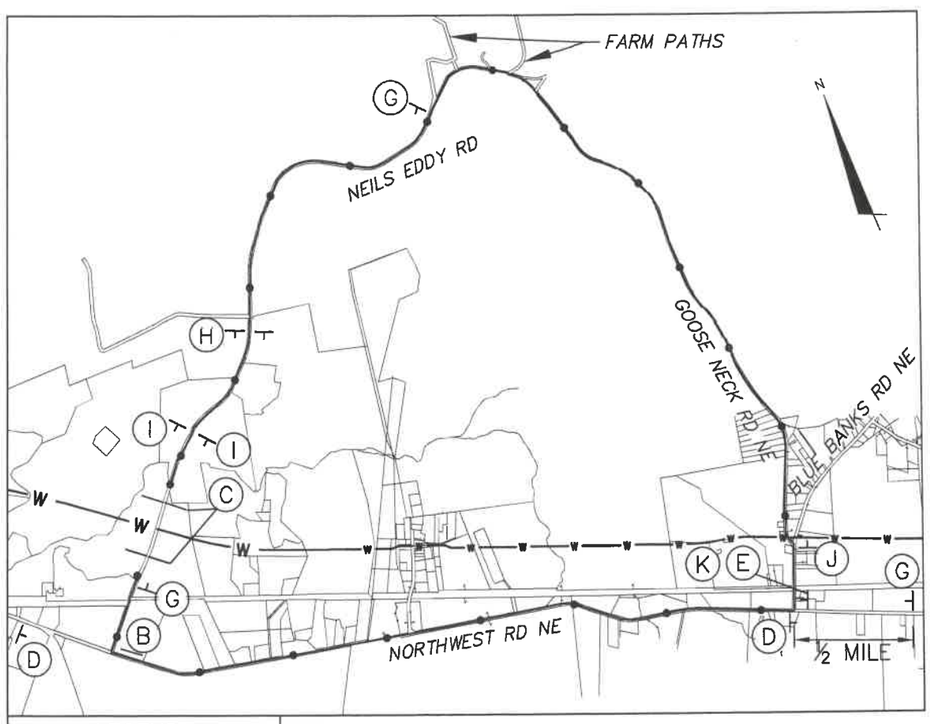
Project Contact: Jess Powell

Applicant's Name: Craig Wilson, CFPUA

Date Submitted: 6/20/2019

P.E. SEAL

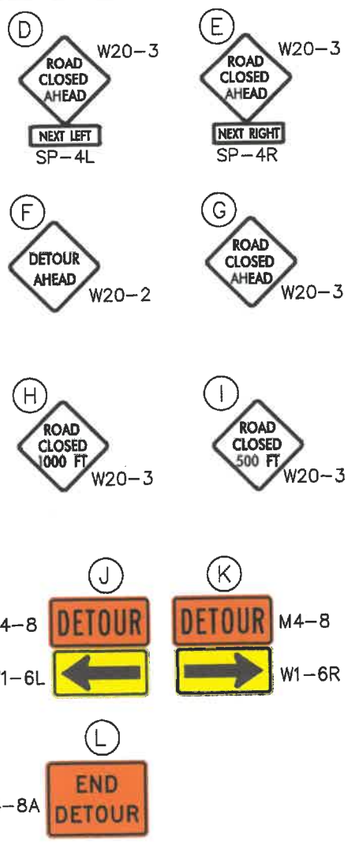
Form VCER-1
June 1, 2006

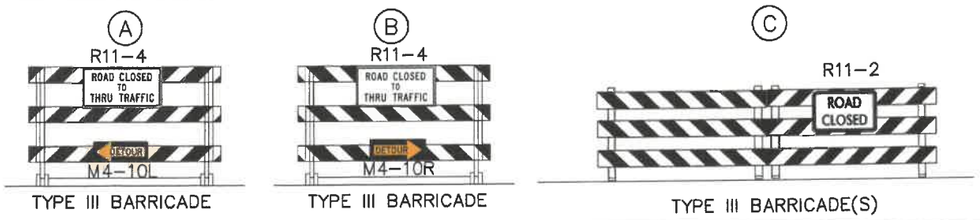


LEGEND

DETOUR ROUTE

STATIONARY SIGN



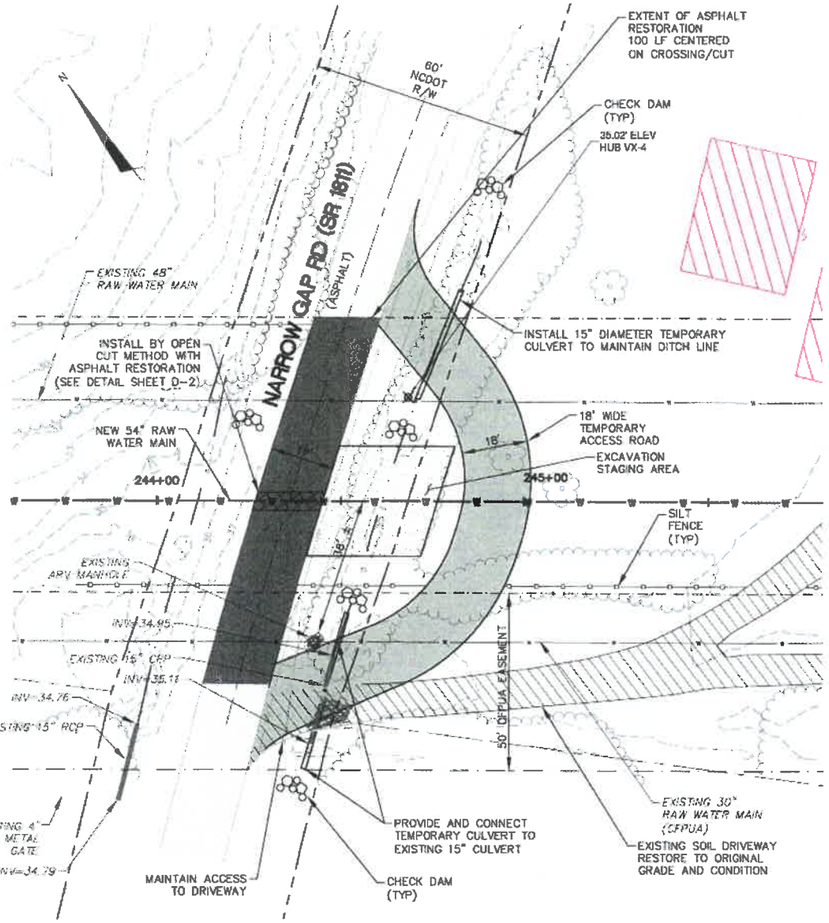


McKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

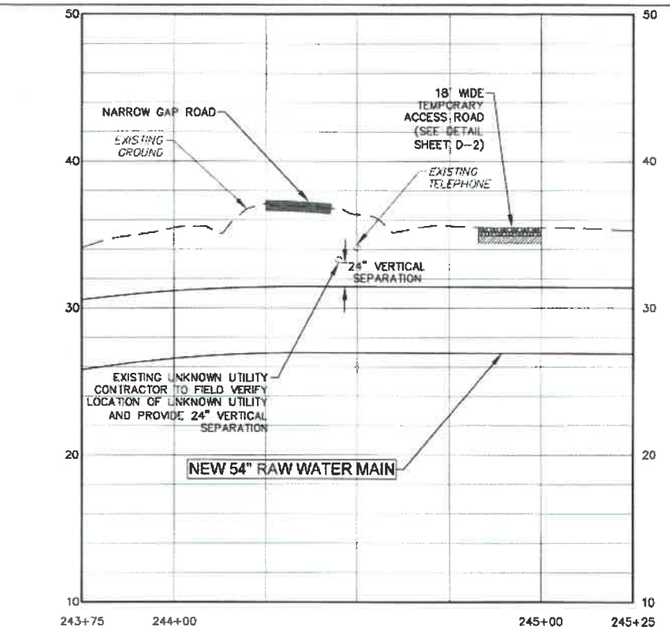
54" RAW WATER MAIN

NEILS EDDY DETOUR ROUTE

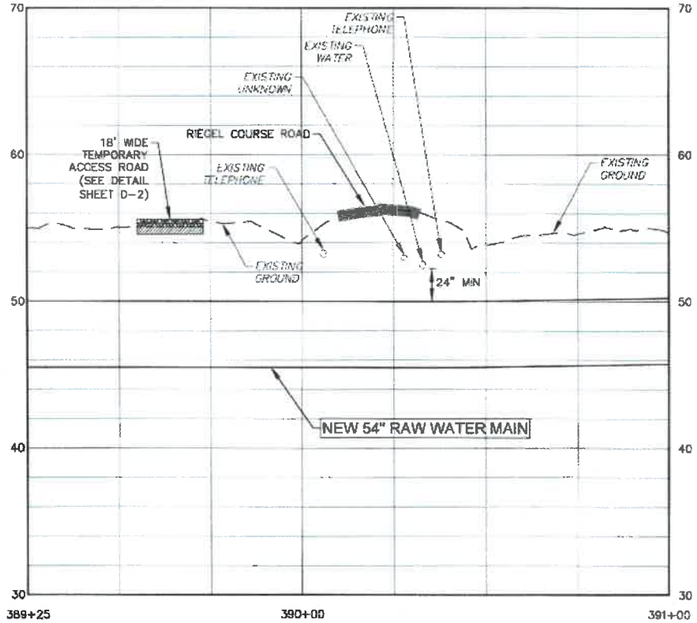
FIG 3



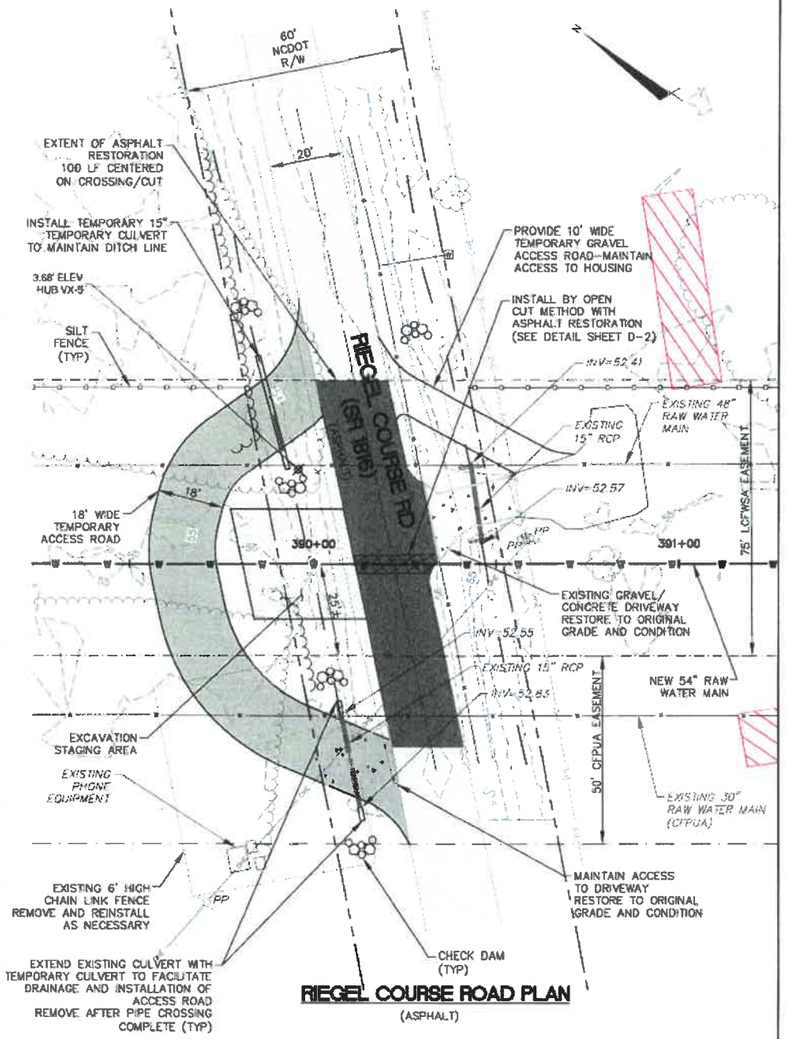
NARROW GAP ROAD PLAN
(ASPHALT)



NARROW GAP ROAD PROFILE



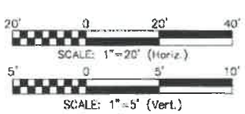
RIEGEL COURSE ROAD PROFILE



RIEGEL COURSE ROAD PLAN
(ASPHALT)

NOTES:

1. STORAGE OF EXCAVATED MATERIALS NOT ALLOWED ON NCDOT RIGHT OF WAY.
2. CONTRACTOR SHALL COMPLETE ALL WORK SHOWN WITHIN NCDOT RIGHT OF WAY, LCFWSA EASEMENT AND CFPUA EASEMENT.
3. PROVIDE FOR POSITIVE DRAINAGE AT ALL TIMES FOR CONSTRUCTION AND OPERATION OF THE TEMPORARY ROAD.
4. CONTRACTOR SHALL MAINTAIN TRAFFIC DURING CONSTRUCTION AND PROVIDE TRAFFIC CONTROL DEVICES PER NCDOT STANDARDS.



McKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1646
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025551 ENGINEER ANTHONY W. SOARS
4-10-19

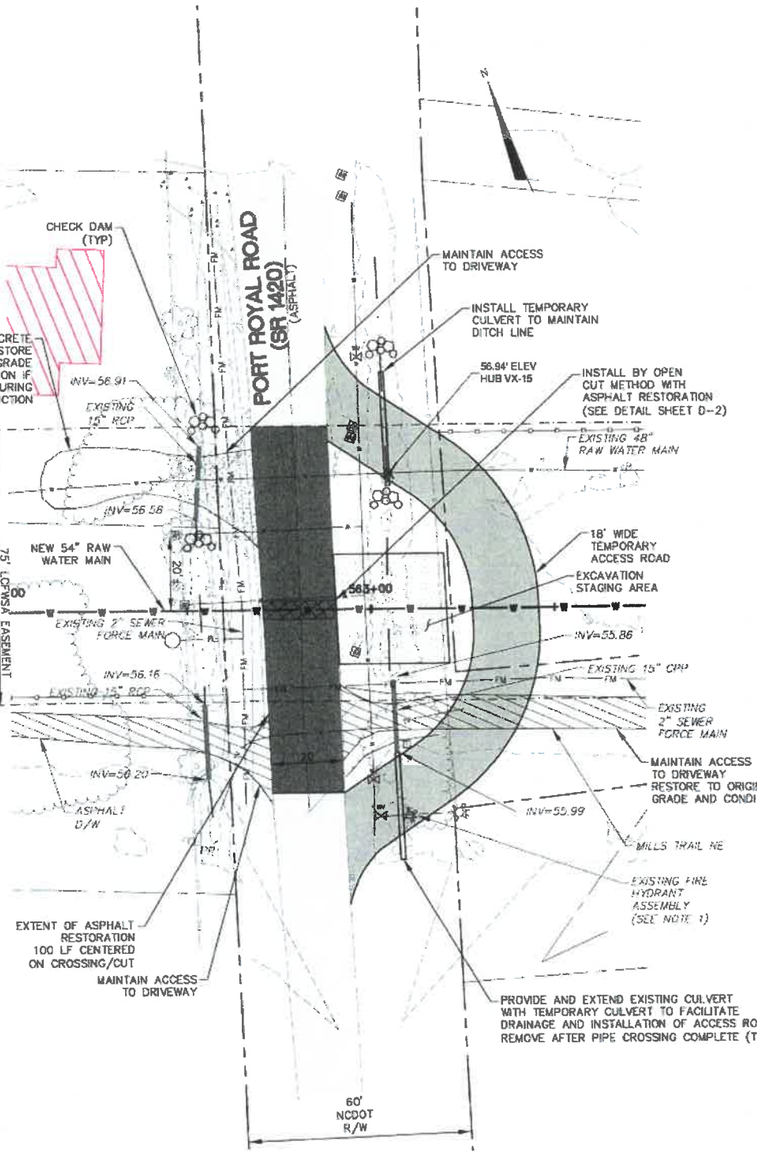
ROAD INTERSECTION PLANS AND PROFILES

CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO.: 5367-0038

SHEET NO: C-52

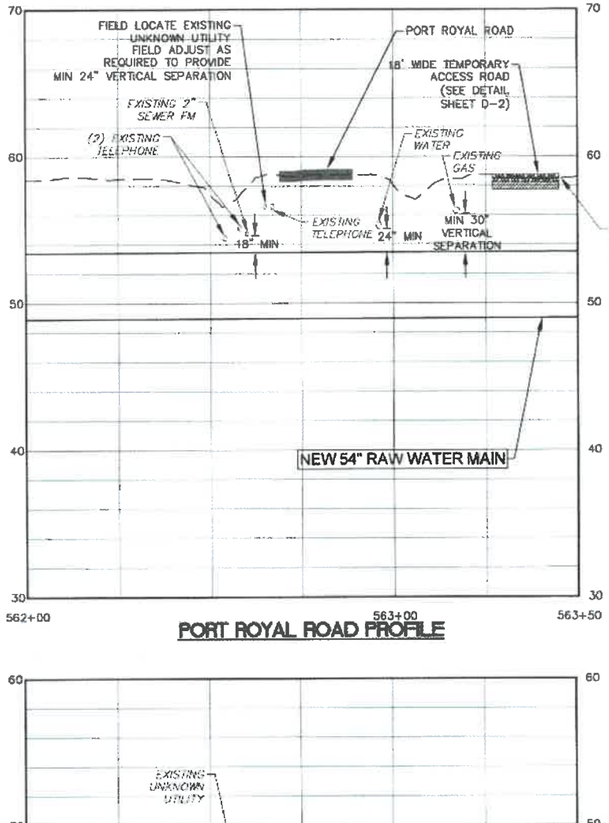


PORT ROYAL ROAD PLAN

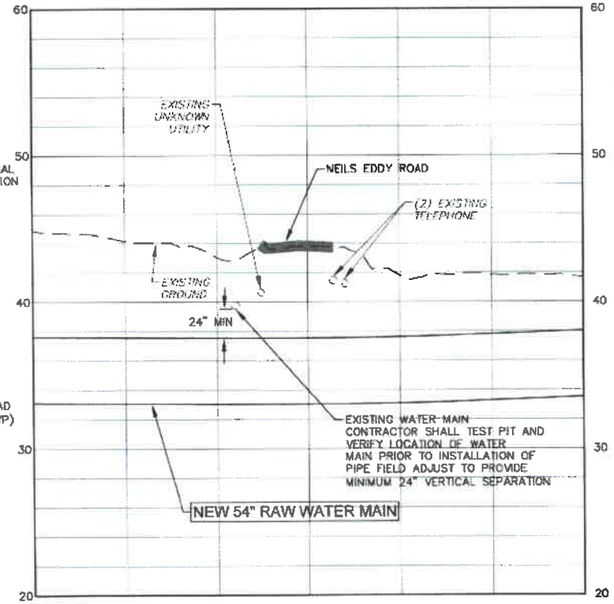
NOTES:

1. CONTRACTOR SHALL RELOCATE EXISTING HYDRANT OUTSIDE OF TEMPORARY ACCESS ROAD PRIOR TO ROAD CONSTRUCTION. AFTER ROAD IS REMOVED, RELOCATE HYDRANT TO ORIGINAL LOCATION. COST OF HYDRANT RELOCATION AND RE-INSTILLATION SHALL BE INCLUDED IN BASE BID.
2. STORAGE OF EXCAVATED MATERIAL NOT ALLOWED IN NCDOT RIGHT OF WAY.
3. CONTRACTOR SHALL COMPLETE ALL WORK SHOWN WITHIN NCDOT RIGHT OF WAY, LCFWSA EASEMENT AND CFPUA EASEMENT.
4. PROVIDE FOR POSITIVE DRAINAGE AT ALL TIMES FOR CONSTRUCTION AND OPERATION OF THE TEMPORARY ROAD.
5. CONTRACTOR SHALL MAINTAIN TRAFFIC DURING CONSTRUCTION AND PROVIDE TRAFFIC CONTROL DEVICES PER NCDOT STANDARDS.

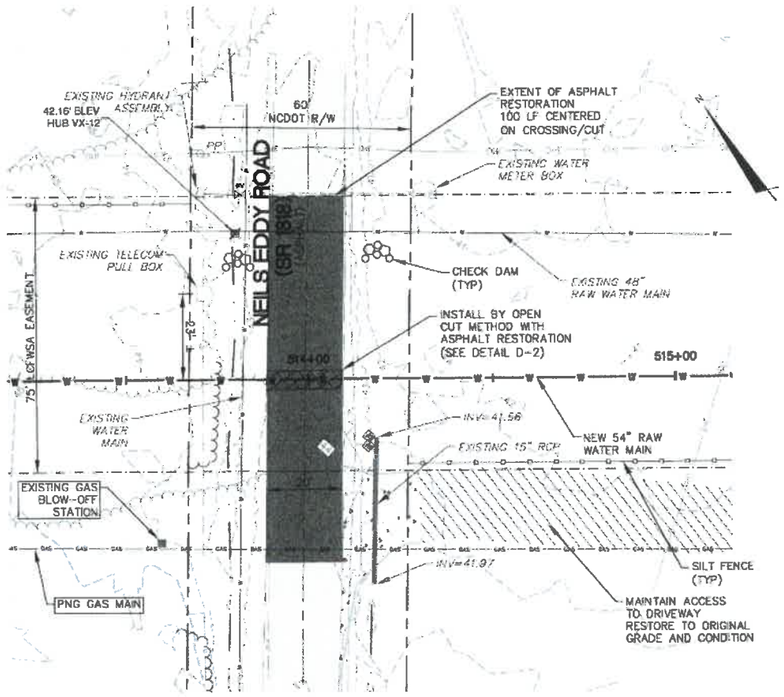
20' 0 20' 40'
SCALE: 1"=20' (Horiz.)
5' 0 5' 10'
SCALE: 1"=5' (Vert.)



PORT ROYAL ROAD PROFILE



NEILS EDDY ROAD PROFILE



NEILS EDDY ROAD PLAN

McKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 030977 ENGINEER ANTHONY W. BOARIN
4-10-19

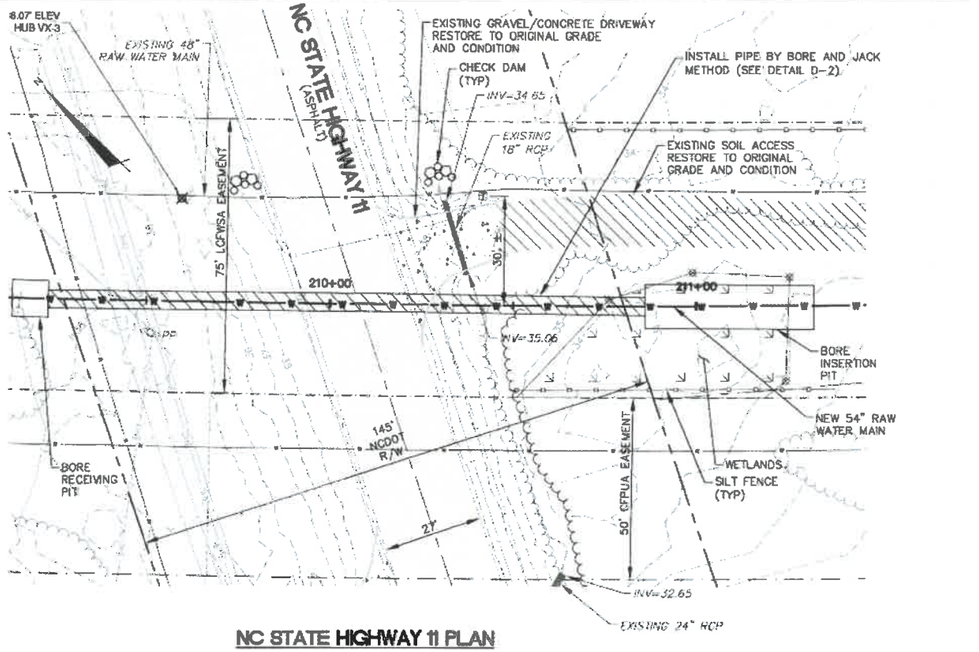
ROAD INTERSECTION PLANS AND PROFILES

CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

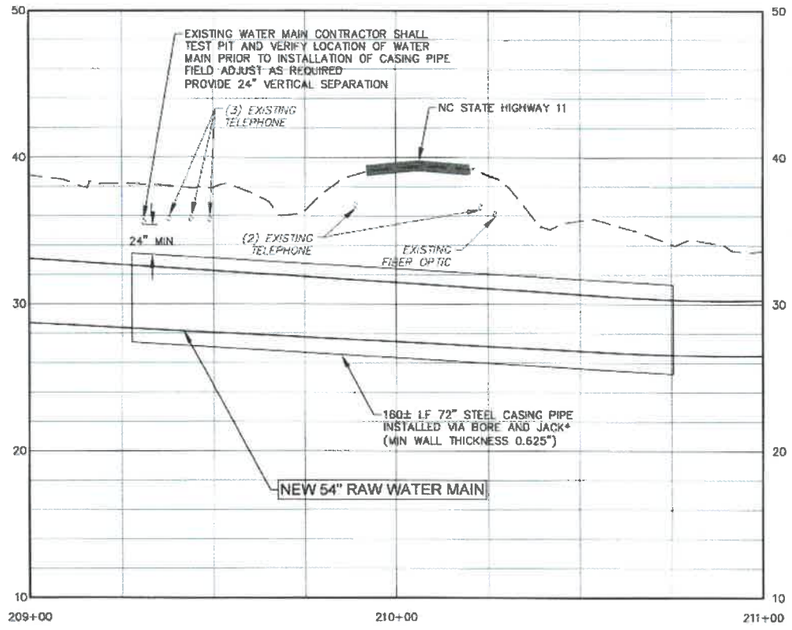
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO : 5367-0038

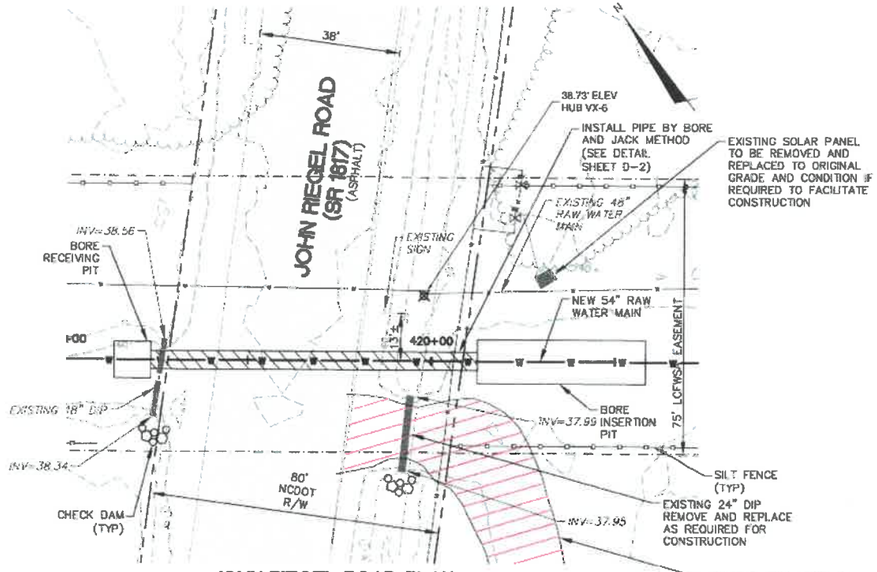
SHEET NO: C-53



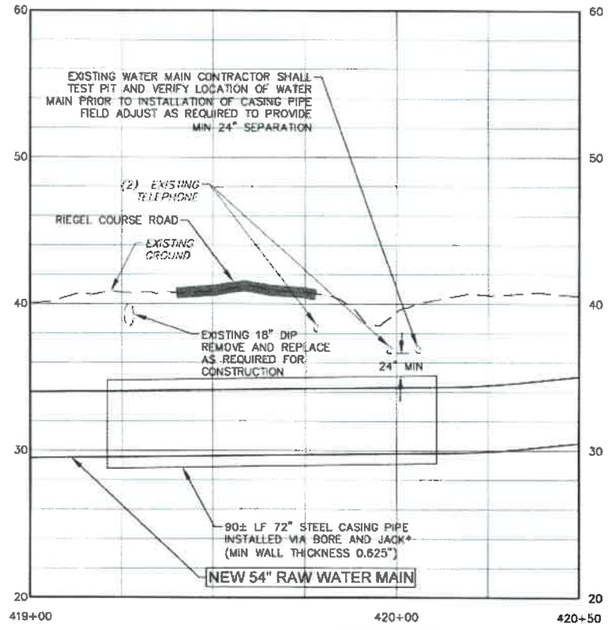
NC STATE HIGHWAY 11 PLAN



NC STATE HIGHWAY 11 PROFILE



JOHN RIEGEL ROAD PLAN



JOHN RIEGEL ROAD PROFILE

NOTES:

1. STORAGE OF EXCAVATED MATERIALS NOT ALLOWED ON NCDOT RIGHT OF WAY.
2. CONTRACTOR SHALL COMPLETE ALL WORK SHOWN WITHIN NCDOT RIGHT OF WAY, LCFWSA EASEMENT AND CFPUA EASEMENT.
3. PROVIDE FOR POSITIVE DRAINAGE AT ALL TIMES FOR CONSTRUCTION AND OPERATION OF THE TEMPORARY ROAD.

20' 0 20' 40'
SCALE: 1"=20' (Horiz.)
5' 0 5' 10'
SCALE: 1"=5' (Vert.)

McKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 035572 ENGINEER ANTHONY W. BOAHEN
4-10-19

ROAD INTERSECTION PLANS AND PROFILES

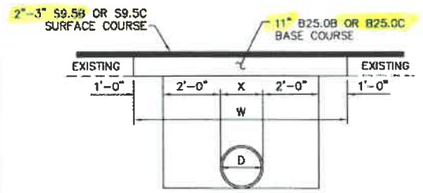
CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

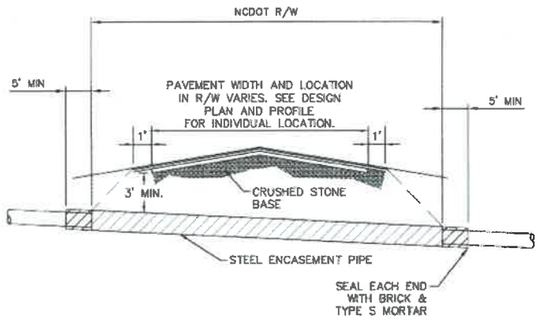
SHEET NO: C-54

D	X	W
12"	1'-4"	7'-4"
15"	1'-7"	7'-7"
18"	1'-10"	7'-10"
24"	2'-6"	8'-6"
30"	3'-1"	9'-1"
36"	3'-8"	9'-8"
42"	4'-5"	10'-5"
48"	5'-0"	11'-0"
54"	5'-0"	11'-0"



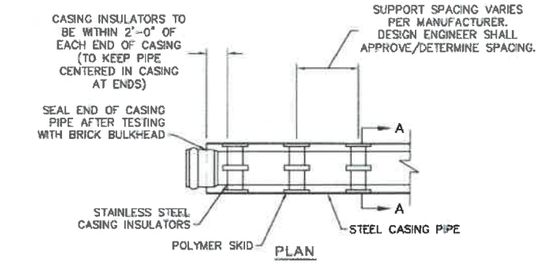
PAVEMENT REPAIRS ON ROADS TO BE RESURFACED
(PIPE IS PLACED UNDER EXISTING PAVEMENT)

NCDOT-PAVEMENT REPAIRS WS-3
NOT TO SCALE

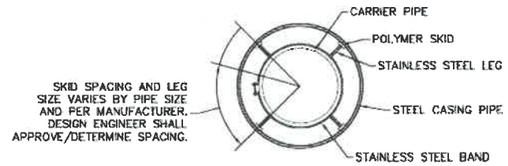


NOTES:
1. CASING WILL BE INSTALLED AT LINE AND GRADE SHOWN ON INDIVIDUAL PROFILE FOR EACH CROSSING. BORING/JACKING TO LINE AND GRADE IS REQUIRED.
2. TRACER WIRE SHALL BE TAPED AT 12' INTERVALS THROUGHOUT THE CASING.
3. PIPING THROUGH CASING SHALL BE RESTRAINED JOINT.
4. SEE DETAIL WS-8 FOR PIPE CASING SUPPORT DETAILS.
5. CASING SHALL EXTEND MIN 5' FROM NCDOT R/W.

TYPICAL BORING & JACKING DETAIL WS-7
NOT TO SCALE

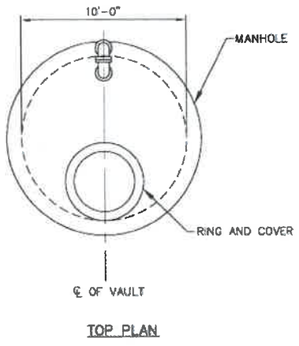


PLAN

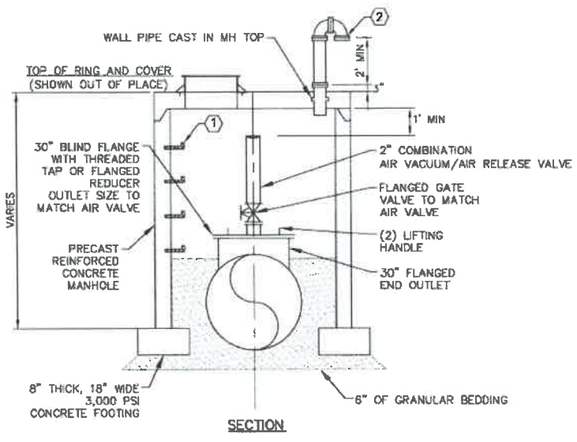


SECTION A-A

PIPE CASING SUPPORT DETAIL WS-8
NOT TO SCALE



TOP PLAN



SECTION

GENERAL NOTE:

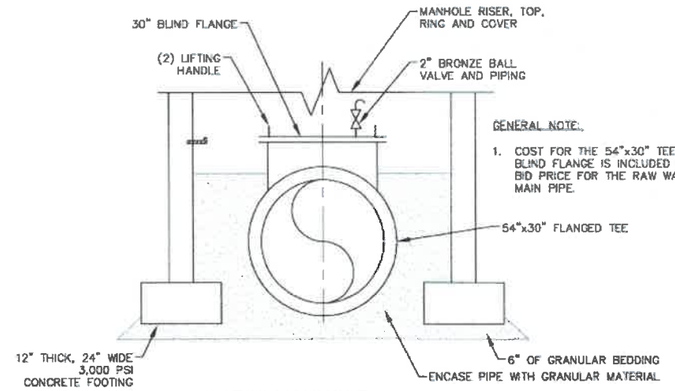
1. ALL PIPE AND FITTINGS SHALL BE STEEL OR DIP.

KEY NOTE:

(1) INSTALL STEEL REINFORCED COPOLYMER POLYPROPYLENE STEPS, SPACE 16" OC (SHOWN OUT OF PLACE).

(2) 8" VENT PIPE WITH FLANGED DIP RETURN BEND WITH STAINLESS STEEL INSECT SCREEN (SHOWN OUT OF PLACE). VENT PIPE SHALL BE DIP, PRIMED AND PAINTED PER PIPE MANUFACTURER'S RECOMMENDATIONS. COLOR TO BE SELECTED BY OWNER. IF REQUIRED TO MEETH-20 LOADING, EXTEND VENT PIPE OUT THE WALL AT NO ADDITIONAL COST.

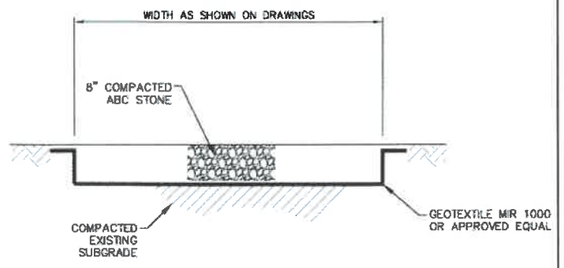
COMBINATION AIR VACUUM / AIR RELEASE VALVE
NOT TO SCALE



GENERAL NOTE:

1. COST FOR THE 54"x30" TEE AND BLIND FLANGE IS INCLUDED IN THE BID PRICE FOR THE RAW WATER MAIN PIPE.

ACCESS MANHOLE DETAIL
NOT TO SCALE



TEMPORARY ROAD DETAIL
NOT TO SCALE

NOTES:

1. CONTRACTOR SHALL INVESTIGATE FOR THE PRESENCE OF EXISTING UTILITIES AND/OR SERVICES NOT SHOWN ON CONTRACT DRAWINGS.
2. PROOF ROLL SUB GRADE IN PRESENCE OF ENGINEER PRIOR TO PLACEMENT OF FABRIC.
3. AREAS OBSERVED TO YIELD SHALL BE REMOVED AND REPLACED AT ENGINEERS DIRECTION.

MCKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority

REV:	DESCRIPTION	DATE:

54" RAW WATER MAIN DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 030174 ENGINEER ANTHONY W. BOAHN
4-10-19

CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW
WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: D-2

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

June 27, 2019

Mr. Don Betz
Executive Director
Lower Cape Fear Water & Sewer Authority
1107 New Pointe Blvd, Suite 17
Leland, NC 28451

And

Mr. Carel Vandermeyden, P.E.
Director of Engineering
Cape Fear Public Utility Authority
235 Government Center Drive
Wilmington, NC 28403

SUBJECT: Encroachment Agreement (E033-010-19-00105) going under SR 1420 (Port Royal Rd NE), SR 1421 (Goose Neck Rd), SR 1422 (Blue Banks Loop Rd NE), SR 1423 (Vernon Rd NE) and SR 1426 (Mt Misery Rd NE) in Brunswick County (Kings Bluff Raw Water Main)

Dear Sirs,

Attached for your files is a copy of Right of Way Encroachment agreement properly executed. This agreement covers the following:

Install a 54-inch raw water main by open cut under SR 1420, SR 1421, SR 1422 and SR 1423. There will be one jack and bore with a 72-inch encasing pipe under SR 1426.

- **Time Restriction – Peak Hours Restricted: No lane closures shall be allowed from 6:00am to 9:00am and from 4:00pm to 7:00pm and NO weekend lane closures. (HOURS SUBJECT TO CHANGE DUE TO TRAFFIC CONDITIONS – NIGHTTIME OPERATIONS WILL BE REQUIRED WHEN WARRANTED)**

- **Cape Fear Public Utilities has provided a letter stating that they will not release their contractor's bond until the NCDOT agrees that the work performed under this permit meets or exceeds NCDOT standards. The Encroaching Party shall notify NCDOT at 910-398-9100 upon completion of the work for a final inspection**.

- **The Specs are not included in the approval package but shall be adhered to.**

- **The Applicant shall provide a contact person to address and resolve any public complaints during the construction.**

- **The applicant is responsible for all expenses for the full-time NCDOT certified inspector. The applicant is required to submit the resume of the NCDOT certified inspector at least 30 days prior to beginning the project.**

- **NCDOT certified roadway inspector must be on site whenever the contractor is working within NCDOT right-of-way on the subject project to ensure the contractor adheres to the NCDOT Standard specifications for Roads and Structures and 2018 NCDOT Roadway Standard Drawings.**

- **All Work and materials shall be in accordance with the current edition of the following: NCDOT Standard specifications 2018 for Roads and Structures, The NCDOT Roadway Standard Drawings 2018, and the current Manual of Uniform Traffic Control Devices (MUTCD).**

- **This permit does not provide APPROVAL for any construction outside of NCDOT right-of-way.**

- **Three weeks before the road closure, the applicant shall contact Emergency Services, NCDOT District office, NCDOT Traffic services office, Brunswick County, the School system, and the residents to advise of the closure**.

- **VMS signs shall be placed a minimum 7 days prior to road closure.**

- **The traffic detour plan will be reviewed again once it has been placed on the road. NCDOT can require the applicant to make field changes to the plan.**

- **Any Pavement damaged will require a mill and fill overlay to the satisfaction of the District Engineer.**

- **Overlay will be done 45-60 days after the patch is placed and will be a 2.0" mechanical mill and fill overlay.**

- **Upon completion of construction, a certification memo that has been signed and sealed as appropriate under General Statute 89C-16 by a North Carolina Professional Engineer or Registered Land Surveyor shall be submitted to the District Engineer. All documentation shall be dated and initialed by the contractor. Verification will include inspection reports, testing reports, or any supporting documentation and calculations. Verification will cover, but is not limited to, subgrade, pavement structure, drainage, and traffic control items.**

- **Centerline pavement markings shall be installed the same day resurfacing is accomplished. All other pavement markings shall be completed within five days of resurfacing. If pavement markings are required under the permit, the permittee shall have the pavement markings pre-marked, inspected, and approved by NCDOT personnel prior to the placement of final pavement markings. Contact Traffic Services at (910) 341-2200 for pre-marking inspections or field changes**

- **A Pre-Construction meeting is required prior to beginning work. Contact the District office to schedule.**

As per this approval it is subject to this work being done in accordance with the attached plan sheets and special provisions.

Sincerely,

Aaron LeBeau

Aaron R. LeBeau, Assistant District Engineer
for Karen E. Collette, PE, Division Engineer
KEC/arl/jpw

ec: Iris McCombs, NCDOT Brunswick County Maintenance Engineer
Jessi Leonard, PE, NCDOT Division Traffic Engineer

E033-010-19-00105

ROUTE SR1420; SR1421; SR1422; SR1423; SR1426 PROJECT KINGS BLUFF RAW WATER MAIN COUNTY OF STATE OF NORTH CAROLINA BRUNSWICK

DEPARTMENT OF TRANSPORTATION

THREE PARTY RIGHT OF WAY ENCROACHMENT AGREEMENT ON PRIMARY AND SECONDARY SYSTEM

-AND-
LOWER CAPE FEAR WATER AND SEWER AUTHORITY
1107 New Pointe Blvd
Suite 17
Leland, NC 28451
910-383-1919

-AND-
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 Government Center Drive
Wilmington, NC 28403
910-332-6654

THIS AGREEMENT, made and entered into this the 27th day of June, 20 19, by and between the Department of Transportation, party of the first part; and LOWER CAPE FEAR WATER AND SEWER AUTHORITY party of the second part; and CAPE FEAR PUBLIC UTILITY AUTHORITY party of the third part,

WITNESSETH

THAT WHEREAS, the party of the second part desires to encroach on the right of way of the public road designated as Route(s) SR1420; SR1421; SR1422; SR1423; SR1426, located Crossing SR1420 approximately 1650 ft North of the intersection of SR1420 and SR1426; Crossing SR1421 approximately 1400 ft North of the intersection of SR1421 and SR1426. Crossing SR1422 approximately 1400 ft North of the intersection of SR1422 and SR1426. Crossing SR1423 approximately 800 ft North of the intersection of SR1423 and SR1426. Crossing SR1426 approximately 3000 ft East of the intersection of SR1423 and SR1426.

with the construction and/or erection of: a 54" raw water tranmission main as shown in the following documents

WHEREAS, it is to the material advantage of the party of the second part to effect this encroachment, and the party of the first part in the exercise of authority conferred upon it by statute, is willing to permit the encroachment within the limits of the right of way as indicated, subject to the conditions of this agreement;

NOW, THEREFORE, IT IS AGREED that the party of the first part hereby grants to the party of the second part the right and privilege to make this encroachment as shown on attached plan sheet(s), specifications and special provisions which are made a part hereof upon the following conditions, to wit:

That the installation, operation, and maintenance of the above described facility will be accomplished in accordance with the party of the first part's latest POLICIES AND PROCEDURES FOR ACCOMMODATING UTILITIES ON HIGHWAY RIGHTS-OF-WAY, and such revisions and amendments thereto as may be in effect at the date of this agreement. Information as to these policies and procedures may be obtained from the Division Engineer or State Utility Agent of the party of the first part.

That the said party of the second part binds and obligates himself to install and maintain the encroaching facility in such safe and proper condition that it will not interfere with or endanger travel upon said highway, nor obstruct nor interfere with the proper maintenance thereof, to reimburse the party of the first part for the cost incurred for any repairs or maintenance to its roadways and structures necessary due to installation and existence of the facilities of the party of the second part, and if at any time the party of the first part shall require the removal of or changes in the location of the said facilities, that the said party of the second part binds himself, his successors and assigns, to promptly remove or alter the said facilities, in order to conform to the said requirement, without any cost to the party of the first part.

That the party of the second part agrees to provide during construction and any subsequent maintenance proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with the latest Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the Division Engineer of the party of the first.

That the party of the second part hereby agrees to indemnify and save harmless the party of the first part from all damages and claims for damage that may arise by reason of the installation and maintenance of this encroachment.

That the party of the second part agrees to restore all areas disturbed during installation and maintenance to the satisfaction of the Division Engineer of the party of the first part. The party of the second part agrees to exercise every reasonable precaution during construction and maintenance to prevent eroding of soil; silting or pollution of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces or other property; or pollution of the air. There shall be compliance with applicable rules and regulations of the North Carolina Division of Environmental Management, North Carolina Sedimentation Control Commission, and with ordinances and regulations of various counties, municipalities and other official agencies relating to pollution prevention and control. When any installation or maintenance operation disturbs the ground surface and existing ground cover, the party of the second part agrees to remove and replace the sod or otherwise reestablish the grass cover to meet the satisfaction of the Division Engineer of the party of the first part.

That the party of the second part agrees to assume the actual cost of any inspection of the work considered to be necessary by the Division Engineer of the party of the first part.

That the party of the second part agrees to have available at the construction site, at all times during construction, a copy of this agreement showing evidence of approval by the party of the first part. The party of the first part reserves the right to stop all work unless evidence of approval can be shown.

Provided the work contained in this agreement is being performed on a completed highway open to traffic; the party of the second part agrees to give written notice to the Division Engineer of the party of the first part when all work contained herein has been completed. Unless specifically requested by the party of the first part, written notice of completion of work on highway projects under construction will not be required.

That in the case of noncompliance with the terms of this agreement by the party of the second part, the party of the first part reserves the right to stop all work until the facility has been brought into compliance or removed from the right of way at no cost to the party of the first part.

That it is agreed by both parties that this agreement shall become void if actual construction of the work contemplated herein is not begun within one (1) year from the date of authorization by the party of the first part unless written waiver is secured by the party of the

second part from the party of the first part.

During the performance of this contract, the second party, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor"), agrees as follows:

a. Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the U. S. Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

b. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

c. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

d. Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.

e. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to,

(1) withholding of payments to the contractor under the contract until the contractor complies, and/or
(2) cancellation, termination or suspension of the contract, in whole or in part.

f. Incorporation of Provisions: The contractor shall include the provisions of paragraphs "a" through "f" in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Department of Transportation to enter into such litigation to protect the interests of the State, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

That when title to the subject that constitutes the aforesaid encroachment passes from the party of the second part and vests in the party of the third part, the party of the third part agrees to assume all responsibilities and rights and to perform all obligations as agreed to herein by the party of the second part.

R/W (166) : Party of the Second Part certifies that this agreement is true and accurate copy of the form R/W (166) incorporating all revisions to date.

IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed the day and year first above written.

DEPARTMENT OF TRANSPORTATION

BY: Aaron LeBeau — Aaron R. LeBeau, Assistant District Engineer for Karen E. Collette, PE, Division Engineer

~~DIVISION ENGINEER~~

WITNESS:

Jamie Mabe Fitzsimmons

JAMIE MABE-FITZSIMMONS NOTARY PUBLIC BRUNSWICK CO., NC

Executive Director
Lower Cape Fear Water & Sewer Authority

LOWER CAPE FEAR WATER AND SEWER AUTHORITY NORTH CAROLINA CORPORATE SEAL

Second Party

WITNESS:

Donna Pope
Donna S. Pope
Clerk to the Board

CAPE FEAR PUBLIC UTILITY AUTHORITY SEAL

Director of Engineering
Cape Fear Public Utility Authority

Third Party

Encroachment Agreement Standard Conditions

District Office Contact Information:
300 Division Drive
Wilmington, NC 28401
(910) 398-9100

The ***Standard Conditions*** in this document apply to this and all encroachment agreements issued by District 3.

SC1 A ***Pre-Construction Meeting*** **is required** prior to beginning work. Contact the District Office to schedule.

SC2 If the approved permit encroaches within the limits of an active construction project the encroaching party will be required to coordinate with the NCDOT contractor as well as secure a hold harmless agreement prior to commencing work. If the approved permit encroaches within the limits of project in preconstruction, the encroaching party will be required to coordinate with the Department's Project Development Unit to ensure no conflicts are created with the installation.

SC3 An ***Initial Construction Inspection*** **is required** after the completion of the work. An Initial Inspection Report will be issued upon satisfactory completion of the work and begins the one year warranty period. Contact the District Office to schedule.

SC4 A ***Final Inspection*** **is required** for release of the bond after the one year warranty period. Contact the District Office to schedule this final inspection. Once the final inspection has been deemed satisfactory by NCDOT, the bond will be released.

SC5 All bonds will be held for a minimum of one year from the time of the *Initial Construction Inspection* Acceptance.

SC6 All traffic control, asphalt mixes, structures, construction, workmanship and construction methods, and materials shall be in compliance with the most-recent versions of the following resources: *Manual on Uniform Traffic Control Devices, Policies and Procedures for Accommodating Utilities on Highway Rights of Way, NCDOT Standard Specifications for Roads and Structures, NCDOT Roadway Standard Drawings,* NCDOT *Asphalt Quality Management System* manual, **and the approved plans.**

SC7 Prior to beginning work, it is the requirement of the Encroaching Party to contact the appropriate Utility Companies involved and make arrangements to adjust or relocate any utilities that conflict with the proposed work.

SC8 If the work is located within ½ mile of a signalized intersection, the Encroaching Party shall contact NCDOT Traffic Services at (910) 341-2200 no less than one week prior to beginning work, for the location of all traffic signal and detection cables. Location is required prior to excavation. **Cost to replace or repair NCDOT signs, signals or associated equipment shall be the responsibility of the Encroaching Party**.

SC9 Prior to beginning work, if the area of work is within a municipality limit, it is the responsibility of the Encroaching Party to notify the municipal authorities.

SC10 The approval of this agreement does not preclude the Encroaching Party from complying with any and all statutes, rules, regulations, and ordinances that may be imposed by other governmental agencies (local, state, and federal) which have jurisdiction, including but not limited to, those related to sediment control, stormwater, wetlands, streams, endangered species, and historical sites.

SC11 All wiring and related work shall conform to the latest edition of the National Electrical Safety Code.

SC12 No alteration of the approved plan will be allowed without written approval by NCDOT.

SC13 The Encroaching Party shall follow any and all revisions shown in RED on attached plan(s).

SC14 A readable, executed copy of this Encroachment Agreement shall be present at the work site at all times while performing work. NCDOT reserves the right to stop all work unless evidence of approval can be shown. Additionally, NCDOT reserves the right to further limit, restrict, or suspend operations within the right-of-way.

SC15 All flagging operations within NCDOT right-of-way require qualified and trained Work Zone Flaggers. Qualified and trained Work Zone Traffic Control Supervisors will be required on significant projects. Training for this certification is provided by NCDOT approved training sources and by private entities that have been pre-approved. For more information, visit *https://connect.ncdot.gov/projects/WZTC/Pages/Training.aspx* or contact Steve Kite, PE with the NCDOT Work Zone Traffic Control Unit at (919) 814-4937, or skite@ncdot.gov.

SC16 No lane closures shall be allowed on State Holidays (day of, day before, and day after) or during Local events.

SC17 No lane closures or impediment to traffic shall be allowed on weekends without prior written approval from the District Engineer.

SC18 One lane must be open to traffic, - only one lane closure in each direction. Ingress and egress shall be maintained to all businesses and dwellings affected by the project. Special attention shall be paid to Police and Fire Stations, fire hydrants and Hospitals.

SC19 All roadway signs removed during project work shall be reinstalled immediately after completion of work. All equipment and materials shall be removed from the NCDOT right-of-way when not in use.

SC20 Any work requiring personnel or equipment within 5' of the travel lane on an undivided roadway, or 10' of the travel lane, on a divided roadway shall require a lane closure per the latest edition of the MUTCD and the NCDOT Standard Specifications. The more stringent standards shall apply.

SC21 Material shall NOT be unloaded or stockpiled on the roadway at any time without proper lane closure during the project. Work is not permitted when the shoulder material is wet or during adverse weather conditions.

SC22 All erosion control devices shall be placed as needed prior to disturbance and maintained throughout the project. All areas disturbed (shoulders, ditches, removed accesses, etc.) shall be graded and seeded within 15 calendar days with an approved NCDOT seed mixture (all lawn type areas shall be maintained and reseeded as such).

SC23 The placement of curb and gutter is not allowed within shoulder sections of roadway.

SC24 It shall be unlawful to place any highway obstruction, including a driveway headwall, fence, rural mailbox, newspaper delivery box, or other roadside obstruction, so as to interfere with the traffic or maintenance of the roads and highways of the state highway system. See North Carolina Administrative Code 19A NCAC 2E.0404.

SC25 Fire Hydrant(s) shall be placed a maximum of 1 foot from the right-of-way line. (STD. 1515.02 in the NCDOT Roadway Standard Drawings).

SC26 Directional drilling methods have not been given statewide approval for use on NCDOT right-of-way. Under no condition shall jetting alone or wet boring with water be used for the installation of utility pipelines.

- Directional boring *is not* allowed in embankment material. Directional boring *is* allowed beneath embankment material in naturally occurring soil.
- Any changes shall be submitted to the District Engineer for approval prior to construction.
- Directional bores are not allowed beneath bridge footings, culvert wingwall footings or retaining walls.
- HDPE pipe installed by directional boring shall not be connected to existing pipe or fittings for one (1) week from the time of installation to allow tensional stresses to relax.
- Directional boring using jetting with a Bentonite (or equivalent material) slurry is approved with the following conditions:
    - Minimum depth of ten **(10')** feet below the pavement surface of roads with no control of access or fifteen **(15')** feet below the surface of roads with partial or full control of access.
    - Minimum depth of five **(5')** feet below any ditch line and/or creek bed.
    - Minimum depth of **(4')** for parallel installations. Must be outside the theoretical 1:1 slope from the existing edge of pavement except where the parallel installation crosses a paved roadway.
    - Minimum horizontal distance of ten **(10')** feet from the nearest part of any structure, including but not limited to bridges, footings, pipe culverts, and box culverts.
    - Minimum vertical distance of ten **(10')** feet from the nearest part of pipe culverts or box culverts.
    - Tip of the drill string shall have a cutter head and detection wire installed with non-ferrous material.
    - All directional drilled piping for sewer force mains and waterlines shall be a minimum of SDR-9.
    - Minimum horizontal separation of five **(5')** feet between each conduit which is part of a multiple conduit installation (including perpendicular and parallel installations). Alternatively, install multiple conduits within a single duct.
    - Overbores shall not be more than two **(2")** inches greater than the diameter of the pipe or encasement.
    - An overbore exceeding two **(2")** inches greater than the diameter of the pipe or encasement will be considered if the encroachment agreement includes a statement signed and sealed by a North Carolina Registered Professional Engineer indicating that an overbore in excess of two (2") inches of the diameter of the pipe or encasement will arch and no damage will be done to the pavement or sub-grade.

SC27 All excavations inside the theoretical 1:1 slope from the existing edge of pavement to the bottom of the nearest trench wall shall be done in accordance with the following conditions:

- Any excavation encroaching upon the theoretical 1:1 slope from the edge of pavement of any NCDOT maintained road shall require temporary active shoring that must be reviewed and approved by NCDOT **prior to work**.
- All trench excavation inside the limits of the theoretical 1:1 slope, as defined by the policy, shall be completely backfilled and compacted at the end of each construction day. No portion of the trench shall be left open overnight.
- The length of parallel excavation shall be limited to the length necessary to install and backfill one (1) joint of pipe at a time.
- Traffic shall be moved to a travel lane outside the limits of a theoretical 1:1 slope from the bottom of the nearest trench wall to the pavement surface.
- Installation of trench shoring shall be accomplished with minimal over-excavation. **Trench boxes shall not be used as shoring.**
- An NCDOT Inspector, the cost of which is to be borne by the Encroaching Party, shall be assigned to this project if deemed necessary by the Division Engineer.
- The trench backfill material shall meet the Statewide Borrow Criteria. The trench shall be backfilled, in accordance with Section 540-6 of the latest NCDOT Standard Specifications for Roads and Structures, which requires the backfill material to be placed in thicknesses between 4" and 8" loose and compacted to at least 97% of the maximum density obtained by compacting a sample in accordance with AASHTO T 180, as modified by the Department.
- At the first sign of trench failure, a trench shall be immediately backfilled with materials consisting of A-1, A-3, A-2-4 soils or A-4 soils having a maximum of 45% passing a No. 200 sieve and a maximum P.I. of 6. All work shall cease, and the Division Engineer shall be contacted. The Encroaching Party shall be required to repair any damage to the pavement caused by the excavation.
- No part of any pit shall be within three (3) feet of edge of pavement or back of curb.
- Detection tape shall be buried in the trench approximately one foot above the utility or fiber optic cable, whenever conduit is installed in right-of-way and is not of ferrous material.

SC28 The Encroaching Party shall comply with all OSHA requirements and **provide a competent person on site** to supervise excavation at all times.

SC29 Approval is only for work within NCDOT right-of-way, and excludes area(s) within Railroad right-of-way. Approval is with the understanding that NCDOT does not guarantee the right-of-way on any road.

SC30 The proposed manholes, handholes, valves or other appurtenances shall not be located in the existing ditch line, front slope of a ditch, or in a manner that would restrict the maintenance or flow of the existing ditch line.

SC31 The Encroaching Party is responsible for any and all damages caused from project work within the right-of-way, including damage to drainage structures, pavement, vegetation, etc.

SC32 Any plant or vegetation in the NCDOT planted sites that is destroyed or damaged as a result of this encroachment shall be replaced with plants of like kind or similar shape. Contact the Division Roadside Environmental Engineer at 910-259-4919.

SC33 Any pavement damaged because of settlement of the pavement or damaged by equipment used to perform encroachment work, shall be re-surfaced to the satisfaction of the District Engineer. This may include the removal of pavement and a 50' mechanical overlay. All temporary and final pavement markings are the responsibility of the Encroaching Party.

SC34 Any open cutting of pavement shall be repaired using the following method:

- Pavements shall be cut full depth and removed.
- After trench work is complete, the edges of the existing pavement along the trench shall be recut a minimum of 1' wider on each side of the trench. If the pavement is undermined, the edges of the existing pavement along the trench shall be recut to 1' beyond the undermined portion and the pavement removed. The design section stated below is to be placed in those areas.
- The pavement repair shall be performed using the following method and pavement design section:

- 11.0″ B25.0C or B25.0B Asphalt Concrete Base Course (accomplished in 2 lifts minimum) according to NCDOT Standard 654.01.
- Mill the entire area a depth of 2.0″, starting from 15′ in front of the edge of the final pavement cut.
- Overlay entire area (a minimum 50′ length mechanical overlay) with 2.0″ S9.5C or S9.5B Asphalt Concrete Surface Course for a total asphalt depth of 13″. Butt joints are required with no feathering of joints.

- All open cuts shall be backfilled, paved and traversable prior to removing lane closure.

Cape Fear
Public Utility Authority
Stewardship. Sustainability. Service.

January 28, 2019

Mr. Kenneth Clark, PE
NCDOT District 3
1194 Prison Camp Road
Whiteville, NC 28472

Re: NCDOT Encroachment Agreement
Cape Fear Public Utility Authority
US 421 Water and Wastewater Utilities

Dear Mr. Clark:

The Cape Fear Public Utility Authority is in the process of permitting the Kings Bluff Raw Water Transmission Main project. The Authority agrees to not release the contractor's bond until NCDOT has signed off on and approved the completed work. We understand that in doing so a separate bond will not be required from the contractor.

Thank you for your assistance with this matter. Please call if you have any questions.

Sincerely,

Carel Vandermeyden
Director of Engineering

Cc: Craig Wilson, Engineering Manager, CFPUA
Jess Powel, Staff Engineer, McKim & Creed
Tony Boahn, Vice President, McKim & Creed

235 Government Center Drive, Wilmington, NC 28403
t: 910-332-6560 f: 910-332-6353 www.cfpua.org

VERIFICATION OF COMPLIANCE WITH ENVIRONMENTAL REGULATIONS

(Check Appropriate Box)

☐ Permits from the N.C. Department of Environment and Natural Resources and the U.S. Army Corp of Engineers are not required for this project. However, all applicable federal and state regulations have been followed.

☑ The required permits from the N.C. Department of Environment and Natural Resources and the U.S. Army Corp of Engineers have been obtained for this project. Copies of permits and Completion Certificates are attached.

☑ All applicable NPDES Stormwater Permit requirements have been met for this project. (The applicant should contact the N.C. Division of Water Quality in Raleigh to determine if a stormwater permit is required.)

☑ The project is in compliance with all applicable sedimentation and erosion control laws and regulations.

Project Name: Kings Bluff 54" Raw Water Transmission Main

Township: Rieglewood, NC County: Brunswick

Project Engineer: McKim & Creed Phone No.: 910-343-1048

Project Contact: Jess Powell

Applicant's Name: Craig Wilson, CFPUA

Date Submitted: 6/20/2019

P.E. SEAL

6-20-19

Form VCER-1
June 1, 2006

National Pollutant Elimination System (NPDES)
Stormwater Permit Compliance Certification

I Jess Powell, a duly authorized representative of Cape Fear Public Utility Authority, an industrial/commercial/residential facility requesting attachment to a North Carolina Department of Transportation highway drainage system at Riegelwood, NC in Brunswick County, do hereby certify the following:

Check appropriate box and circle type of facility

☑ The Industrial / Commercial / Residential facility does not require an NPDES stormwater permit.

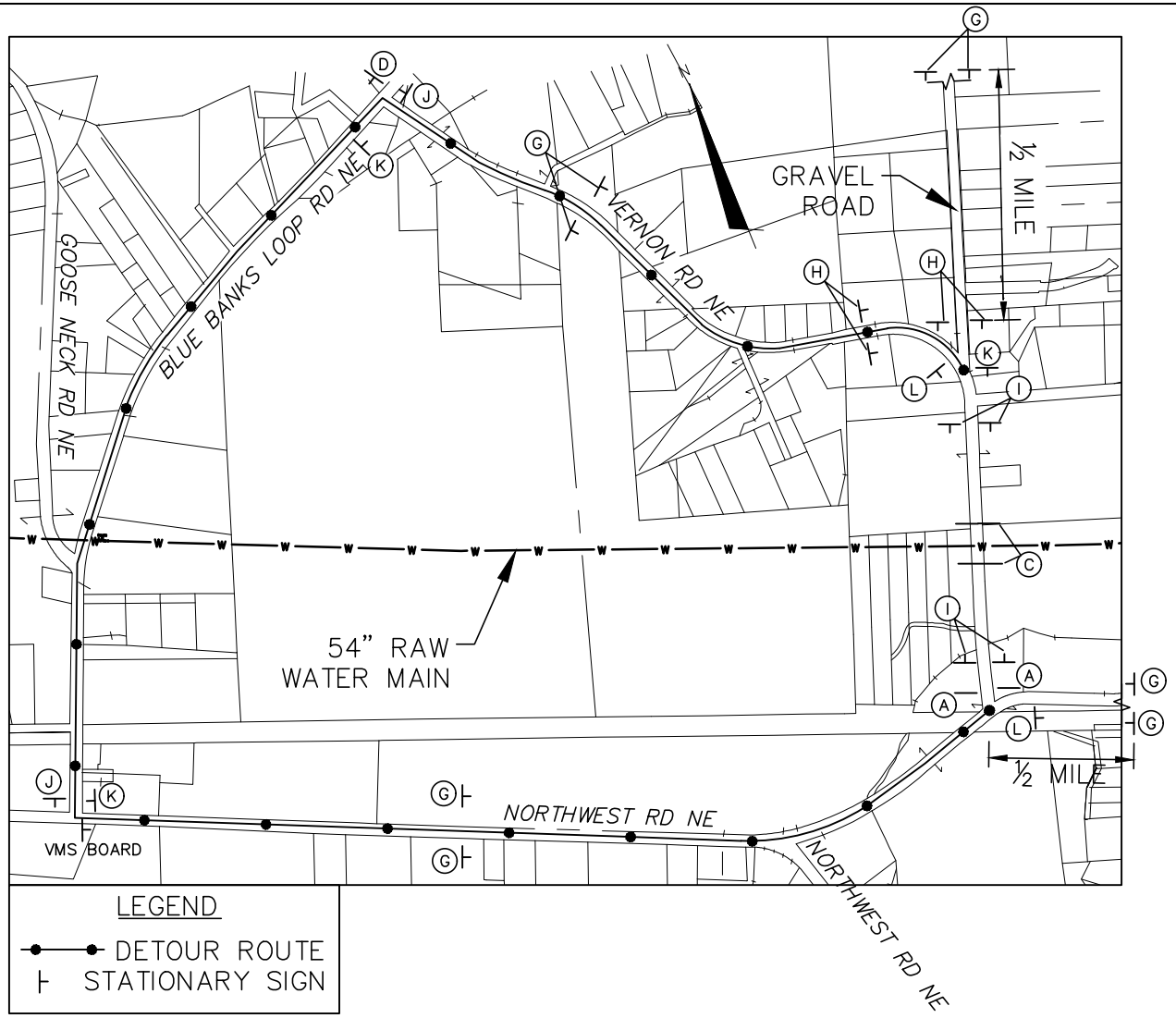
☐ The Industrial / Commercial / Residential facility does require an NPDES stormwater permit. The permit has been obtained and a Stormwater Pollution Prevention Plan (SPPP) is in place. Appropriate structural stormwater best management practices (BMP) are designed and installed as required by the Department of Environment and Natural Resources (DENR) and/or the local governing agency. All structural stormwater BMP's are located outside of NCDOT right –of-way.

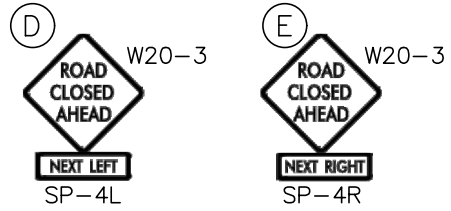
I understand if the Department of Transportation determines the facility is not in compliance with NPDES stormwater requirements, the Department will report the noncompliance to the DENR Division of Water Quality. I also understand that falsification of this certification may result in penalty of law against the facility and me as prescribed in the North Carolina General Statutes.

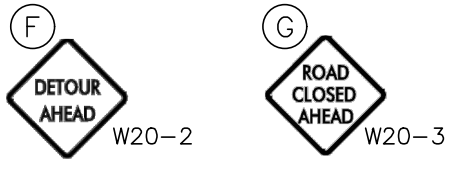
Signature: 

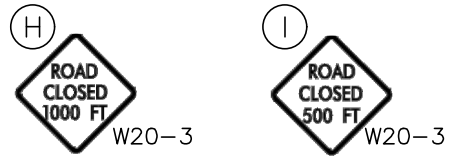
Date: 6/20/2019

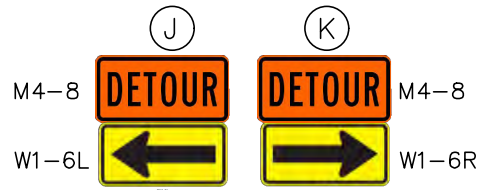
Note: If the applicant has a question as to whether an NPDES stormwater permit is required, he or she may contact the N.C. Division of Water Quality in Raleigh at (919) 733-5083 (ask for Stormwater and General Permits Unit).

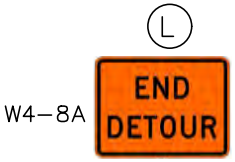


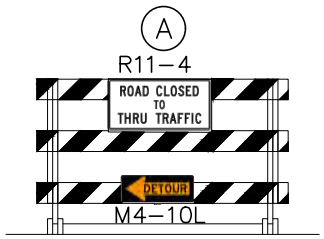


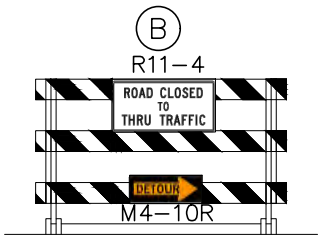


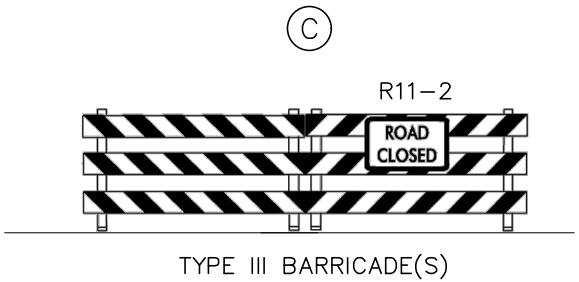










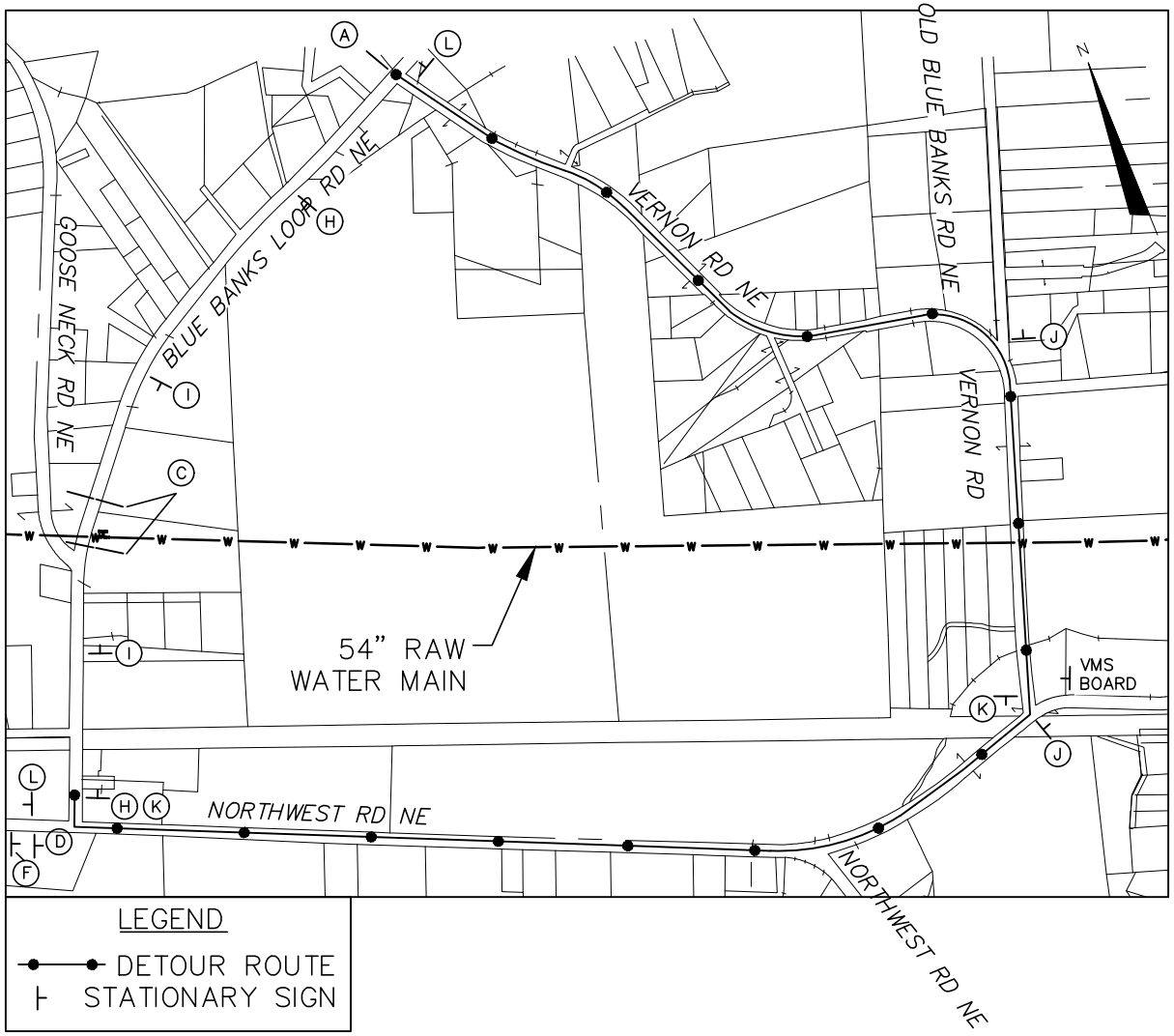


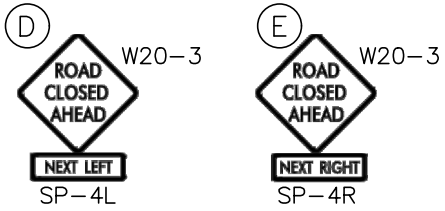
McKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

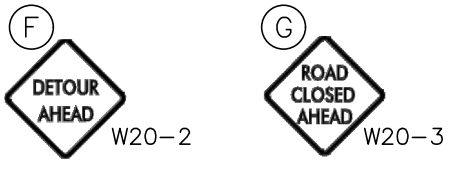
54" RAW WATER MAIN

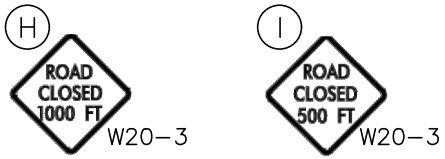
VERNON RD DETOUR ROUTE

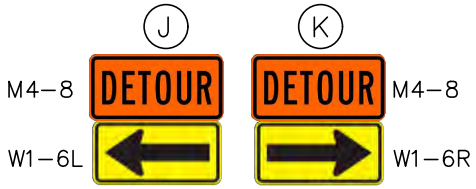
FIG 1

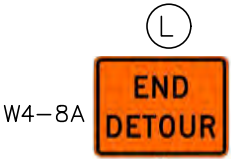


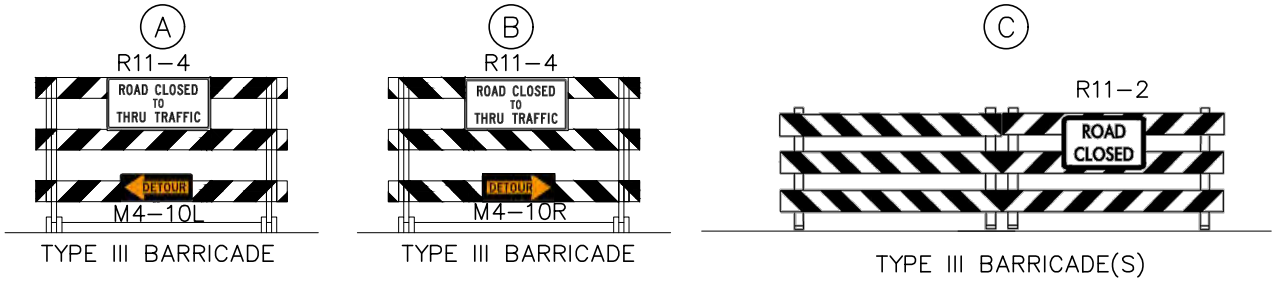












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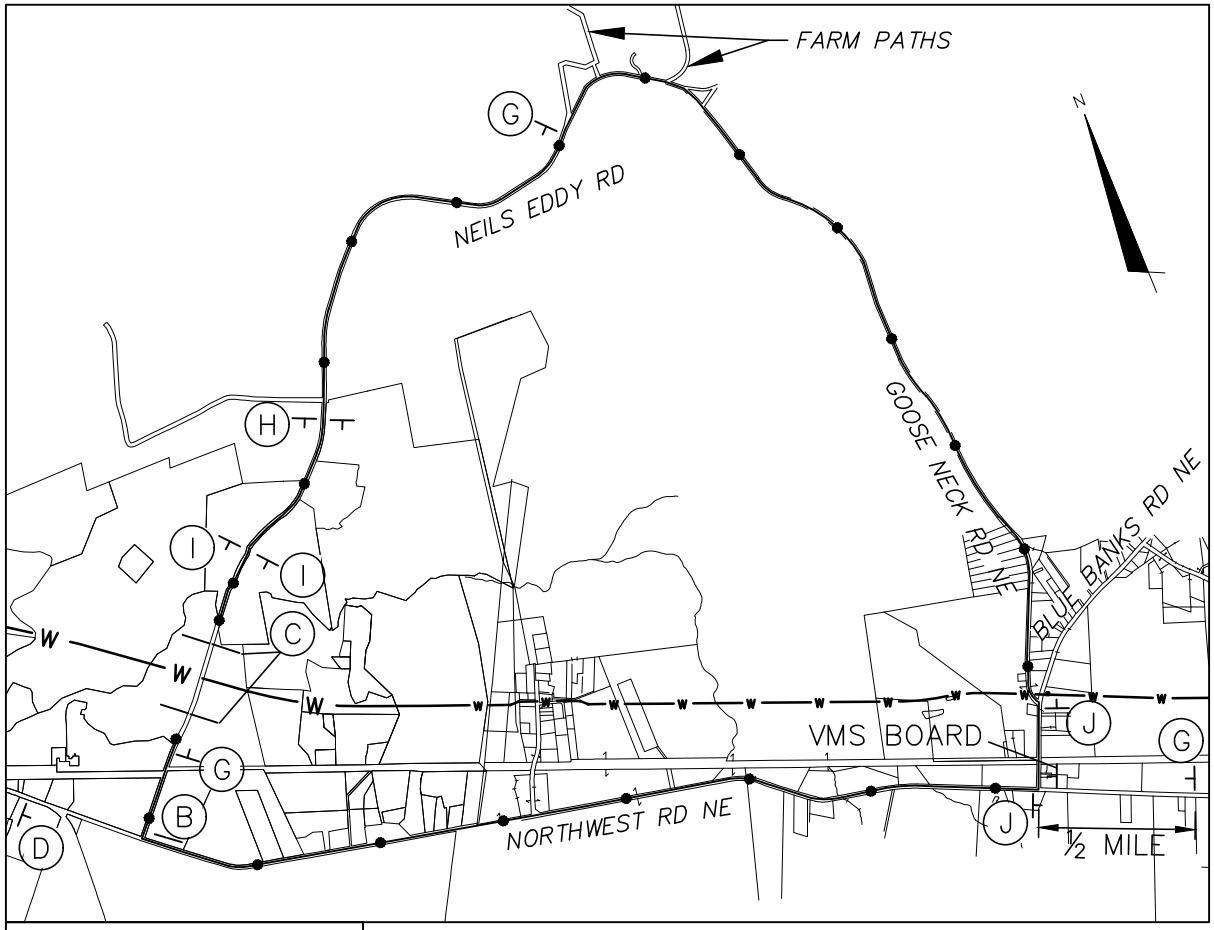
54" RAW WATER MAIN

BLUE BANKS LOOP RD NE DETOUR ROUTE

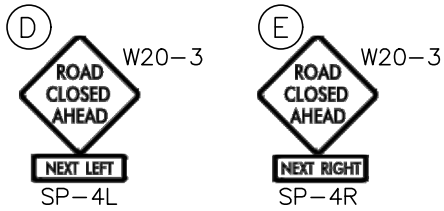
FIG 2

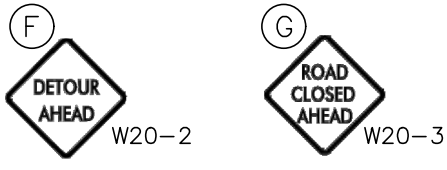


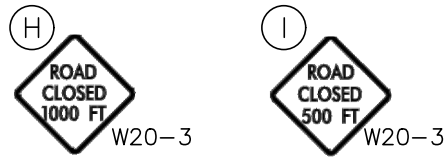
LEGEND

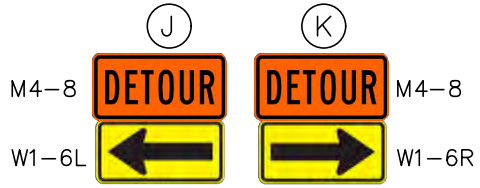
DETOUR ROUTE

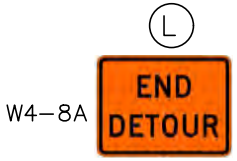
STATIONARY SIGN

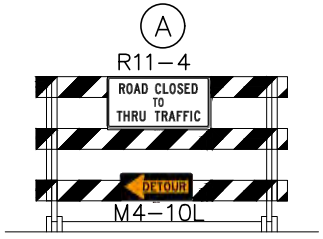




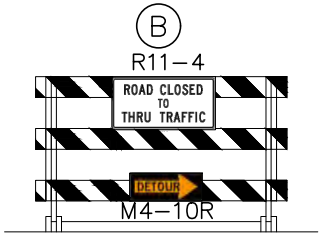








TYPE III BARRICADE



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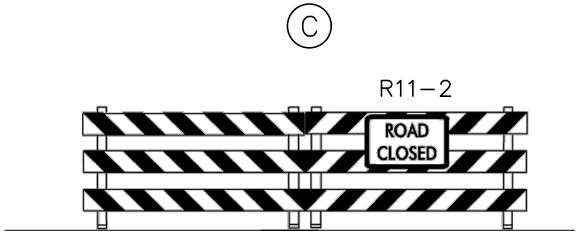

TYPE III BARRICADE(S)

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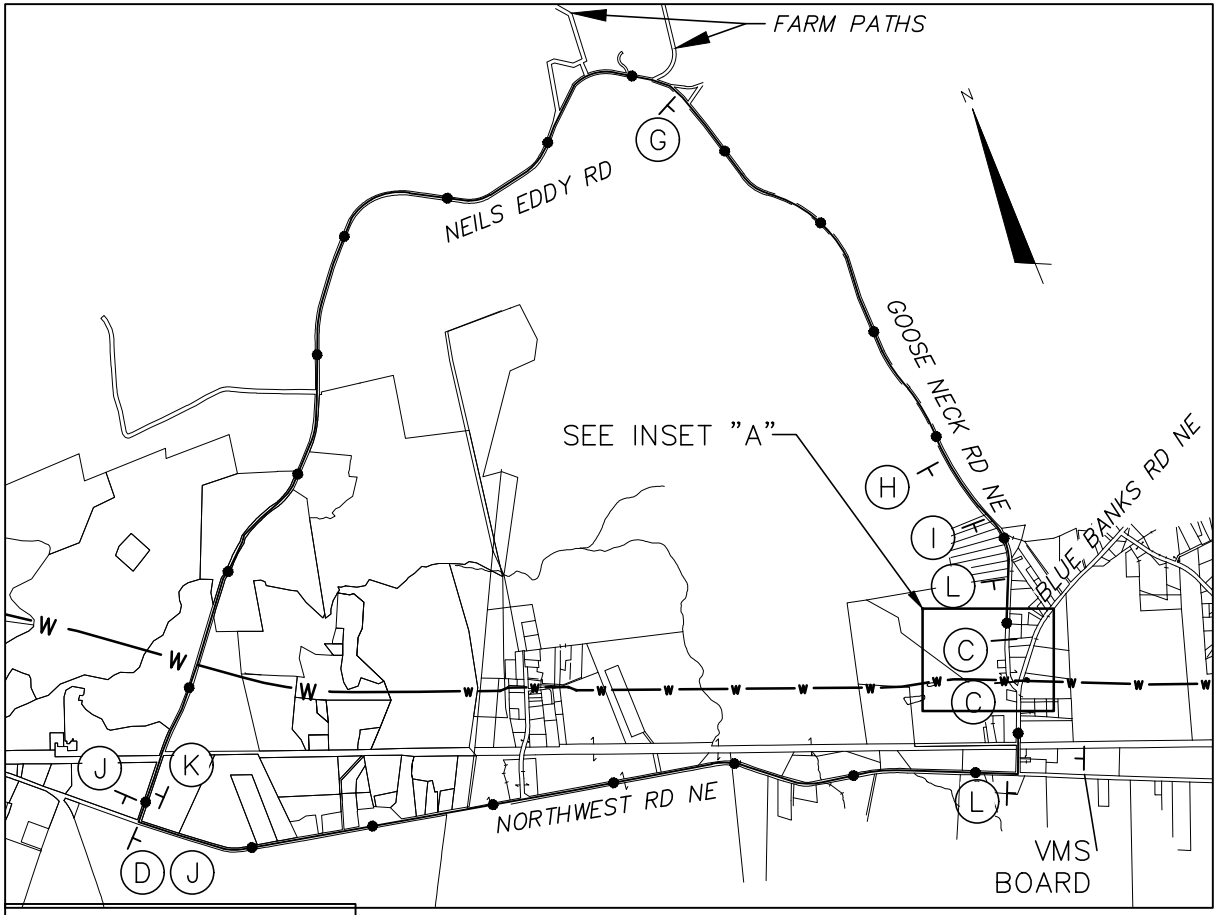
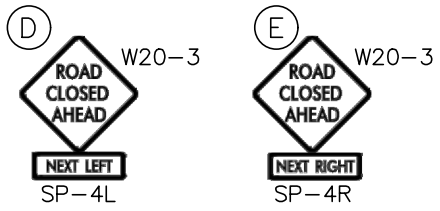
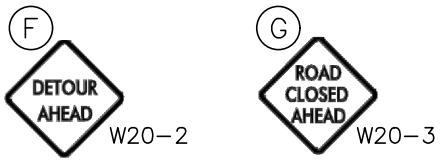
54" RAW WATER MAIN

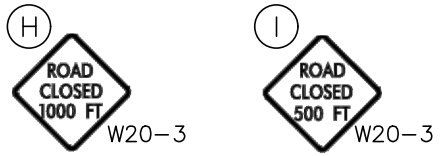
NEILS EDDY DETOUR ROUTE

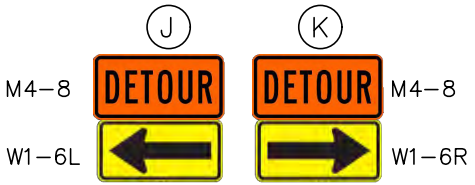
FIG 3

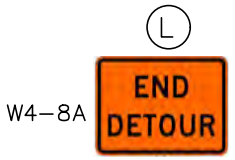


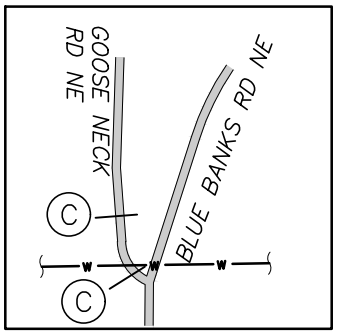


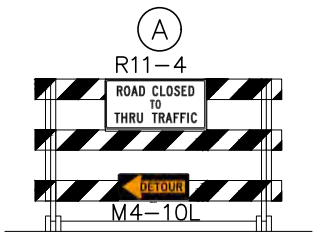


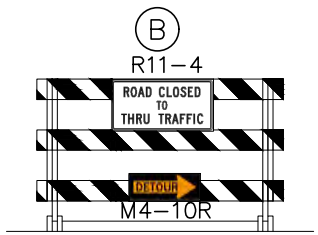


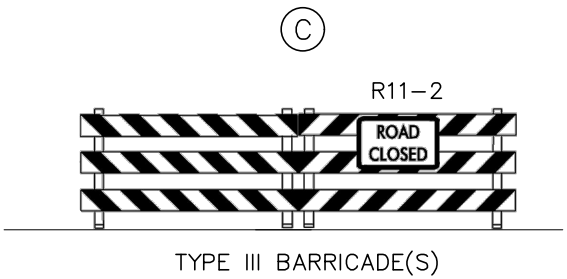












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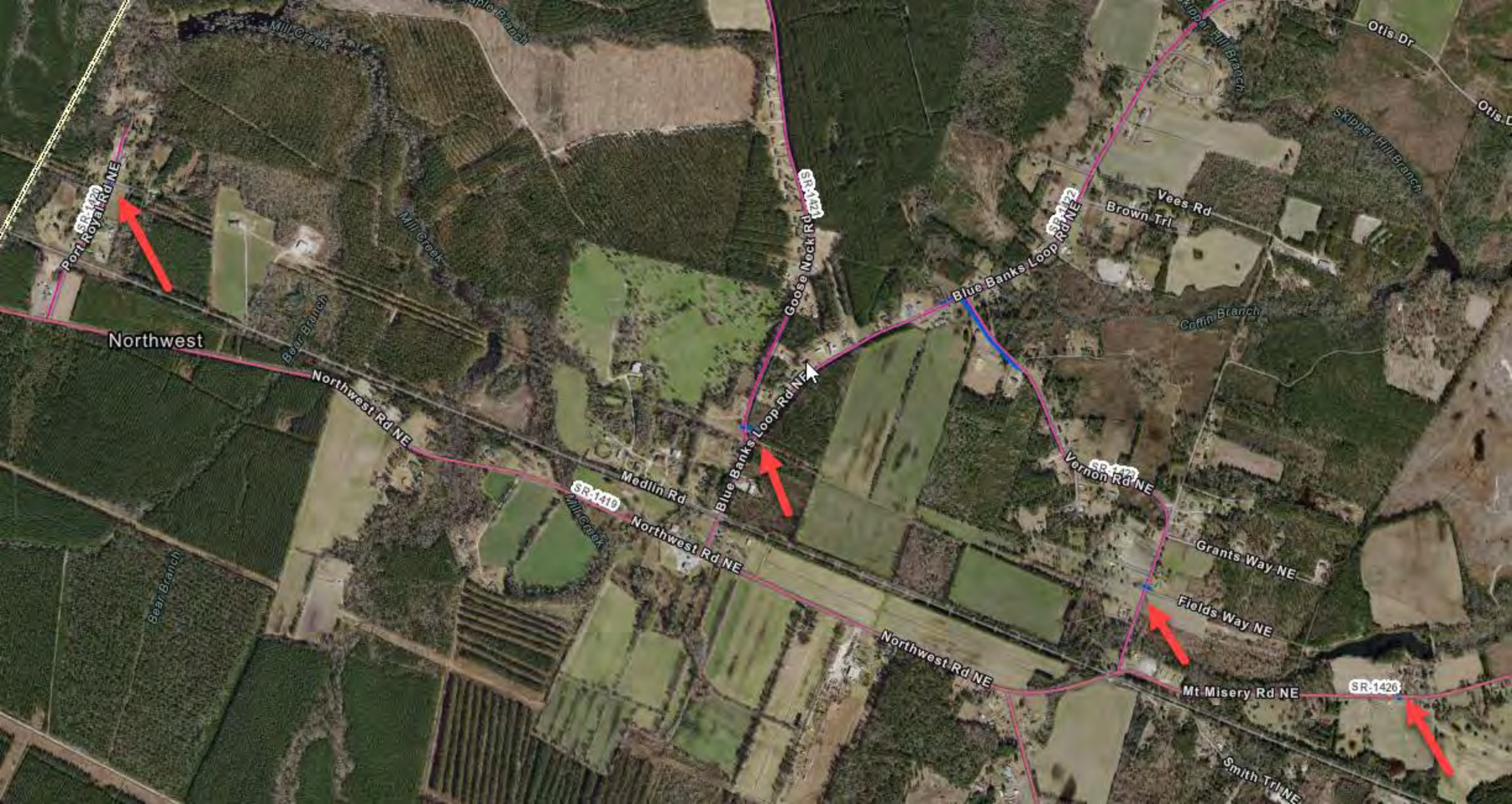
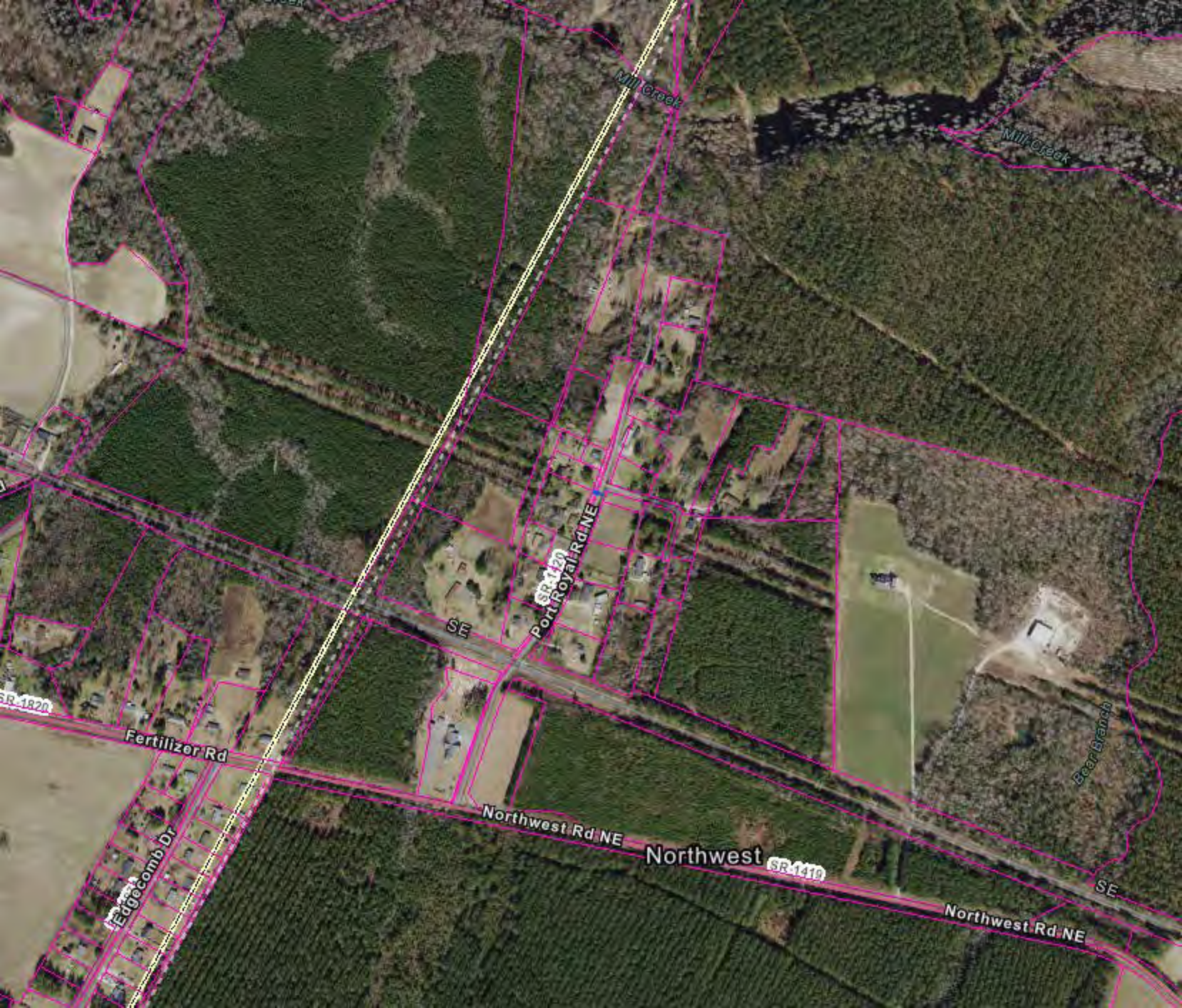
54" RAW WATER MAIN

GOOSE NECK RD DETOUR ROUTE

FIG 4


Mill Creek
Maple Branch
Otis Dr
Skipper Hill Branch
SR-1422
Port Royal Rd NE
Vees Rd
Brown Trl
Goose Neck Rd
SR-1421
Blue Banks Loop Rd NE
Coffin Branch
Northwest
Bear Branch
Northwest Rd NE
Medlin Rd
SR-1410
Vernon Rd NE
Grants Way NE
Fields Way NE
Mt Misery Rd NE
SR-1426
Smith Trl NE


Mill Creek
Mill Creek
SR 1120
Port Royal Rd NE
SE
SR 1820
Fertilizer Rd
Northwest Rd NE
Northwest
SR 1410
Northwest Rd NE
SE
Bear Branch
Edgecomb Dr


Goose Neck Rd
Goose Neck Rd
Blue Banks Loop Rd NE
Blue Banks Loop Rd NE
Medlin Rd
Medlin Rd
SE
Northwest Rd NE
SR 1436
Mill Creek

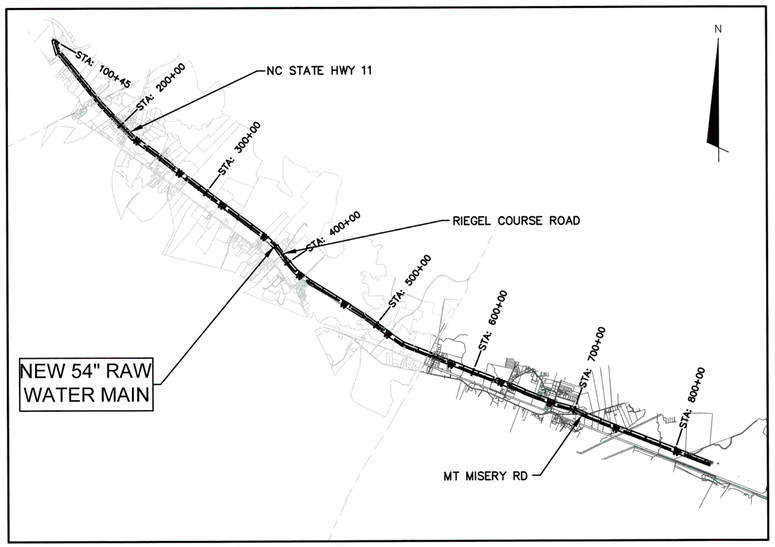

Grants Way NE
Cornelia Way
Cornelia Way
Vernon Rd NE
Fields Way NE
Fields Wa
Vernon Rd NE


Mt Misery Rd NE
SR-1426
Mt Misery Rd NE

KINGS BLUFF RAW
54" WATER TRANSMISSION MAIN

McKim & Creed Project #05367-0038

FINAL DESIGN -
NOT FOR CONSTRUCTION
APRIL 2019



VICINITY MAP
NOT TO SCALE

NORTH CAROLINA PROFESSIONAL SEAL 025512 ENGINEER ANTHONY MCBORAN
4-10-19

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Cape Fear
Public Utility Authority
Stewardship. Sustainablility. Service.

KINGS BLUFF RAW WATER TRANSMISSION MAIN
5367-0038
APRIL 2019

SHEET INDEX

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Cape Fear Public Utility Authority
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REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025014 ENGINEER ANTHONY W. BOANN
4-10-19

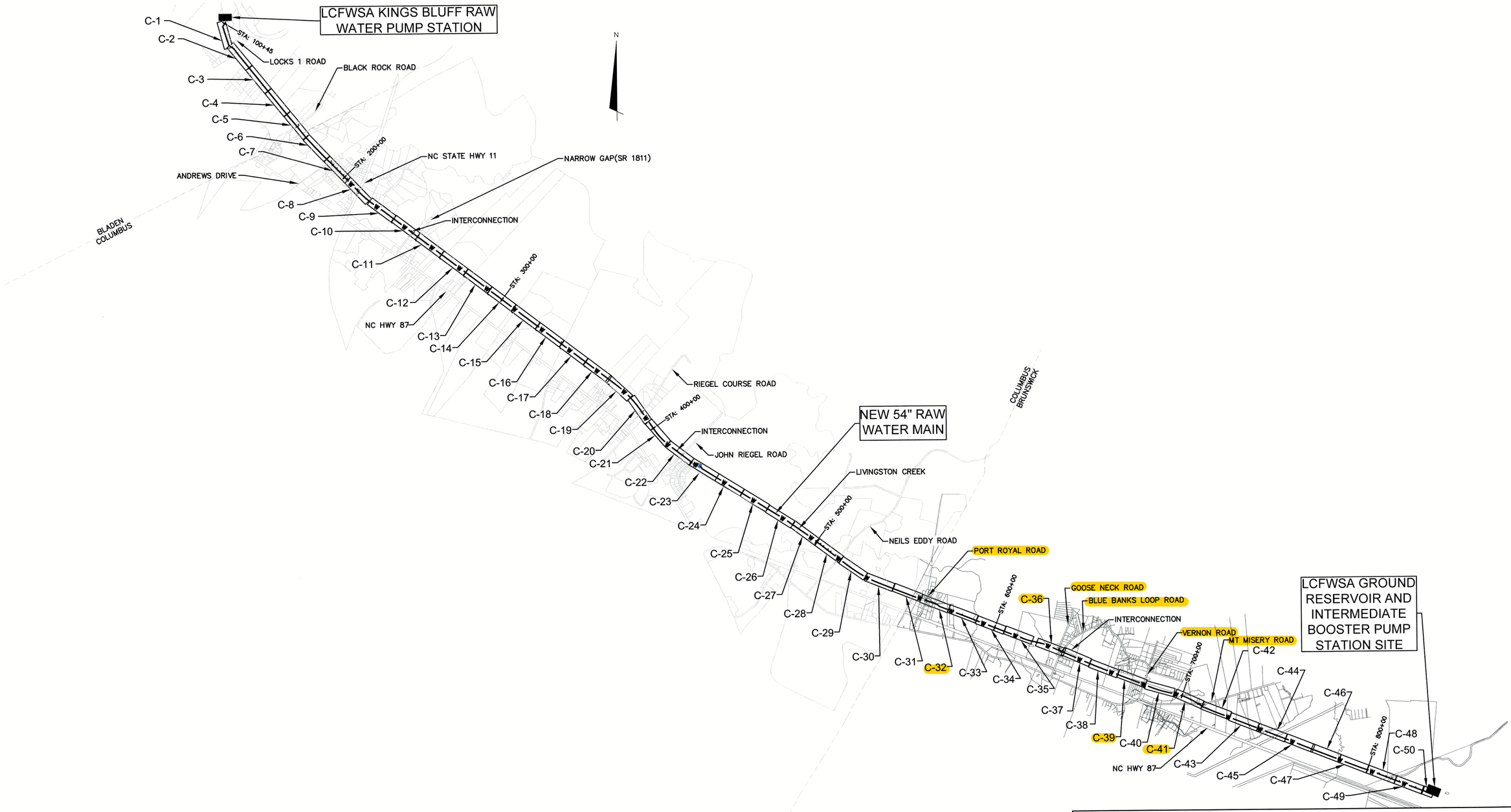
INDEX SHEET

CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: **G-1A**



KEY SHEET

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LICENSE: F-1222

Cape Fear Public Utility Authority
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REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025512 ENGINEER ANTHONY W. BOAHN
4-10-19

CAPE FEAR
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KINGS BLUFF RAW WATER TRANSMISSION MAIN

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DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: **G-2**

NOTES:

1. ALL WORK SHALL COMPLY WITH APPLICABLE STATE, FEDERAL, AND LOCAL CODES, AND ALL NECESSARY LICENSES AND PERMITS SHALL BE OBTAINED BY THE CONTRACTOR AT HIS EXPENSE, UNLESS PREVIOUSLY OBTAINED BY THE OWNER AND PROVIDED AT THE PRE CONSTRUCTION CONFERENCE.

2. DEVIATION FROM THESE PLANS AND NOTES WITHOUT THE PRIOR WRITTEN CONSENT BY THE OWNER OR HIS REPRESENTATIVE OR THE ENGINEER MAY BE CAUSE FOR WORK TO BE UNACCEPTABLE.

3. ALL PIPE LINE CONSTRUCTION SHALL CONFORM TO NCDEQ REGULATIONS, AND TO CAPE FEAR PUBLIC UTILITY AUTHORITY TECHNICAL STANDARDS, AND SPECIFICATIONS.

4. ALL PIPE LENGTHS AND DISTANCES BETWEEN STRUCTURES ARE MEASURED FROM CENTER OF STRUCTURE TO CENTER OF STRUCTURE ALONG A HORIZONTAL PLANE.

5. LOCATIONS OF EXISTING SHOWN UTILITIES ARE APPROXIMATE. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO DETERMINE THE SIZE, DEPTH, MATERIAL, AND LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO CONSTRUCTION AND TO TAKE WHATEVER STEPS ARE NECESSARY TO PROVIDE FOR THEIR PROTECTION. THE ENGINEER HAS ATTEMPTED TO LOCATE AND INDICATE ALL EXISTING UTILITIES ON THE PLANS; HOWEVER, THIS INFORMATION IS SHOWN FOR THE CONTRACTOR'S CONVENIENCE ONLY. THE ENGINEER AND THE OWNER ASSUME NO RESPONSIBILITY FOR THE LOCATIONS OF UTILITIES SHOWN OR NOT SHOWN. AT LEAST 48 HOURS PRIOR TO DIGGING ON OR OFF SITE, THE CONTRACTOR SHALL HAVE ALL UTILITIES LOCATIONS LOCATED BY "NC 811" 1-800-632-4949, THE CONTRACTOR SHALL CONTACT ANY UTILITY COMPANY WHOSE UTILITIES ARE NOT LOCATED BY "NC 811" FOR EXACT LOCATION OF THEIR UTILITIES PRIOR TO STARTING CONSTRUCTION. IT SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR TO REPAIR AND/OR REPLACE ANY AND ALL DAMAGE MADE TO UTILITIES BY THE CONTRACTOR TO EXISTING CONDITIONS AT THE CONTRACTOR'S EXPENSE.

6. THE CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY SHOULD ANY FIELD CONDITIONS BE ENCOUNTERED THAT VARY FROM THE INFORMATION PROVIDED IN THE CONTRACT DOCUMENTS.

7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING WITH DUKE ENERGY A MINIMUM OF 30 DAYS PRIOR TO CONSTRUCTION FOR ANY ADDITIONAL SUPPORT OR RELOCATION OF EXISTING POWER POLES AS REQUIRED FOR PIPELINE INSTALLATION. ALL COSTS OF SUCH WORK SHALL BE PAID BY THE CONTRACTOR. DUKE ENERGY DISTRIBUTION LINE REPRESENTATIVE: MR. JERRY PEARSEN (910) 602-4377.

8. ALL PAVEMENT CUTS SHALL BE SAW CUT ALONG A STRAIGHT CONTINUOUS EDGE, CUT THROUGH ENTIRE PAVEMENT SECTION. PAVEMENT OVERLAYS REQUIRE CITY OF WILMINGTON APPROVAL.

9. TRAFFIC ISLANDS, CURBS AND CONCRETE DRIVEWAYS SHALL BE REPLACED TO THE FIRST EXPANSION JOINT BEYOND THE TRENCH EXCAVATION LIMITS AND TO THE FULL WIDTH. TRAFFIC ISLANDS, CURBS AND CONCRETE DRIVEWAYS SHALL MATCH EXISTING.

10. THE CONTRACTOR SHALL REMOVE AND REINSTALL ALL EXISTING FENCE AS REQUIRED FOR PIPE INSTALLATION. ANY ADDITIONAL FENCE MATERIALS REQUIRED SHALL BE PROVIDED BY THE CONTRACTOR AT NO ADDITIONAL COST TO THE OWNER.

11. THE CONTRACTOR SHALL FURNISH AND INSTALL ALL SHEETING REQUIRED FOR THE INSTALLATION OF THE UTILITY, ALL EXCAVATIONS SHALL BE KEPT WITHIN THE DESIGNATED RIGHT OF WAY OR EASEMENT WIDTHS, EXCAVATION WITHIN PAVED AREAS SHALL BE KEPT TO A MINIMUM. SHEETING SHALL BE INSTALLED AS REQUIRED TO PROTECT EXISTING UTILITIES.

12. CONTRACTOR SHALL PLAN AND CONSTRUCT WORK SO AS TO CAUSE MINIMUM INCONVENIENCE TO THE OWNER AND PUBLIC. THE CONTRACTOR SHALL PROVIDE TRAFFIC CONTROL AND ERECT AND MAINTAIN AT ALL TIMES DURING THE DUKE OR TEMPORARY SUSPENSION OF WORK, SUITABLE BARRIERS, FENCES, SIGNS OR OTHER ADEQUATE PROTECTION, INCLUDING FLAG MEN AND WATCHMEN AS NECESSARY TO INSURE THE SAFETY OF THE PUBLIC AS WELL AS THOSE ENGAGED IN THE CONSTRUCTION WORK. CONSTRUCTION SIGNAGE SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF "CONSTRUCTION AND MAINTENANCE OPERATIONS SUPPLEMENT TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" BY THE NCDOT.

13. CLEARING REQUIREMENTS AND/OR CLEARING LIMITS ARE NOT DEPICTED ON PLANS. CLEARING THAT IS NOT SHOWN ON PLANS WILL BE NECESSARY FOR CONSTRUCTION. CONTRACTOR SHALL FIELD VERIFY REQUIRED CLEARING PRIOR TO SUBMITTING A BID AND SHALL INCLUDE COST TO PERFORM ALL CLEARING NECESSARY FOR CONSTRUCTION OF THE PROJECT IN THE COST OF THE WORK. THEREFORE NO SEPARATE PAYMENT FOR CLEARING SHALL BE MADE. ALL MATERIAL CLEARED AND GRUBBED BY THE CONTRACTOR IN ORDER TO CONSTRUCT THE WORK, SUCH AS TREES, VEGETATION, FENCING, ETC., SHALL BECOME THE PROPERTY OF THE CONTRACTOR AND SHALL BE PROPERLY DISPOSED OF OFF-SITE AT A STATE APPROVED DISPOSAL SITE. RECEIVE ENGINEER'S APPROVAL FOR ANY LANDSCAPE REMOVAL.

14. PRIOR TO CONSTRUCTION, CONTRACTOR SHALL VIDEOTAPE PIPE LINE ALIGNMENT INCLUDING ALL DRIVEWAYS, SIDEWALKS, ETC., TO BE DISTURBED WITHIN THE PROJECT CONSTRUCTION AREA. ALL DISTURBED AREAS SHALL BE RESTORED TO ORIGINAL CONDITION OR BETTER. VIDEO SHALL BE SUBMITTED TO THE ENGINEER AND OWNER PRIOR TO THE START OF CONSTRUCTION.

15. CONTRACTOR SHALL MAINTAIN AN APPROPRIATE CONSTRUCTION ENTRANCE FOR INGRESS/EGRESS TO EACH PROPERTY AT ALL TIMES.

16. LIMITS OF CONSTRUCTION ARE SHOWN AS ALLOWED LIMITS OF DISTURBANCE AND DO NOT GRANT RIGHT OF ENTRY TO PRIVATE PROPERTY. CONTRACTOR TO SECURE RIGHT OF ENTRY FOR ALL PROPERTIES OUTSIDE OF EASEMENTS & PUBLIC RIGHT-OF-WAY WHICH WILL BE DISTURBED OR ENCROACHED UPON DURING CONSTRUCTION. WHERE THE CONTRACTOR DETERMINES THAT ENCROACHMENT ONTO PRIVATE PROPERTY IS NECESSARY, AND AN EASEMENT HAS NOT BEEN PROVIDED, THE CONTRACTOR SHALL CONTACT INDIVIDUAL PROPERTY OWNERS AND OBTAIN WRITTEN APPROVAL FOR THAT ENCROACHMENT.

17. THE CONTRACTOR SHALL PROVIDE ALL SURVEY WHERE NECESSARY FOR CONSTRUCTION. ANY EXISTING STAKE OUT OR BENCHMARKS SHALL NOT BE USED BY THE CONTRACTOR.

20. CONTRACTOR SHALL NOTIFY HOME AND BUSINESS OWNERS AT LEAST 14 DAYS PRIOR TO ANY CONSTRUCTION ACTIVITY THAT WILL TAKE PLACE IN THEIR AREA.

21. CONTRACTOR SHALL REMOVE, STORE AND REPLACE ALL CONFLICTING MAIL BOXES, CULVERTS, HEADWALL, ORNAMENTAL STRUCTURES, ETC. WITHIN THE RIGHT OF WAY. CONFLICTING TREES WITHIN THE RIGHT OF WAY SHALL BE REMOVED AS DIRECTED BY THE ENGINEER BUT NOT REPLACED.

22. EROSION AND SEDIMENTATION CONTROL DEVICES SHALL BE INSTALLED ACCORDING TO NORTH CAROLINA SEDIMENT AND EROSION CONTROL STANDARDS AND AS DIRECTED BY THE ENGINEER. ALL DEVICES SHALL BE MAINTAINED SUCH THAT THEY FUNCTION AS INTENDED. AFTER COMPLETION OF THE PROJECT THE CONTRACTOR SHALL REMOVE ALL EROSION CONTROL DEVICES WHERE A GOOD STAND OF GRASS HAS BEEN ESTABLISHED AND EROSION IS NO LONGER EVIDENT. REMOVAL OF THE REMAINDER OF THE EROSION CONTROL DEVICES SHALL OCCUR AS OTHER AREAS ARE STABILIZED. REMOVAL OF THE EROSION CONTROL DEVICES SHALL BE PERMITTED ONLY WITH THE PRIOR APPROVAL OF THE ENGINEER. EROSION CONTROL DEVICES DEPICTED ON THE DRAWINGS ARE MINIMUM PERMIT REQUIREMENTS PER NCDEQ. CONTRACTOR SHALL PROVIDE ADDITIONAL EROSION CONTROL MEASURES AS REQUIRED TO CONTROL SEDIMENT FROM LEAVING THE SITE BASED ON HIS CONSTRUCTION ACTIVITIES.

23. ALL AREAS DISTURBED BY GRADING, EXCAVATION, AND GENERAL CONSTRUCTION SHALL BE SEEDED, MULCHED, AND RESTORED IN ACCORDANCE WITH NORTH CAROLINA SEDIMENT AND EROSION CONTROL STANDARDS.

24. EXISTING VEGETATION OUTSIDE OF THE CLEARING LIMITS TO REMAIN SHALL BE PROTECTED FROM DAMAGE.

25. ALL CONSTRUCTION ACTIVITY SHALL BE LIMITED TO PUBLIC RIGHT-OF-WAY, CITY OF WILMINGTON RIGHT-OF-WAY, AND OWNER OBTAINED EASEMENTS.

26. ANY AREAS THE CONTRACTOR UTILIZES FOR STOCKPILING SHALL HAVE ADEQUATE EROSION CONTROL MEASURES INSTALLED PER THE NORTH CAROLINA SEDIMENT AND EROSION CONTROL HANDBOOK. CONTRACTOR IS RESPONSIBLE FOR SECURING WRITTEN PERMISSION FROM PROPERTY OWNER PRIOR TO STOCKPILING MATERIAL.

27. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATING HIS CONSTRUCTION ACTIVITIES WITH THOSE OF OTHER CONTRACTORS AND OTHER ENTITIES INVOLVED IN ORDER TO ASSURE EFFICIENT AND ORDERLY INSTALLATION OF EACH PART OF THE WORK. COORDINATION CONFLICTS SHALL BE IMMEDIATELY DIRECTED TO THE ENGINEER.

28. THE CONTRACTOR SHALL NOT USE EXISTING SANITARY SEWERS AS A MEANS OF DEWATERING DURING CONSTRUCTION WORK. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SURFACE WATER RUNOFF AND GROUND WATER FROM THE TRENCHES AND SHALL PROVIDE NECESSARY DEWATERING AND PUMPING EQUIPMENT FOR HANDLING THESE FLOWS DURING CONSTRUCTION. DEWATERING ACTIVITIES TO COMPLY WITH ALL FEDERAL, STATE, AND LOCAL LAWS. ANY ADDITIONAL PERMITS REQUIRED AS A RESULT OF DEWATERING ACTIVITIES ARE THE CONTRACTOR'S RESPONSIBILITY. ALL DEWATERING COSTS ARE CONSIDERED ANCILLARY TO THE COST OF WORK AND NO ADDITIONAL COMPENSATION WILL BE CONSIDERED FOR DEWATERING. EROSION CONTROL MEASURES SHOWN ON PLANS ARE DESIGNED FOR RAINFALL EVENTS ONLY AS PER NCDEQ REGULATIONS. ADDITIONAL MEASURES REQUIRED TO CONTAIN/CONTROL DEWATERING ACTIVITIES AND ASSOCIATED DISCHARGES SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR AND INCLUDED IN THE COST OF THE WORK.

29. ANY AND ALL DISTURBED PROPERTY PINS SHALL BE RESET BY A PROFESSIONAL SURVEYOR LICENSED IN THE STATE OF NORTH CAROLINA.

30. EXISTING WATER & SEWER SERVICES DAMAGED AS A RESULT OF CONSTRUCTION SHALL BE REPAIRED/REPLACED/RELOCATED AS REQUIRED FOR CONSTRUCTION AT NO ADDITIONAL COST TO THE OWNER.

31. EXISTING SANITARY SEWER SYSTEMS SHALL REMAIN IN SERVICE AT ALL TIMES DURING CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL WORK NECESSARY TO MAINTAIN FLOW THROUGH EXISTING SYSTEM DURING CONSTRUCTION (BYPASS PUMPING, PUMP & HAUL, PLUGS, ETC.) AT NO ADDITIONAL COST TO THE OWNER. BYPASS PUMPING PLAN MUST BE SUBMITTED PRIOR TO CONSTRUCTION AND APPROVED BEFORE LINE IS REMOVED FROM SERVICE.

32. CONTRACTOR SHALL HAVE ON SITE AT ALL TIMES REPAIR MATERIALS FOR ALL EXISTING PIPE LINES SHOWN ON THE PLANS. ALL REPAIR CLAMPS & HARDWARE MUST BE OF STAINLESS STEEL CONSTRUCTION.

33. NO PIPE JOINT SHALL EXCEED PIPE MANUFACTURER'S MAX. ALLOWABLE LIMITS FOR DEFLECTION OR CAPE FEAR PUBLIC UTILITY AUTHORITY'S MAX. ALLOWABLE DEFLECTION WHICHEVER IS LESS.

34. LIMITS OF CONSTRUCTION SHALL BE DEFINED AS WITHIN THE LIMITS OF DOT RIGHT-OF-WAY AND OWNER OBTAINED EASEMENTS DEPICTED ON THE DRAWINGS UNLESS OTHERWISE NOTED. ALL DAMAGES INCURRED AS A RESULT OF ACTIVITY OUTSIDE THE DESIGNED CONSTRUCTION LIMITS SHALL BE THE CONTRACTOR'S RESPONSIBILITY.

35. CONTRACTOR TO VERIFY SIZE, DEPTH, MATERIAL AND LOCATION FOR ALL UNDERGROUND UTILITIES PRIOR TO THE START OF CONSTRUCTION. TEST EXCAVATIONS TO DETERMINE SUCH INFORMATION SHALL BE DONE PRIOR TO CONSTRUCTION AT THE CONTRACTOR'S EXPENSE.

36. SEDIMENT & EROSION CONTROLS SHOWN ARE MINIMUM ALLOWABLE. CONTRACTOR SHALL BE RESPONSIBLE FOR INSTALLATION & MAINTENANCE OF ADDITIONAL SEDIMENT & EROSION CONTROLS AS REQUIRED TO COMPLY WITH ALL APPLICABLE FEDERAL, STATE & LOCAL LAWS.

37. BY SUBMITTING A BID THE CONTRACTOR ATTESTS THEY HAVE PERFORMED ALL SITE VERIFICATIONS AS REQUIRED TO BE CONFIDENT IN EXISTING CONDITIONS AND AS SUCH NO CLAIMS FOR ADDITIONAL PAYMENT SHALL BE CONSIDERED FOR FIELD CONDITIONS WHICH MAY DIFFER FROM WHAT IS SHOWN ON THE PLAN SHEETS.

38. SLOPES (INCLUDING CUTS, FILLS AND DITCH BANKS) THAT ARE STEEPER THAN 3 HORIZONTAL TO 1 VERTICAL LEFT EXPOSED WILL, WITHIN SEVEN (7) CALENDAR DAYS AFTER COMPLETION OF ANY PHASE OF GRADING, BE PROVIDED WITH GROUNDCOVER. SLOPES THAT ARE 3 HORIZONTAL TO 1 VERTICAL OR FLATTER WILL BE PROVIDED WITH GROUNDCOVER WITHIN FOURTEEN (14) CALENDAR DAYS.

39. TEMPORARY CONSTRUCTION EXCAVATION SHORING SHALL COMPLY WITH LOCAL, STATE, & FEDERAL GOVERNING REGULATIONS, INCLUDING OSHA (29 CFR PART 1926) EXCAVATION TRENCH SAFETY STANDARDS.

40. STOCKPILES SHALL BE SETBACK A MINIMUM HORIZONTAL DISTANCE FROM THE TOP EDGE OF THE EXCAVATION EQUAL TO THE MAXIMUM DEPTH OF THE EXCAVATION, UNLESS A SHORING SYSTEM IS DESIGN BY A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NORTH CAROLINA TO HANDLE STOCKPILE SURCHARGE LOADS.

SYMBOL LEGEND

- FIRE HYDRANT
- LIGHT POLE
- POWER POLE
- GUY WIRE
- GAS VALVE
- PROPOSED SANITARY SEWER MANHOLE
- EXISTING SANITARY SEWER MANHOLE
- SANITARY SEWER VALVE
- CLEANOUT
- CURB INLET (CI) OR CATCH BASIN (CB)
- GUTTER INLET (GI)
- STORM DRAIN MANHOLE
- YARD LIGHT
- ELECTRIC HANDHOLE
- FIBER OPTIC PEDESTAL
- FIBER OPTIC MARKER/FLAG
- MAILBOX
- CHECK DAM
- TURBIDITY CURTAIN
- IRF — IRON ROD FOUND
- WATER METER
- VALVE
- SIGN
- TELEPHONE PEDESTAL
- ELECTRICAL METER BOX
- TREE LINE/LANDSCAPING
- SILT FENCE
- CONTOUR
- SD — STORM PIPE
- T — UNDERGROUND TELEPHONE LINE
- FO — UNDERGROUND FIBER OPTIC LINE
- G — UNDERGROUND GAS MAIN
- FENCE
- W — WATERLINE
- SEWER FORCE MAIN
- GRAVITY SEWER MAIN
- OHE — OVERHEAD ELECTRIC LINE
- RIGHT OF WAY (SEE NOTE 18)
- 47.72 SUE 30 — TEST HOLE LOCATION # AND AND GROUND ELEVATION (TYP) REFER TO TECHNICAL SPECIFICATIONS FOR TEST HOLE DATA
- BENCHMARK
- ALLOWABLE OPEN CUT TRENCH WIDTH
- DRIVEWAY/ROAD
- PT1-3 — GEOTECH

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Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025512 ENGINEER ANTHONY W. BOAHN
4-10-19

GENERAL NOTES AND LEGEND

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

SHEET NO: G-3

Parcel ID on Plans	PARCEL NUMBER	DEED BOOK/PAGE	OWNER	ADDRESS
			BLADEN COUNTY	
1	221300282518	509/772	CAPE FEAR PUBLIC UTILITY AUTHORITY	235 GOVERNMENT CENTER DRIVE, WILMINGTON NC 28403
2	221300285931	113/050	CAPE FEAR PUBLIC UTILITY AUTHORITY	235 GOVERNMENT CENTER DRIVE, WILMINGTON NC 28403
3	221300184415	604/754, 95/105, 129/262, 113/262	ALEXANDER ALMA DANIEL	23835 NC 87 HWY EAST RIEGELWOOD NC 28456
4	221300279456	215/212	SNOWDEN GEORGE WASHINGTON	870 LOCKS RD. RIEGELWOOD NC 28456
5	221300367881	DEATH/CERT10 410/408	MACON BOBBY L	23338 NC HWY 87 EAST
6	221300455374	283/471	BREWER JAMES N	2340 BRYAN AVE. VENICE CA 90291
7	221300550097	478/518	CARTER HACKNEY & HUDSON LLC	102 OXFORD RD LUMBERTON NC 28358
8	221300544137	303/731-73	MYERS TILDA ANN BOLINGER	97 CORNWALLIS ROAD RIEGELWOOD NC 28456
9	221300535725	197/97	NC STATE HIGHWAY COMMISSION	PO BOX 197 RALEIGH NC 27604
10	221300536550	DEATH/CERT11	SANDERS OLIVIA B HEIRS	PO BIX 156 RIEGELWOOD NC 28456
11	221300532298	291/052	NEAL WILLIAM J ETUX EDITH	299 BLACKROCK ROAD RIEGELWOOD NC 28456
12	221300537164	291/052	BLANKS SHERMAN	PO BOX 957 RIEGELWOOD NC 28456
			COLUMBUS COUNTY	
13	2213.00-62-3775.000	387/860	BLANKS SHERMAN	PO BOX 957 RIEGELWOOD NC 28456
14	2213.00-72-7381.000		LANE JESSE B & VIRGENTA B	6407 S PLANK RD CAMERON NC 28326
16	2213.00-71-4642.000	479/504	GRAHAM LEON	421 ANDREWS DRIVE RIEGELWOOD NC 28456
17	2212.00-79-5417.000	534/98	F & J PROPERTIES	118 N CARDINAL DR. WILMINGTON NC 28405
18	2213.00-71-6564.000	1070/665	RAYNOR CASHA	324 WATERLINE WAY PO BOX 233 RIEGELWOOD NC 28456
20	2213.00-71-6303.000	754/828	CARR THERESA A & JEREMIAH	4515 BLUE BANKS LOOP ROAD LELAND NC 28451
19	2213.00-71-7447.000	743/589, 585/231	BANK OF AMERICA NA	100 N TRYON ST CHARLOTTE NC 28255
21	2213.00-71-8336.000	608/237	CAVANAUGH ARTHUR J (JR) & SONYA R	PO BOX 83 DELCO NC 28436
22	2213.00-71-9218.000	608/239	WYATT LISA	258 WATERLINE WAY RIEGELWOOD NC 28456
23	2213.00-71-9168.000	938/275	RIVERA CIRO Z	236 WATERLINE WAY PO BOX 12997 WILMINGTON NC 28405
24	2213.00-81-0161.000	1159/336	BROWN THEODORE C (JR) & BONITA D	32668 NC HWY 210 CURRIE NC 28435
25	2213.00-81-1041.000	1154/597	BOWEN E W	23588 NC 87 HWY E RIEGELWOOD NC 28456
26	2213.00-80-2819.000	629/90	MALDONADO NANCY ANN & FRANKIE	PO BOX 2034 SPRINGFIELD MA 01101
27	2213.00-80-3822.000	938/273	ROGERS LARRY RAY	PO BOX 419 RIEGELWOOD NC 28456
28	2213.00-80-4705.000	793/785	PETERSON RONNIE RAY	124 WATERLINE WAY RIEGELWOOD NC 28456
29	2213.00-80-8731.000	624/926	SAULS LAWRENCE J & LOUISE	3330 BRAGG DR. WILMINGTON NC 28409
30	2212.00-79-5417.000	534/98	F & J PROPERTIES	118 N CARDINAL DR. WILMINGTON NC 28405
31	2213.00-90-1067.000	874/387	GREEN CONNIE J	PO BOX 2805 GLEN ROSE TX 76043
32	2212.00-99-2160.000	487/764	EASON JERRY DONALD	6828 OLD STAGE HWY RIEGELWOOD NC 28456
33	2212.00-99-4742.000	932/306	ROBINSON ELWOOD NATHAN	716 BEAVER RIDGE DR. PO BOX 291 RIEGELWOOD NC 28456
34	2212.00-99-5675.000	868/19	PRIDGEN RONNIE PAUL & KIMBERLY ROBINSON PRIDGEN	716 BEAVER RIDGE RD. RIEGELWOOD NC 28456
35	2212.00-99-8698.000	861/138	PRIDGEN RONNIE PAUL & KIMBERLY ROBINSON PRIDGEN	716 BEAVER RIDGE RD. RIEGELWOOD NC 28456
36	2222.00-09-1365.000	947/678	MACARTNEY EARL F (III) & CORRINE G	PO BOX 454 RIEGELWOOD NC 28456
37	2222.00-07-2927.000	933/767	CAINES PAMELA SUE CARROLL	PO BOX 843 RIEGELWOOD NC 28456
38	2222.00-49-6364.000	1073/524	W3 CAPE FEAR LLC	2927 N KERR AVE. WILMINGTON NC 28405
39	2222.00-18-6023.000	912/97	MAUNEY CHRISTOPHER TODD (SR) & SUSAN C MAUNEY	400 NARROW GAP ROAD RIEGELWOOD NC 28456
41	2222.00-27-2575.000	1022/16	HEATH JIMMIE R	PO BOX 367 LELAND NC 28451
42	2222.00-26-2675.000	321/320	HEATH MARGARET B	3500 TALL PINE CT WILMINGTON NC 28409
43	2222.00-26-6483.000	1007/711	BLAKE JOHN ALAN	5692 OLD STAGE HWY RIEGELWOOD NC 28456
44	2222.00-36-2032.000	1035/30	SKIPPER PENNY BLAKE	5760 OLD STAGE HWY RIEGELWOOD NC 28456
45	2222.00-35-9819.000	786/398	BLAKE LLOYD ALAN & TONI A	5690 OLD STAGE HWY RIEGELWOOD NC 28456
46	2222.00-56-5030.000	668/577	TRAYNHAM DAVID D (SR) (TRUST)	PO BOX 30787 CHARLOTTE NC 28230
47	2222.00-63-9945.000	757/329	MOORE DAVID & LOUISE M JARRELL	5606 HILLWOOD STREET WILMINGTON NC 28409
48	2222.00-82-0923.000	209/637	WOODBURN WALTON A & NELLIE L	4678 OLD STAGE HWY RIEGELWOOD NC 28456
49	2232.00-04-8488.000	895/163	PRIEST JOSEPH G	5101 OLEANDER DR. WILMINGTON NC 28403
51	2232.00-11-6043.000	243/84	BROWN WILLIAM F & CATHERINE	1409 PARKLAND WAY LELAND NC 28451
52	2232.00-10-7397.000	1022/16	HEATH JIMMIE R	PO BOX 367 LELAND NC 28451
53	2231.01-18-9949.000	147/316	WILLIAMS MAGGIE H HEIRS	3864 GILLETTE DR. WILMINGTON NC 28403
54	2231.01-28-6537.000	10 E/326	CARROLL ALSON D (JR)	3254 MOBLEYS BRIDGE RD. GRIMELAND NC 27837
55	2231.01-48-8634.000	556/30	FEDERAL PAPER BOARD CO. INC	865 JOHN L RIEGEL RD. 28456 RIEGELWOOD NC 28456
56	2231.02-98-1989.000	190/33	FEDERAL PAPER BOARD CO. INC	865 JOHN L RIEGEL RD. 28456 RIEGELWOOD NC 28456
57	2241.00-13-9158.000	1064/921	CRONLY BLUFFS LLC	514 WAYNE DR WILMINGTON NC 28403
58	2231.04-91-9502.000	799/329	OAK BARK CORPORATION	1224 OLD STAGE HWY RIEGELWOOD NC 28456
59	2241.00-20-7826.000	1064/921	CRONLY BLUFFS LLC	514 WAYNE DRIVE WILMINGTON NC 28403
60	2240.00-49-4660.000	971/400	ELLIS ROBERT M & ENNIS B	410 ELLIS FARM RD RIEGELWOOD NC 28456
61	2241.00-30-4508.000	973/46	CARROLL MARGARET E & HUBERT	378 PINELAND RD RIEGELWOOD NC 28456
62	2241.00-40-2790.000	973/48	ATWOOD ROSA MARIA E	590 ELLIS FARM RD RIEGELWOOD NC 28456
63	2241.00-50-7692.000	869/765	TC&I TIMBER COMPANY LLC	ONE SW COLUMBIA STE 1700 PORTLAND OREGON 97258
64	2241.00-60-8752.000	424/365	SIMPSON JANIE LOUISE	3935 NORTHWEST ROAD LELAND NC 28451

Parcel ID on Plans	PARCEL NUMBER	DEED BOOK/PAGE	OWNER	ADDRESS
			BRUNSWICK COUNTY	
65-67	224000694219	375/576	BROWN WALTER	5485 PORT ROYAL RD. RIEGELWOOD NC 28456
68-70	224000698219	134/338	SIMPSON WILLIE & ETALS	5519 PORT ROYAL RD. RIEGELWOOD NC 28456
71	224000791448	80/83	GRAINGER GEORGE HRS	5494 PORT ROYAL RD. RIEGELWOOD NC 28456
72	224000794624	1407/965	FORMEY THEODORE ET GAILEY	820 THIERIOT AVE APT 5E BRONX, NY 10473
73A	224000793290	1407/959	GOODWIN WILLIAM J	5526 MILLS TRAIN NE RIEGELWOOD NC
74			JENNINGS HARVARD ELIZABETH	5524 MILLS TRAIL NE RIEGELWOOD, NC 28456
75	224000828781	2978/001	WALTERS MICHAEL P ETALS	PO BOX 457 TABOR CITY NC 28463
76-77	224000888701	3196/1091	GRICE JAMES DARREN ETUX CHRISTY	5400 NORTHWEST ROAD RIEGELWOOD NC 28456
78	225000097198	2495/1247	TC&I TIMBER COMPANY LLC	ONE SW COLUMBIA SUITE 1700 PORTLAND OR 97258
79A	225000177172	520/769	CARROLL CHARLES LEO ETUX SUSAN S	5014 NORTHWEST RD. NE RIEGELWOOD NC 28456
79	225000274580	1523/0105	CARROLL CHARLES R	5080 MEDLIN RD NE RIEGELWOOD NC 28456
80-81	225000373588	244/828	CAROL CARROLL M	5080 MEDLIN RD NE RIEGELWOOD NC 28456
82	225000460680	1298/1313	KEITH-PERRY LLC	PO BOX 20290 RALEIGH NC 27619
84	225002564741	1909/0291	CARROLL CHARLES L ET SUSAN S	5014 NORTHWEST RD. NE RIEGELWOOD NC 28456
85	225002654519	502/775	CARROLL CHARLES LEO ETUX SUSAN S	5014 NORTHWEST RD. NE RIEGELWOOD NC 28456
86	225002752005	2731/1383	VERNON ALEXANDER JEROME	2100 DOVER CT. WINDSOR CT 06095
87	225002752082	2731/1381	VERNON ALEXANDER JEROME	2100 DOVER CT. WINDSOR CT 06095
88	225002753070	2731/1379	VERNON ALEXANDER JEROME	2100 DOVER CT. WINDSOR CT 06095
89	225004744967	546/1063	VERNON ALEXANDER JEROME	2100 DOVER CT. WINDSOR CT 06095
90	225004745977	398/252	VERNON WILMA	4655 VERNON RD. LELAND NC 28451
91	225004746986	398/244	VERNON MARY	4655 VERNON RD. LELAND NC 28451
92	225004845659	1068/0319	PERKINS ROSALIND	246 NORTH COLONY CIRCLE
93	225004948792	3352/300	PETERSON NEDRY HARRY ETALS	31190 NE VERITAS LANE NEWBERG OR 97132
94, 95, 97	226001057037	238/264	PETERSON ELSIE	4514 MT MISERY RD NE LELAND NC 28451
96	226003033728	1121/468	PETERSON H O III	360 CROSSFIELD RD. KING OF PRUSSIA PA 19406
98	226003131606	1760/1045	PETERSON R GLEN	PO BOX 28675 RALEIGH NC 27611
99	226003137547	515/092	PETERSON NEDRY HARRY P	31180 NE VERITAS LANE NEWBERG OR 97132
100	226003232650	3442/1077	PETERSON H O III ETALS	PO BOX 28675 RALEIGH NC 27611
101	226003237392	3097/636	BUCHANAN SHEILA OWENS	715 DEWOIL PLANT RD. DELCO NC 28436
102	226003334318	3097/668	SPIVEY PAMELA	4439 MT MISERY RD. LELAND NC 28451
103	226003339563	3097/704	JENKINS RHONDA OWENS	10 BOURBON ST. LELAND NC 28451
104-105	226004524452	83/420	CORBETT BROTHERS	PO BOX 210 WILMINGTON NC 28401
106	226004817762	489/729	BRUNSWICK COUNTY C/O FINANCE DEPT.	PO BOX 249 BOLIVIA NC 28422
107	227003121569	2621/0652	REDMOND CAROL & ETALS	3400 RED BERRY DR WILMINGTON NC 28409
108	227004505402	3224/0367	SMM SOUTHEAST LLC	325 N LASALLE ST STE 550 CHICAGO IL 60654
109	217901293732	509/261	LOWER CAPE FEAR WATER AND SEWER AUTHORITY	1107 NEW POINTE BLVD #17 LELAND NC 28451

NOTE:

PARCEL NUMBER, DEED BOOK/PAGE #, OWNER AND ADDRESS INFORMATION SHOWN ON THIS SHEET IS BASED ON INFORMATION AVAILABLE FROM GIS AND TAX RECORDS. INFORMATION IS NOT GUARANTEED AND IS PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

McKIM & CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025976 ENGINEER ANTHONY W. BOAHN
4-10-19

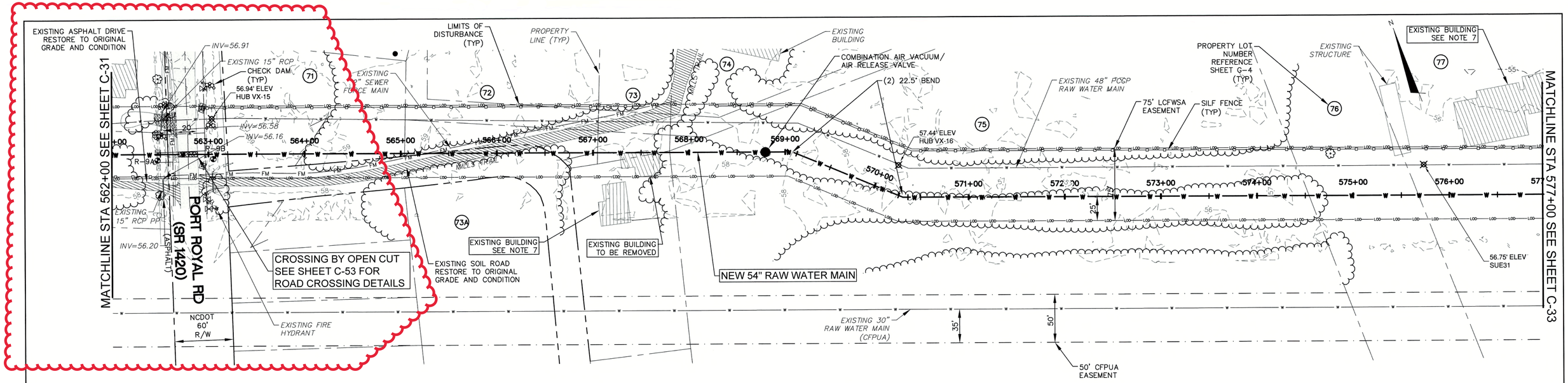
PROPERTY LOT NUMBER REFERENCE SHEET

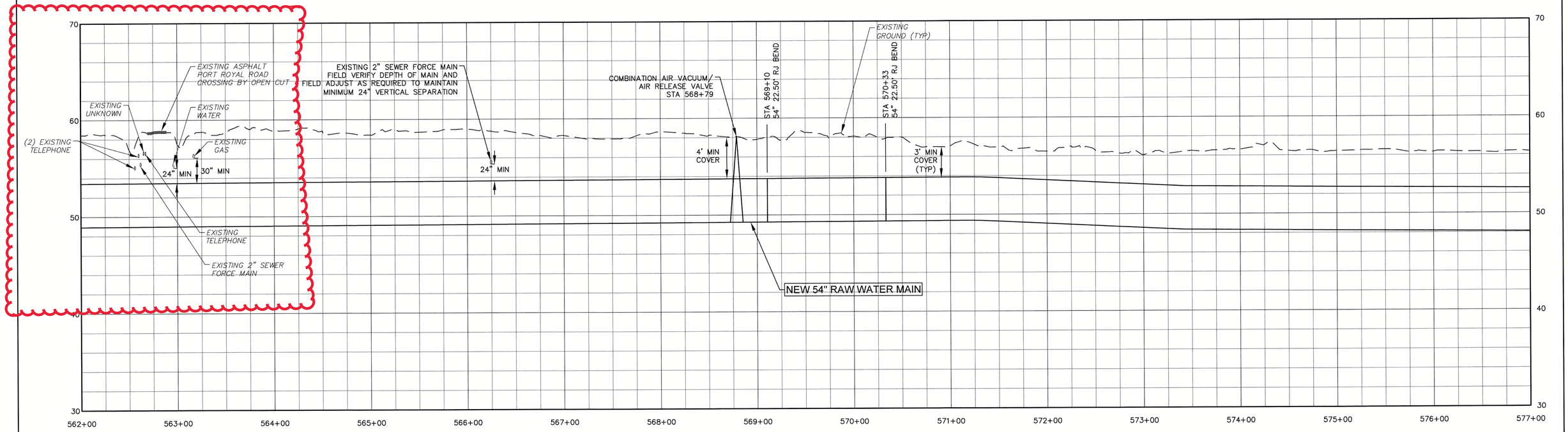
CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: G-4





GENERAL NOTES:

1. LAYOUT BASED ON STANDARD FITTING SIZES USING MAXIMUM JOINT DEFLECTION OF 2 DEGREES AND MINIMUM RADIUS OF 700 FT.
2. CONTRACTOR SHALL TAKE THE NECESSARY STEPS TO PROTECT THE EXISTING 48" RAW WATER MAIN.
3. ALL EXCAVATIONS (TRENCHING, BORING, BORE PITS, ETC) ARE UNCLASSIFIED. GEOTECHNICAL REPORT AND BORING LOGS HAVE BEEN PROVIDED IN PROJECT SPECIFICATIONS.
4. SITE SURVEY WAS PERFORMED BY MCKIM AND CREED IN 2017. ALL COORDINATES ARE TIED TO THE NORTH CAROLINA STATE PLAN COORDINATE SYSTEM (NAD 83 FEET).
5. THE LOCATION OF ALL EXISTING UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY LOCATIONS.
6. NEW 54" RAW WATER MAIN SHALL BE WELDED STEEL PIPE (THICKNESS MIN = 0.22, LINING = CEMENT MORTAR, COATING = POLYURETHANE) OR DUCTILE IRON PIPE (PC 150, LINING = CEMENT MORTAR, COATING = POLYWRAP). CONTRACTOR SHALL UTILIZE ONLY ONE MATERIAL UNLESS APPROVED BY ENGINEER OR MATERIAL IS SHOWN ON PLANS.
7. CONTRACTOR SHALL NOT DISTURB OR DAMAGE EXISTING STRUCTURE OR STRUCTURE FOUNDATION. CONTRACTOR SHALL PROVIDE GEOTECHNICAL INSTRUMENTATION AND MONITORING FOR THIS STRUCTURE AS PER BID LINE ITEM 27.

50' 0 50' 100'
SCALE: 1"=50' (Horiz.)

5' 0 5' 10'
SCALE: 1"=5' (Vert.)

McKIM&CREED
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WILMINGTON, NORTH CAROLINA 28401
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LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

54" RAW WATER MAIN PLAN AND PROFILE STA 562+00 TO STA 577+00

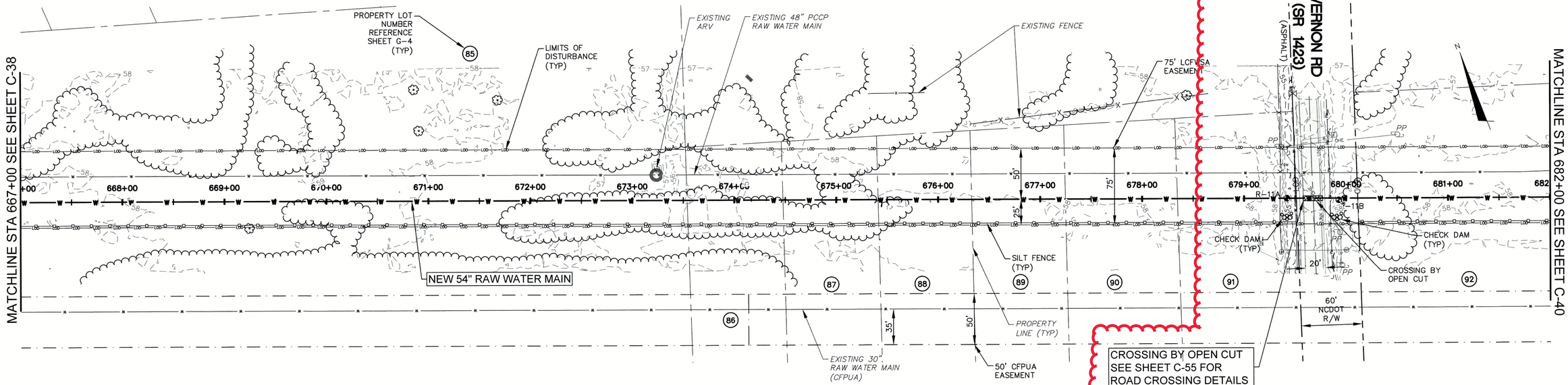
NORTH CAROLINA PROFESSIONAL SEAL 025121 ENGINEER ANTHONY W. BOAHN
4-10-19

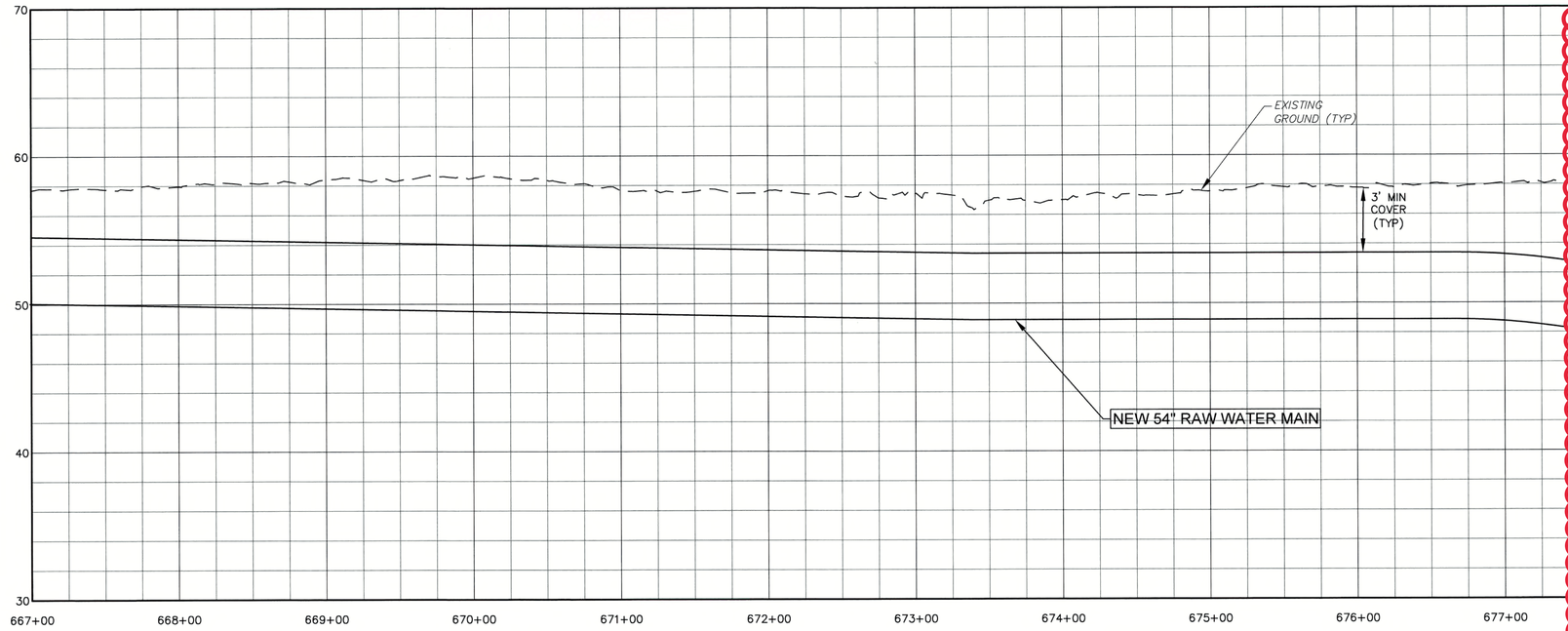
CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

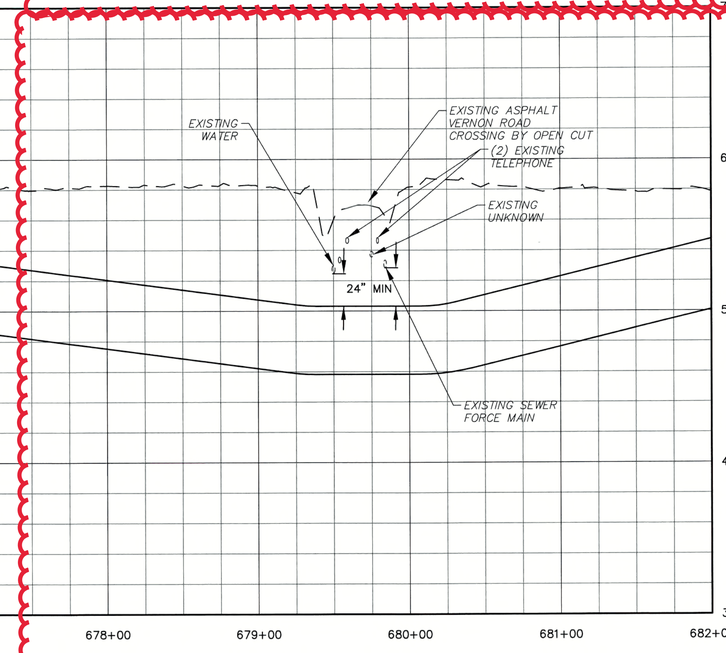
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: C-32







GENERAL NOTES:

1. LAYOUT BASED ON STANDARD FITTING SIZES USING MAXIMUM JOINT DEFLECTION OF 2 DEGREES AND MINIMUM RADIUS OF 700 FT.
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50' 0 50' 100'
SCALE: 1"=50' (Horiz.)

5' 0 5' 10'
SCALE: 1"=5' (Vert.)

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FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

PLAN AND PROFILE
STA 667+00 TO STA 682+00

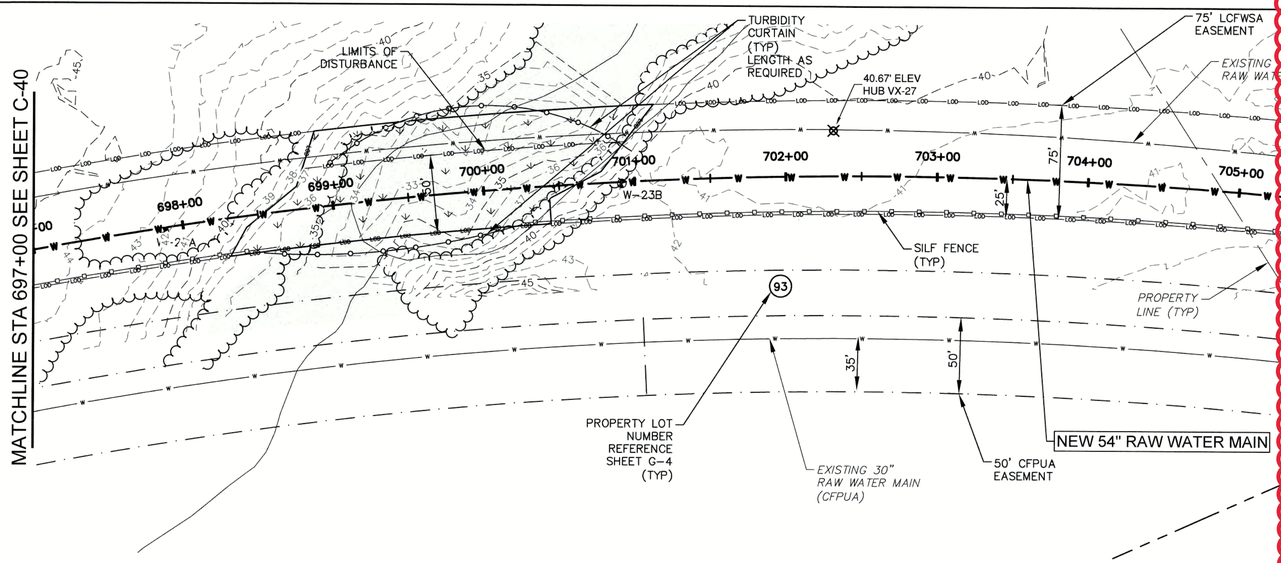
NORTH CAROLINA PROFESSIONAL SEAL 025972 ENGINEER ANTHONY W. BOHAN
4-10-19

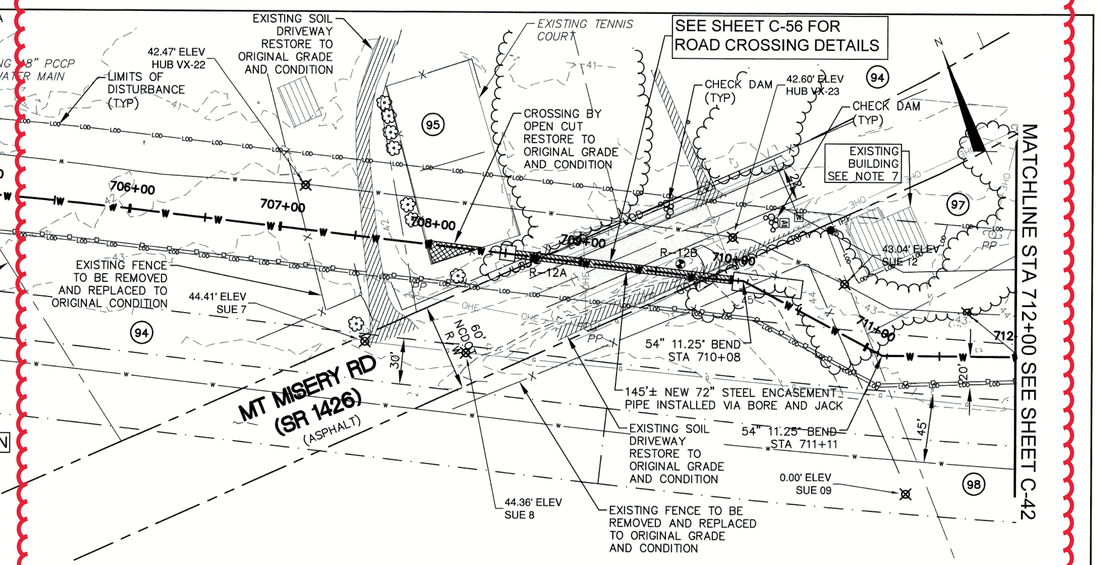
CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

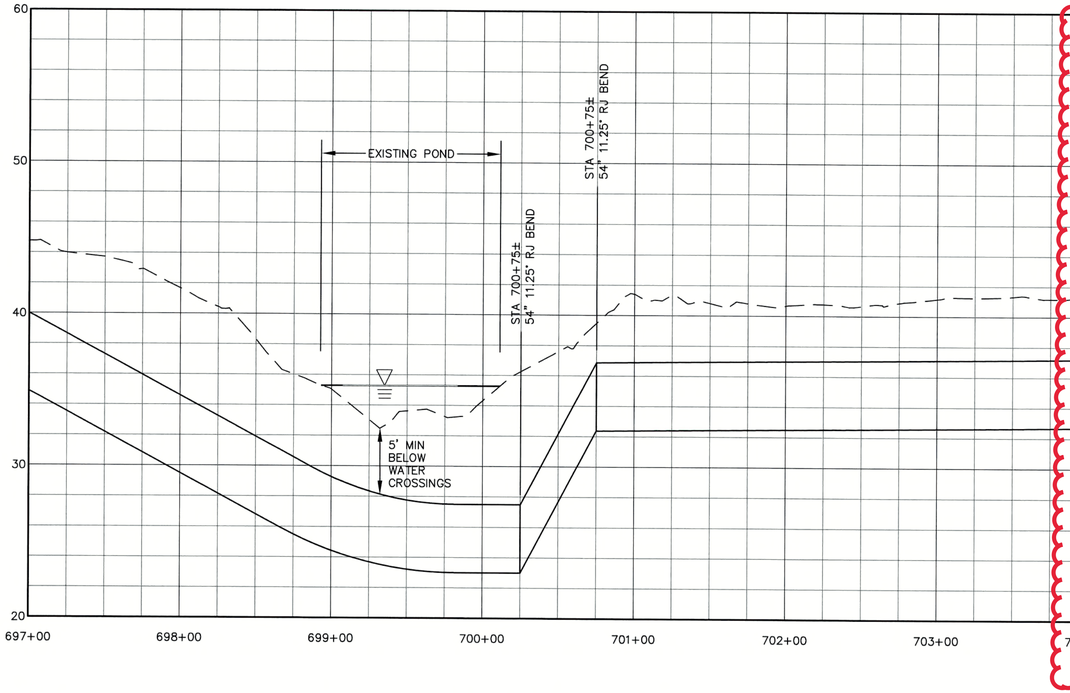
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

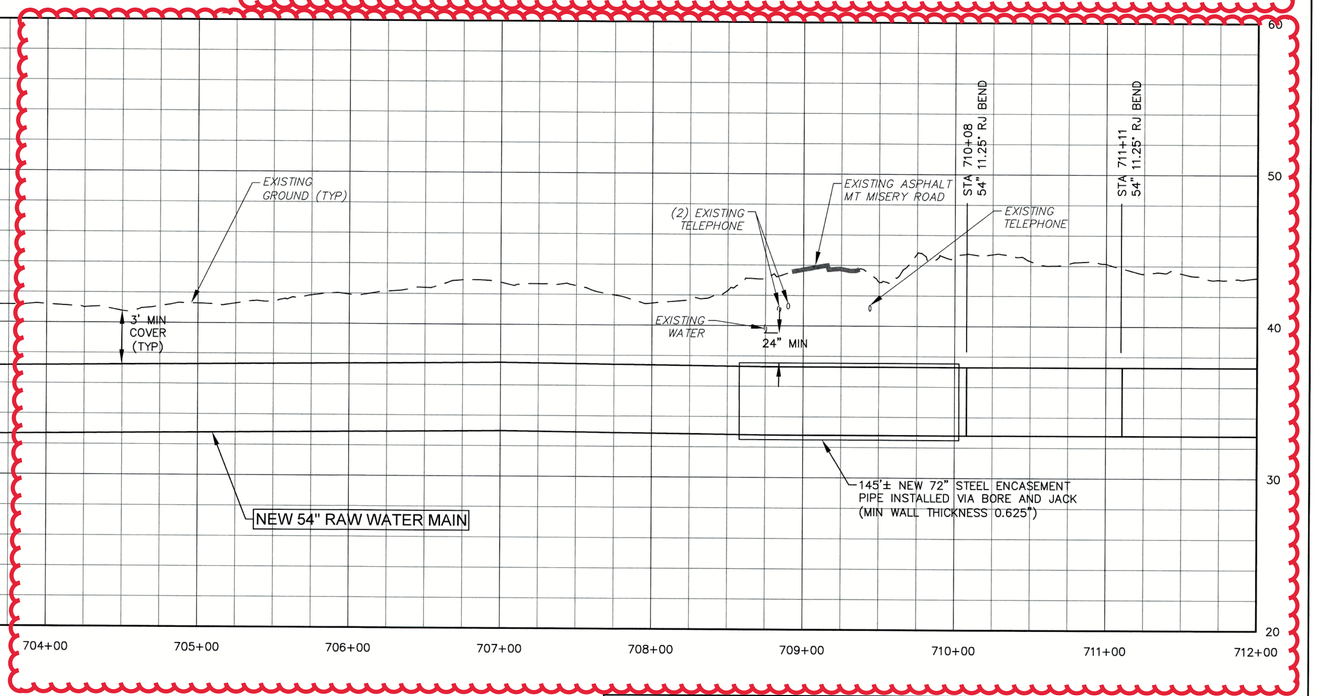
DATE:	APR 2019
SCALE:	AS SHOWN
DRAWN BY:	JPV
CHECKED BY:	AWB
PROJECT NO. :	5367-0038

SHEET NO:
C-39









GENERAL NOTES:

1. LAYOUT BASED ON STANDARD FITTING SIZES USING MAXIMUM JOINT DEFLECTION OF 2 DEGREES AND MINIMUM RADIUS OF 700 FT.
2. CONTRACTOR SHALL TAKE THE NECESSARY STEPS TO PROTECT THE EXISTING 48" RAW WATER MAIN.
3. ALL EXCAVATIONS (TRENCHING, BORING, BORE PITS, ETC) ARE UNCLASSIFIED. GEOTECHNICAL REPORT AND BORING LOGS HAVE BEEN PROVIDED IN PROJECT SPECIFICATIONS.
4. SITE SURVEY WAS PERFORMED BY MCKIM AND CREED IN 2017. ALL COORDINATES ARE TIED TO THE NORTH CAROLINA STATE PLAN COORDINATE SYSTEM (NAD 83 FEET).
5. THE LOCATION OF ALL EXISTING UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY LOCATIONS.
6. NEW 54" RAW WATER MAIN SHALL BE WELDED STEEL PIPE (THICKNESS MIN = 0.22, LINING = CEMENT MORTAR, COATING = POLYURETHANE) OR DUCTILE IRON PIPE (PC 150, LINING = CEMENT MORTAR, COATING = POLYWRAP). CONTRACTOR SHALL UTILIZE ONLY ONE MATERIAL UNLESS APPROVED BY ENGINEER OR MATERIAL IS SHOWN ON PLANS.
7. CONTRACTOR SHALL NOT DISTURB OR DAMAGE EXISTING STRUCTURE OR STRUCTURE FOUNDATION. CONTRACTOR SHALL PROVIDE GEOTECHNICAL INSTRUMENTATION AND MONITORING FOR THIS STRUCTURE AS PER BID LINE ITEM 27.

50' 0 50' 100'
SCALE: 1"=50' (Horiz.)
5' 0 5' 10'
SCALE: 1"=5' (Vert.)

McKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025912 ENGINEER ANTHONY W. BOAHN
4-10-19

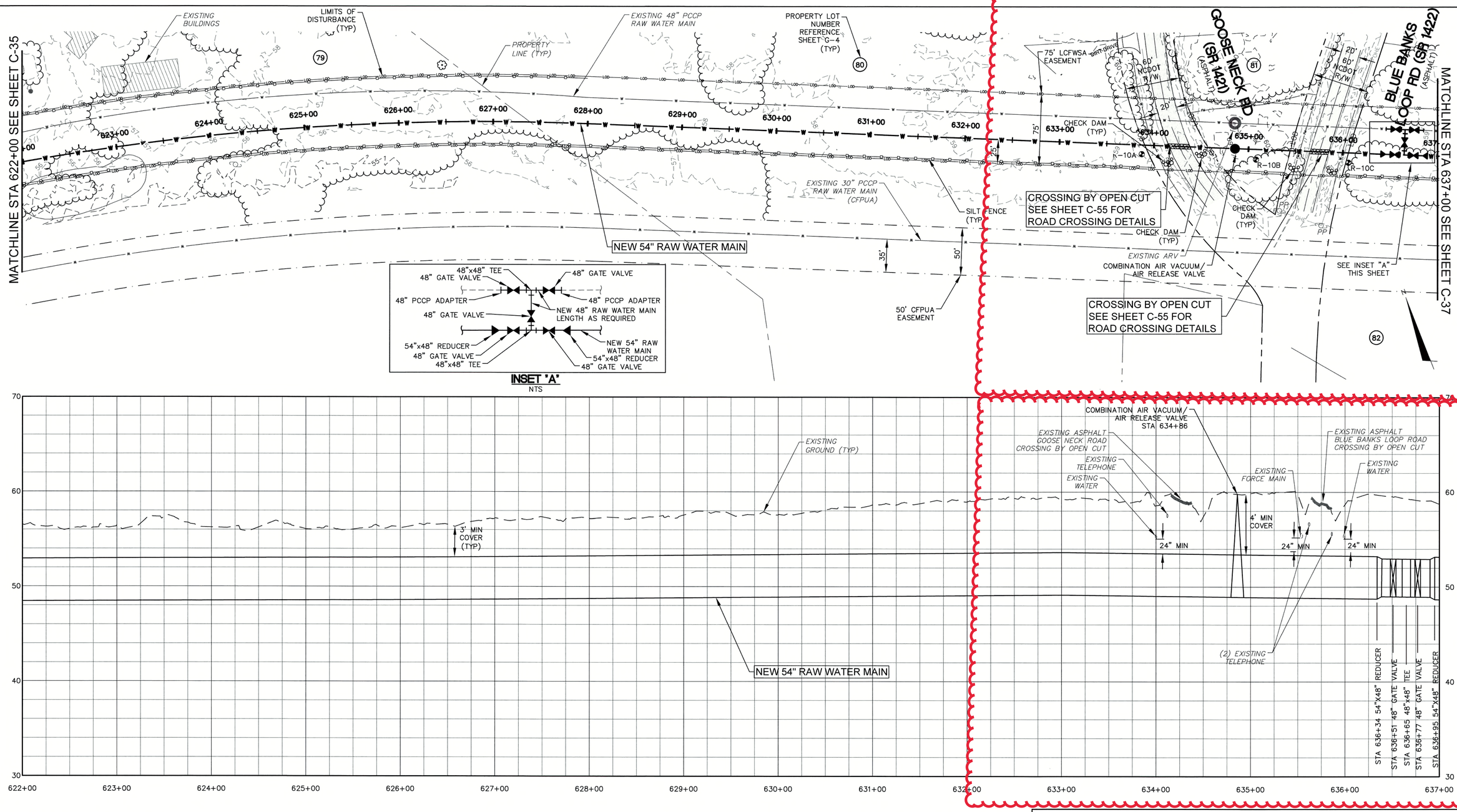
54" RAW WATER MAIN PLAN AND PROFILE STA 697+00 TO STA 712+00

CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: C-41



GENERAL NOTES:

1. LAYOUT BASED ON STANDARD FITTING SIZES USING MAXIMUM JOINT DEFLECTION OF 2 DEGREES AND MINIMUM RADIUS OF 700 FT.
2. CONTRACTOR SHALL TAKE THE NECESSARY STEPS TO PROTECT THE EXISTING 48" RAW WATER MAIN.
3. ALL EXCAVATIONS (TRENCHING, BORING, BORE PITS, ETC) ARE UNCLASSIFIED. GEOTECHNICAL REPORT AND BORING LOGS HAVE BEEN PROVIDED IN PROJECT SPECIFICATIONS.
4. SITE SURVEY WAS PERFORMED BY MCKIM AND CREED IN 2017. ALL COORDINATES ARE TIED TO THE NORTH CAROLINA STATE PLAN COORDINATE SYSTEM (NAD 83 FEET).
5. THE LOCATION OF ALL EXISTING UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY LOCATIONS.
6. NEW 54" RAW WATER MAIN SHALL BE WELDED STEEL PIPE (THICKNESS MIN = 0.22, LINING = CEMENT MORTAR, COATING = POLYURETHANE) OR DUCTILE IRON PIPE (PC 150, LINING = CEMENT MORTAR, COATING = POLYWRAP). CONTRACTOR SHALL UTILIZE ONLY ONE MATERIAL UNLESS APPROVED BY ENGINEER OR MATERIAL IS SHOWN ON PLANS.

50' 0 50' 100'
SCALE: 1"=50' (Horiz.)

5' 0 5' 10'
SCALE: 1"=5' (Vert.)

54" RAW WATER MAIN PLAN AND PROFILE STA 622+00 TO STA 637+00

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

SHEET NO: C-36

McKIM & CREED
243 NORTH FRONT ST
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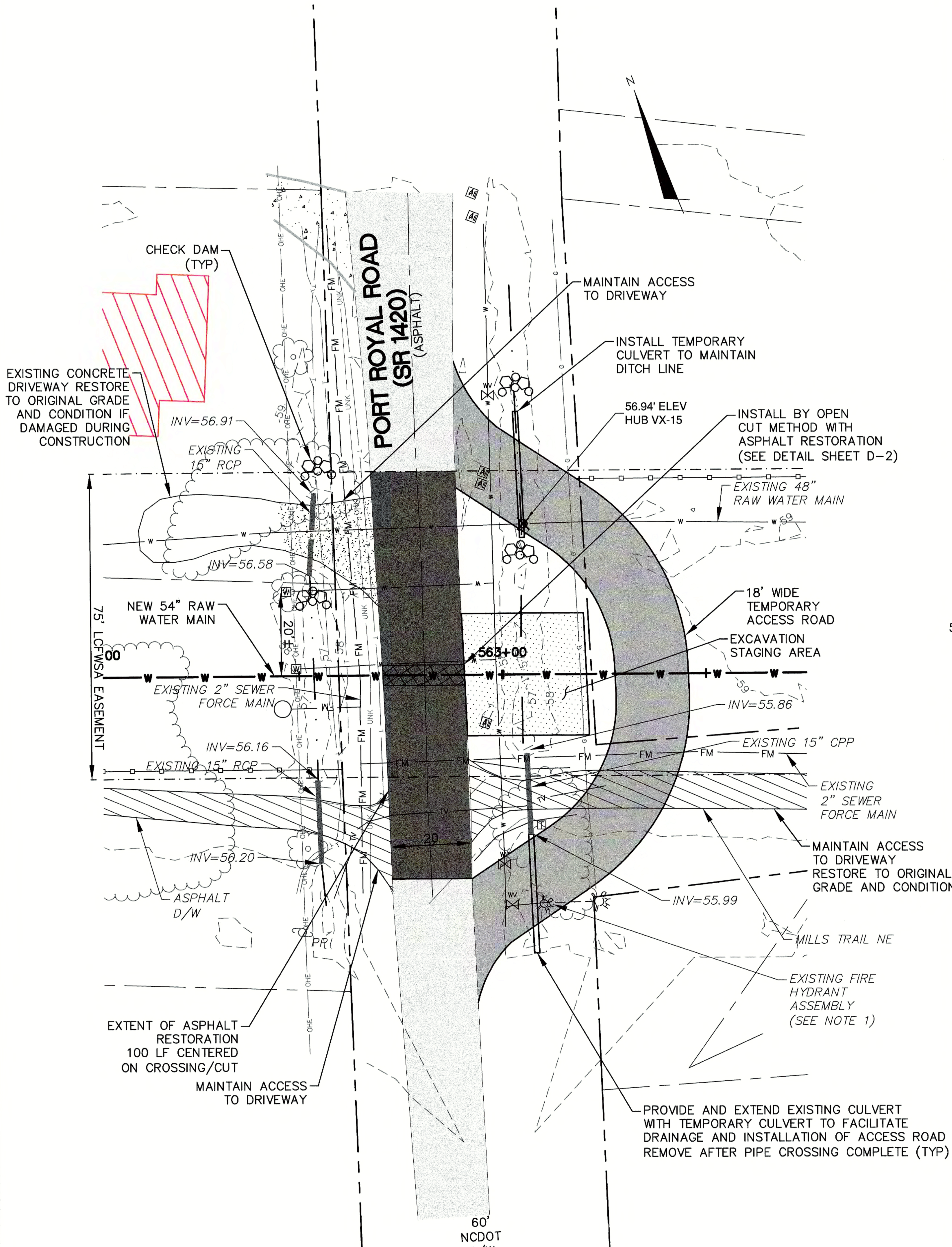
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

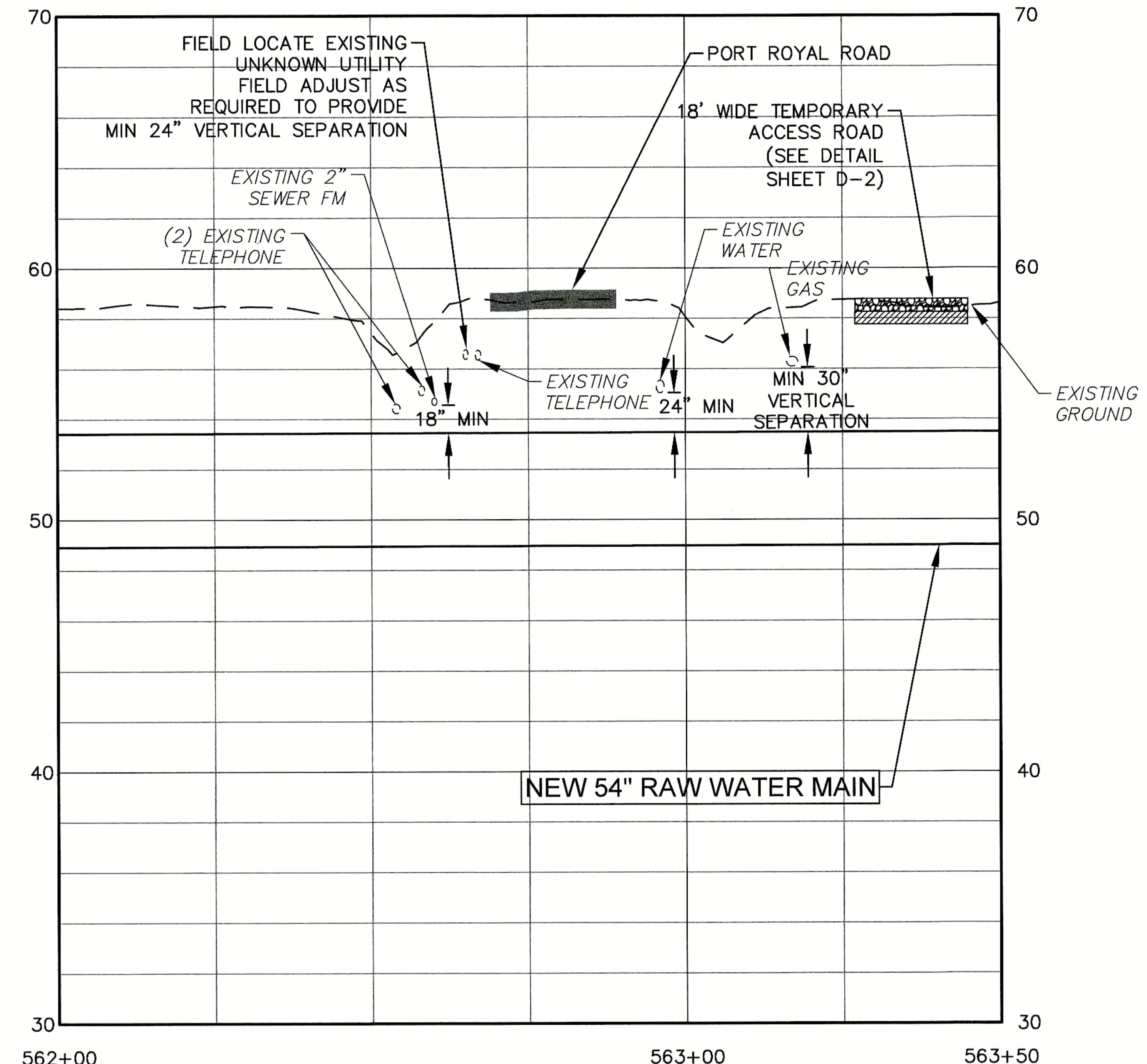
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

REV:	DESCRIPTION	DATE:

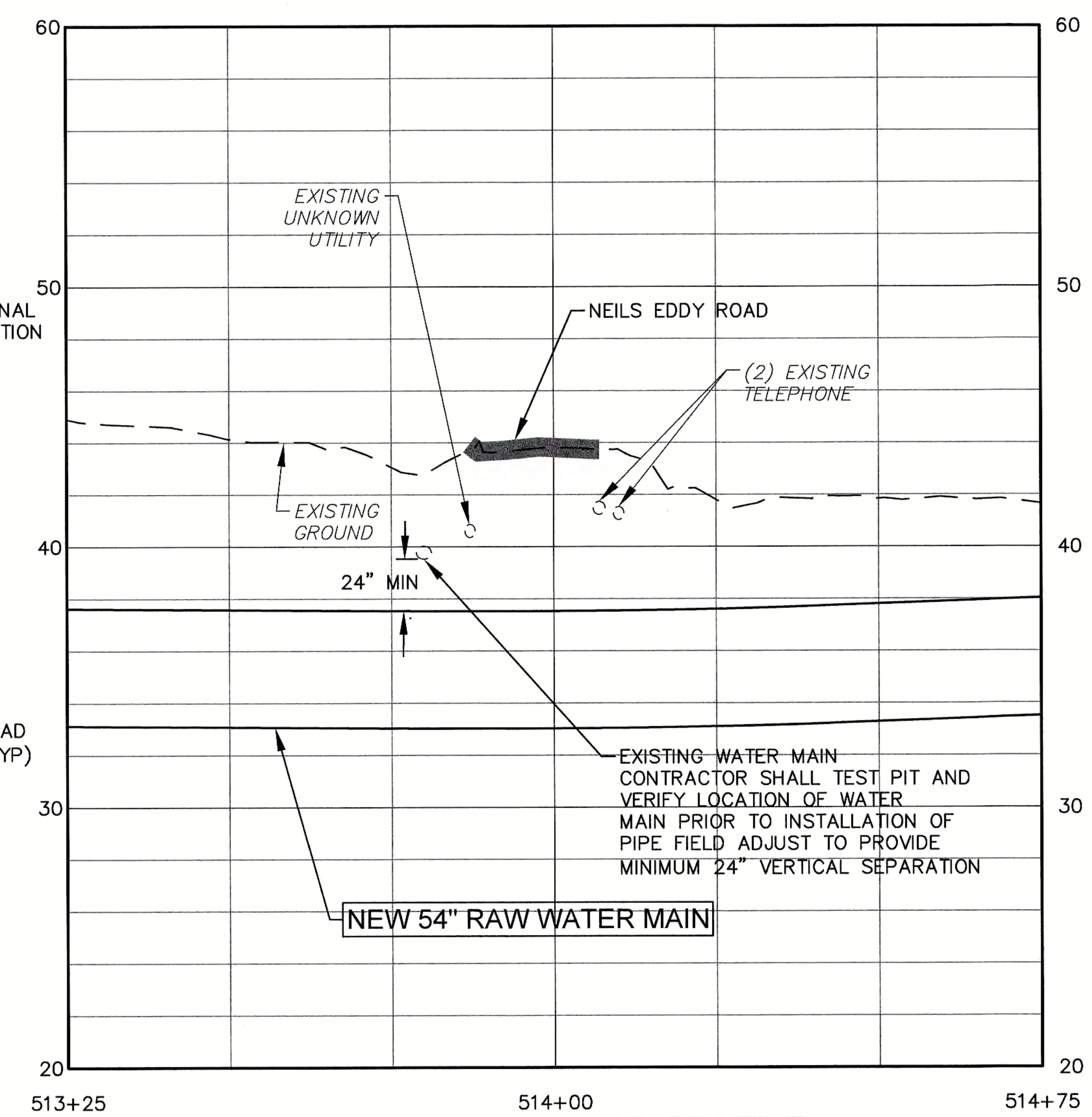
NORTH CAROLINA PROFESSIONAL SEAL 025512 ENGINEER ANTHONY W. BOAHN
4-10-19



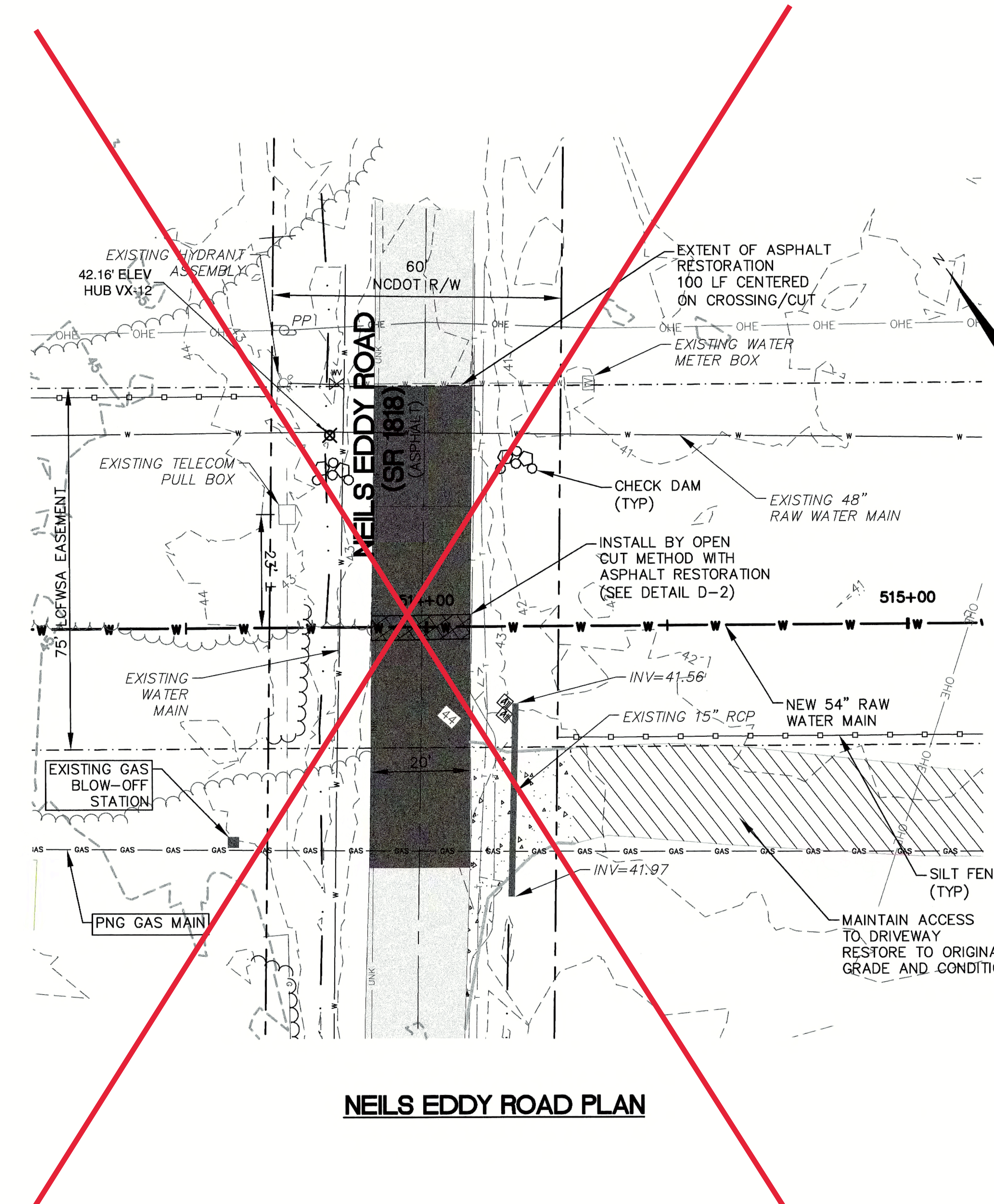
PORT ROYAL ROAD PLAN



PORT ROYAL ROAD PROFILE



NEILS EDDY ROAD PROFILE



NEILS EDDY ROAD PLAN

NOTES:

1. CONTRACTOR SHALL RELOCATE EXISTING HYDRANT OUTSIDE OF TEMPORARY ACCESS ROAD PRIOR TO ROAD CONSTRUCTION. AFTER ROAD IS REMOVED, RELOCATE HYDRANT TO ORIGINAL LOCATION. COST OF HYDRANT RELOCATION AND RE-INSTILLATION SHALL BE INCLUDED IN BASE BID.
2. STORAGE OF EXCAVATED MATERIAL NOT ALLOWED IN NCDOT RIGHT OF WAY.
3. CONTRACTOR SHALL COMPLETE ALL WORK SHOWN WITHIN NCDOT RIGHT OF WAY, LCFWSA EASEMENT AND CFPUA EASEMENT.
4. PROVIDE FOR POSITIVE DRAINAGE AT ALL TIMES FOR CONSTRUCTION AND OPERATION OF THE TEMPORARY ROAD.
5. CONTRACTOR SHALL MAINTAIN TRAFFIC DURING CONSTRUCTION AND PROVIDE TRAFFIC CONTROL DEVICES PER NCDOT STANDARDS.

20' 0 20' 40'
SCALE: 1"=20' (Horiz.)

5' 0 5' 10'
SCALE: 1"=5' (Vert.)

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Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 025319 ANTHONY W. BOAHN
4-10-19

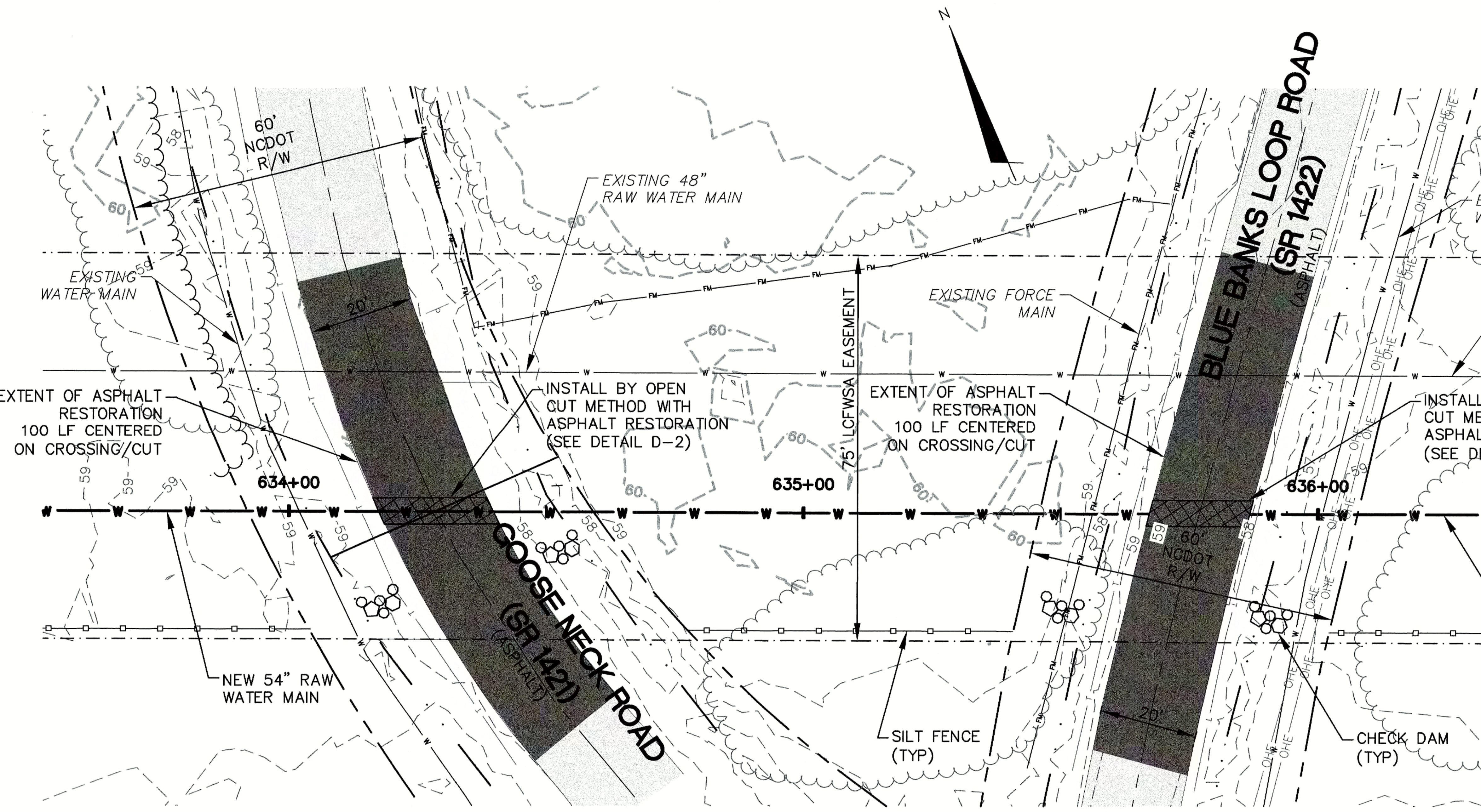
ROAD INTERSECTION PLANS AND PROFILES

CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO.: 5367-0038

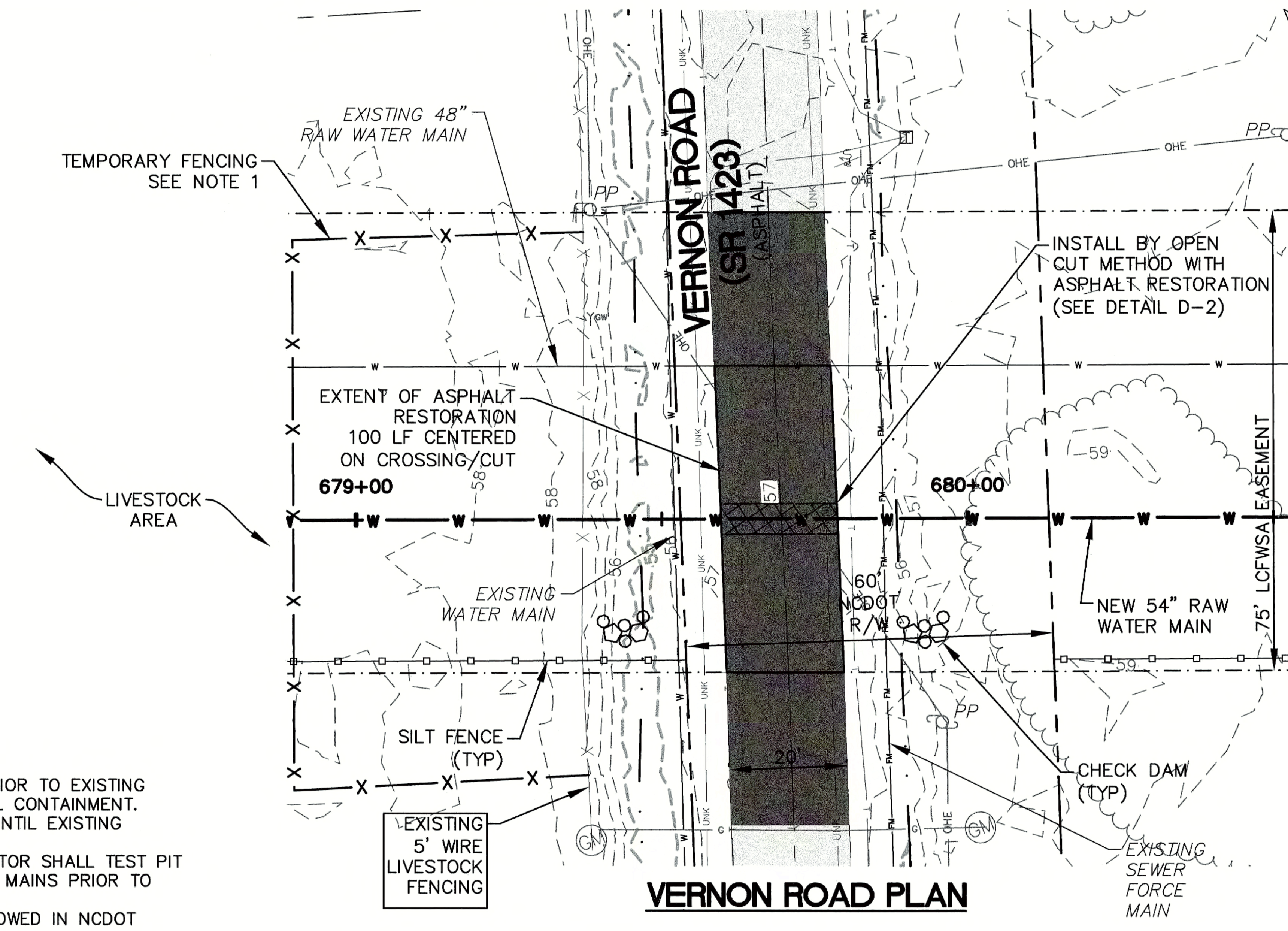
SHEET NO: C-53



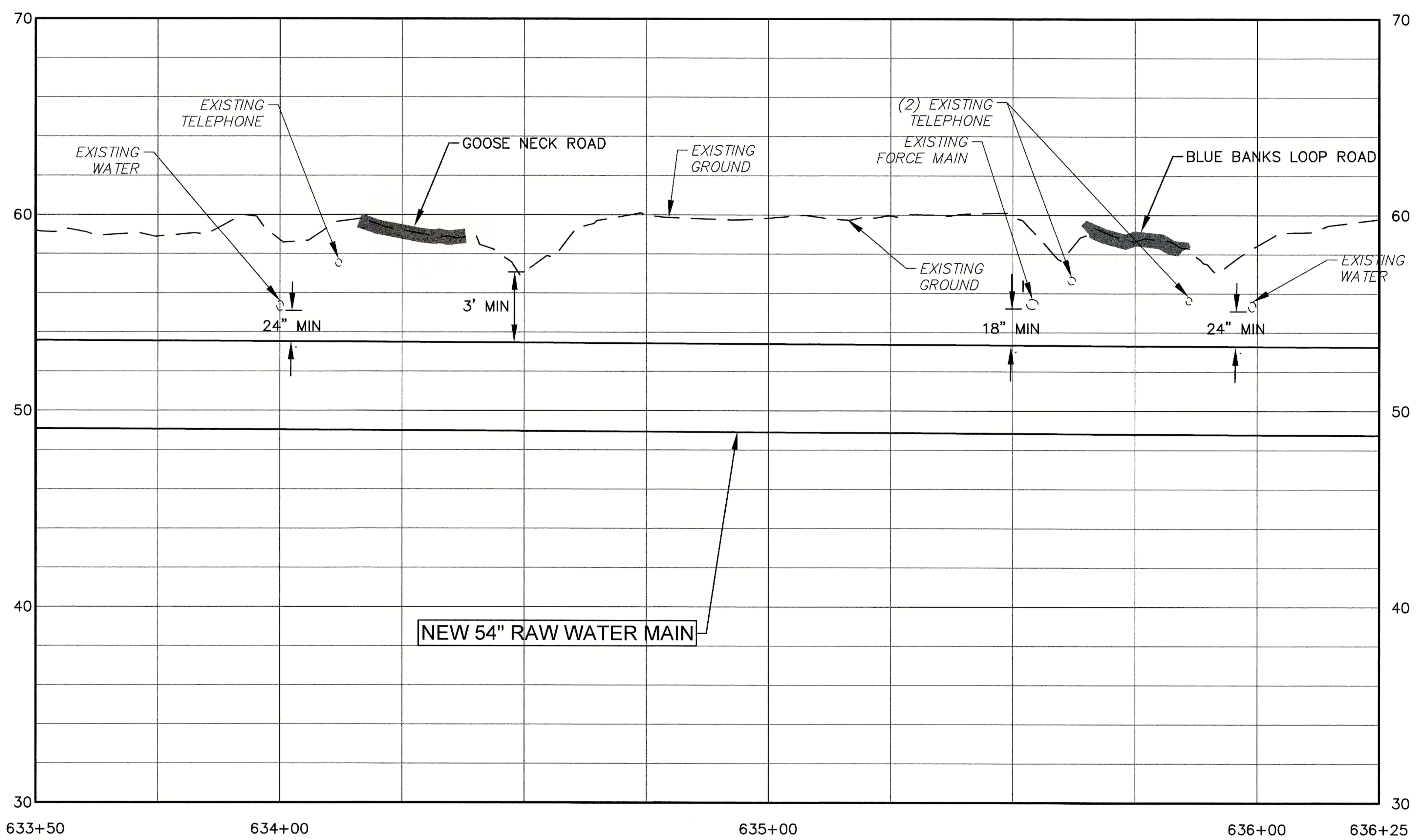
GOOSE NECK ROAD AND BLUE BANKS LOOP ROAD PLAN

NOTES:

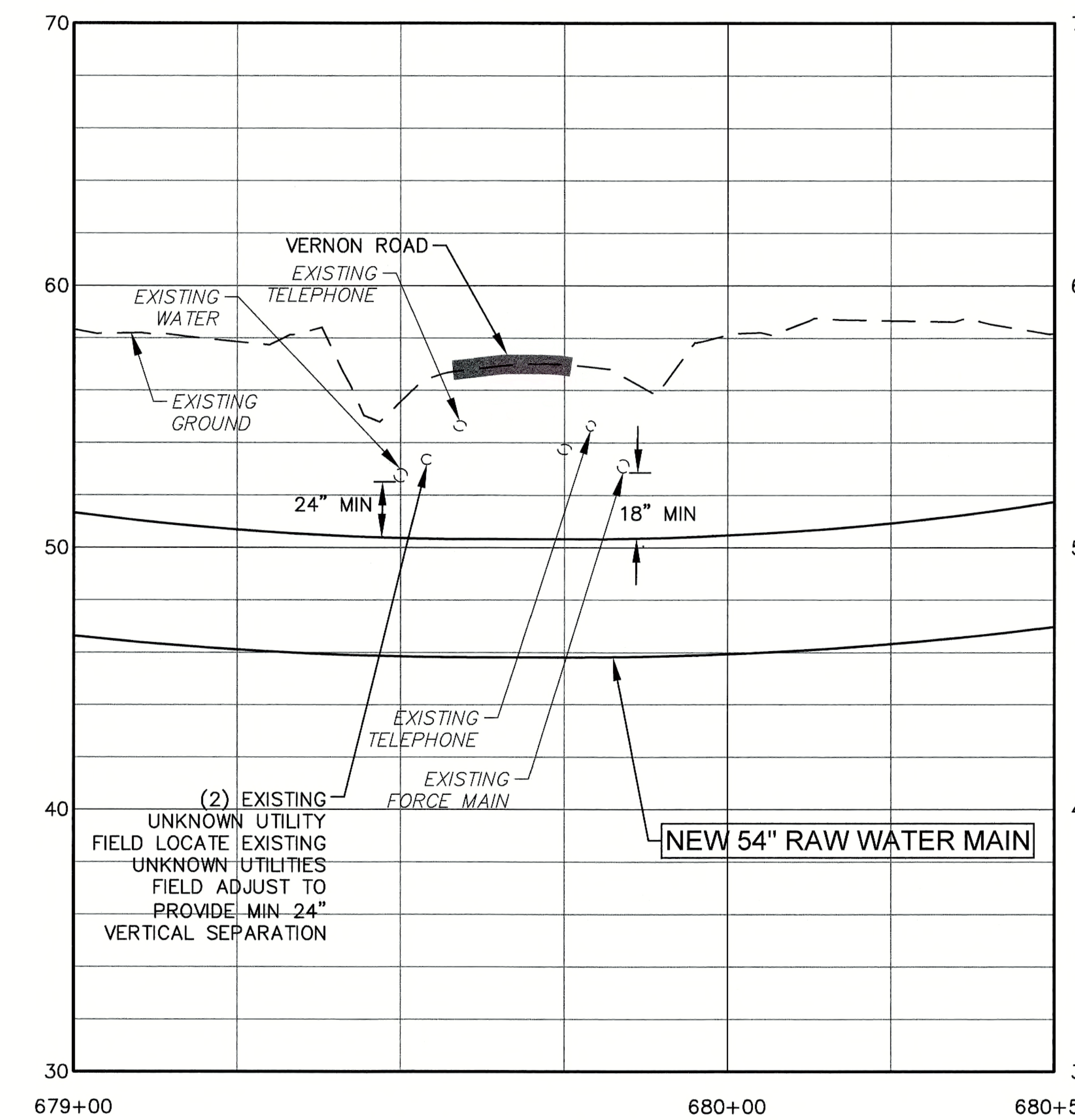
1. TEMPORARY FENCING SHALL BE INSTALLED PRIOR TO EXISTING FENCING BEING REMOVED TO MAINTAIN ANIMAL CONTAINMENT. TEMPORARY FENCING SHALL BE MAINTAINED UNTIL EXISTING FENCING IS REINSTALLED.
2. EXISTING WATER AND SEWER MAINS—CONTRACTOR SHALL TEST PIT AND VERIFY LOCATION OF WATER AND SEWER MAINS PRIOR TO INSTALLATION OF RAW WATER MAIN PIPE.
3. STORAGE OF EXCAVATED MATERIAL NOT ALLOWED IN NCDOT RIGHT OF WAY.
4. CONTRACTOR SHALL COMPLETE ALL WORK SHOWN WITHIN NCDOT RIGHT OF WAY, LCFWSA EASEMENT AND CFPUA EASEMENT.
5. PROVIDE FOR POSITIVE DRAINAGE AT ALL TIMES FOR CONSTRUCTION AND OPERATION OF THE TEMPORARY ROAD.
6. CONTRACTOR SHALL MAINTAIN TRAFFIC DURING CONSTRUCTION AND PROVIDE TRAFFIC CONTROL DEVICES PER NCDOT STANDARDS.



VERNON ROAD PLAN



GOOSE NECK ROAD AND BLUE BANKS LOOP ROAD PROFILE



VERNON ROAD PROFILE

20' 0 20' 40'
SCALE: 1"=20' (Horiz.)
5' 0 5' 10'
SCALE: 1"=5' (Vert.)

McKIM&CREED
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Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 025512 ANTHONY W. BOAHN
4-10-19

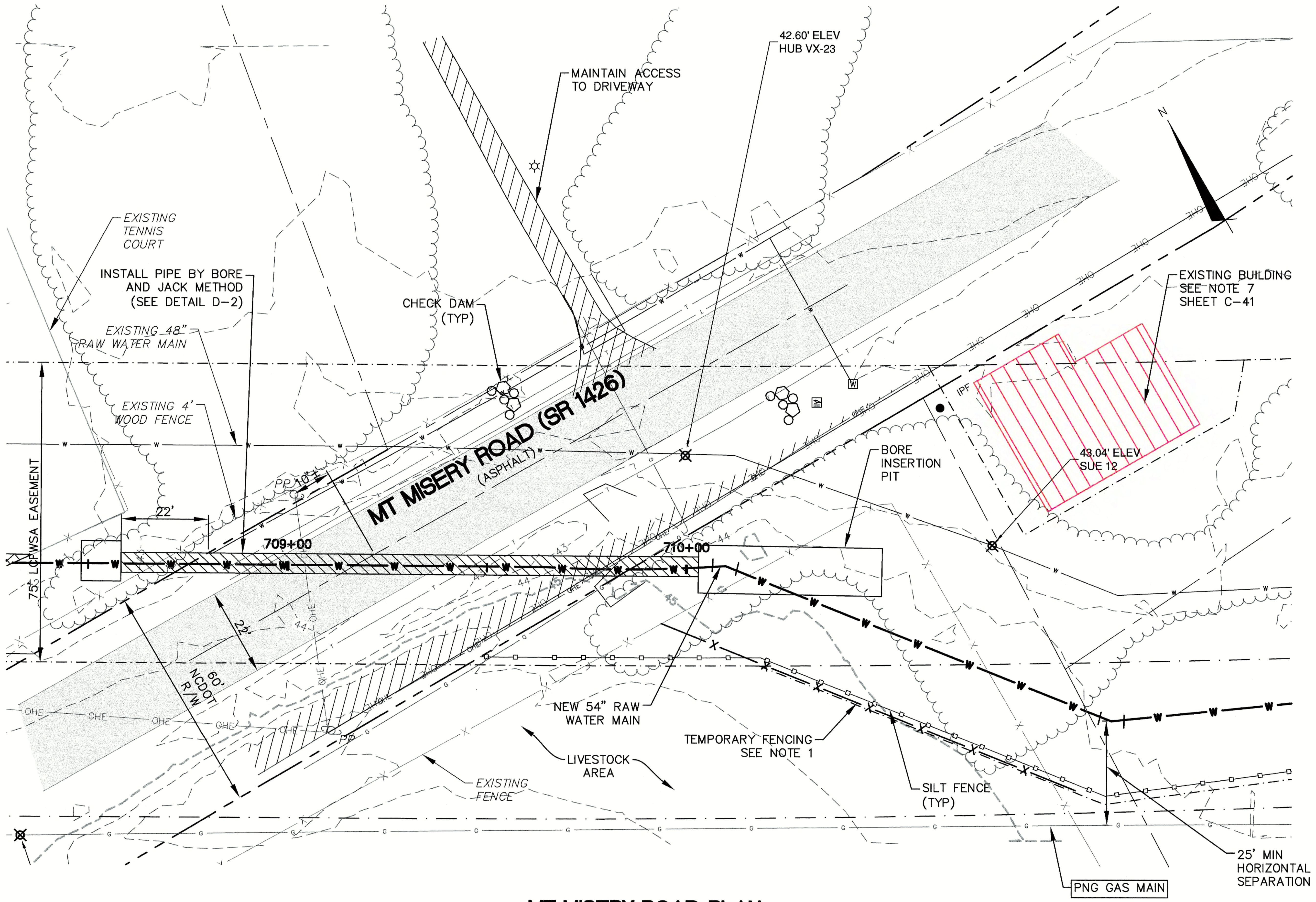
ROAD INTERSECTION PLANS AND PROFILES

CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

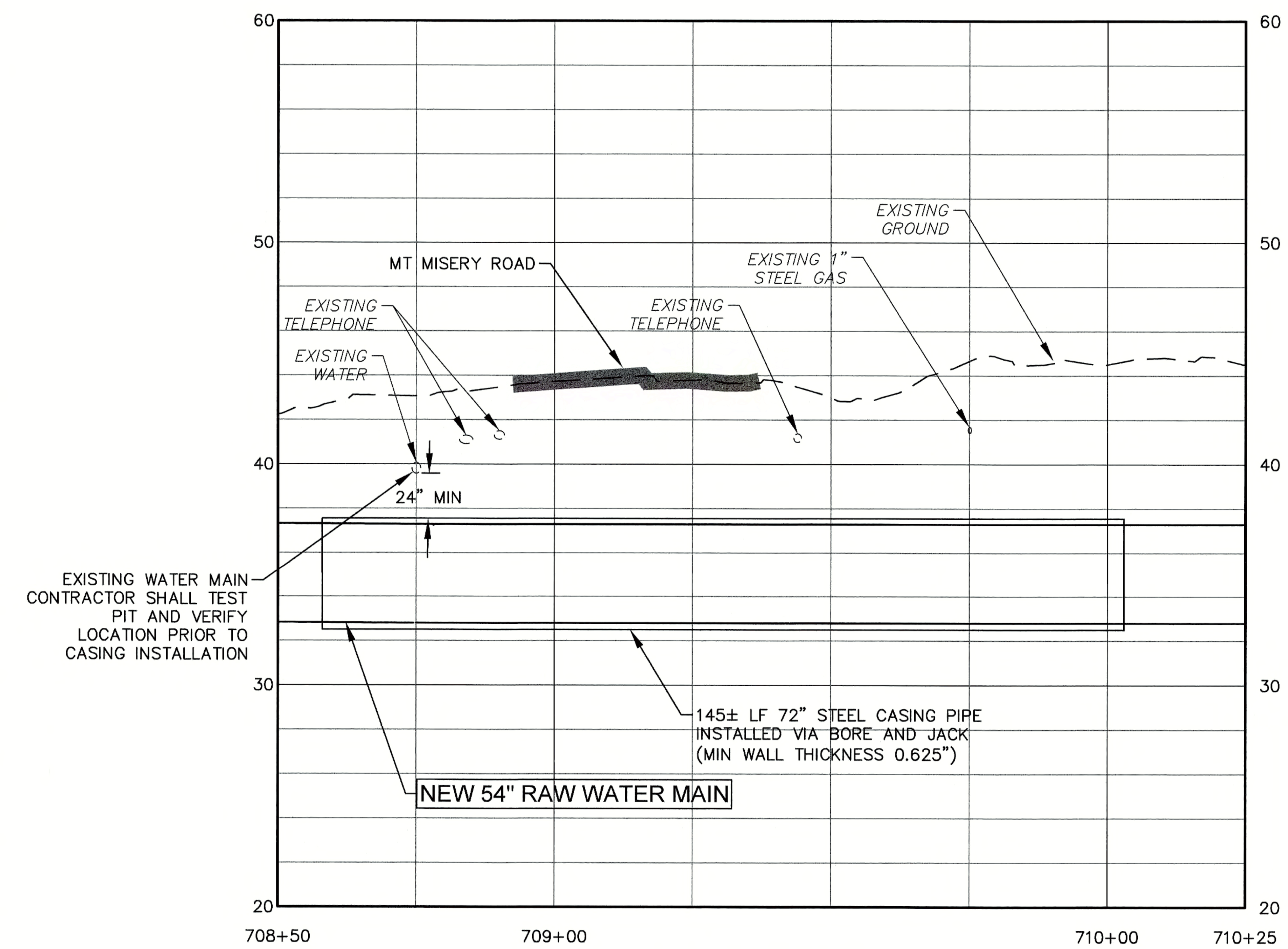
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO.: 5367-0038

SHEET NO: C-55



MT MISERY ROAD PLAN



MT MISERY ROAD PROFILE

NOTES:

1. TEMPORARY FENCING SHALL BE INSTALLED PRIOR TO EXISTING FENCING BEING REMOVED TO MAINTAIN ANIMAL CONTAINMENT. TEMPORARY FENCING SHALL BE MAINTAINED UNTIL EXISTING FENCING IS REINSTALLED.
2. STORAGE OF EXCAVATED MATERIALS NOT ALLOWED ON NCDOT RIGHT OF WAY.
3. CONTRACTOR SHALL COMPLETE ALL WORK SHOWN WITHIN NCDOT RIGHT OF WAY, LCFWSA EASEMENT AND CFPUA EASEMENT.
4. PROVIDE FOR POSITIVE DRAINAGE AT ALL TIMES FOR CONSTRUCTION AND OPERATION OF THE TEMPORARY ROAD.

20' 0 20' 40'
SCALE: 1"=20' (Horiz.)
5' 0 5' 10'
SCALE: 1"=5' (Vert.)

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Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

ROAD INTERSECTION PLANS AND PROFILES

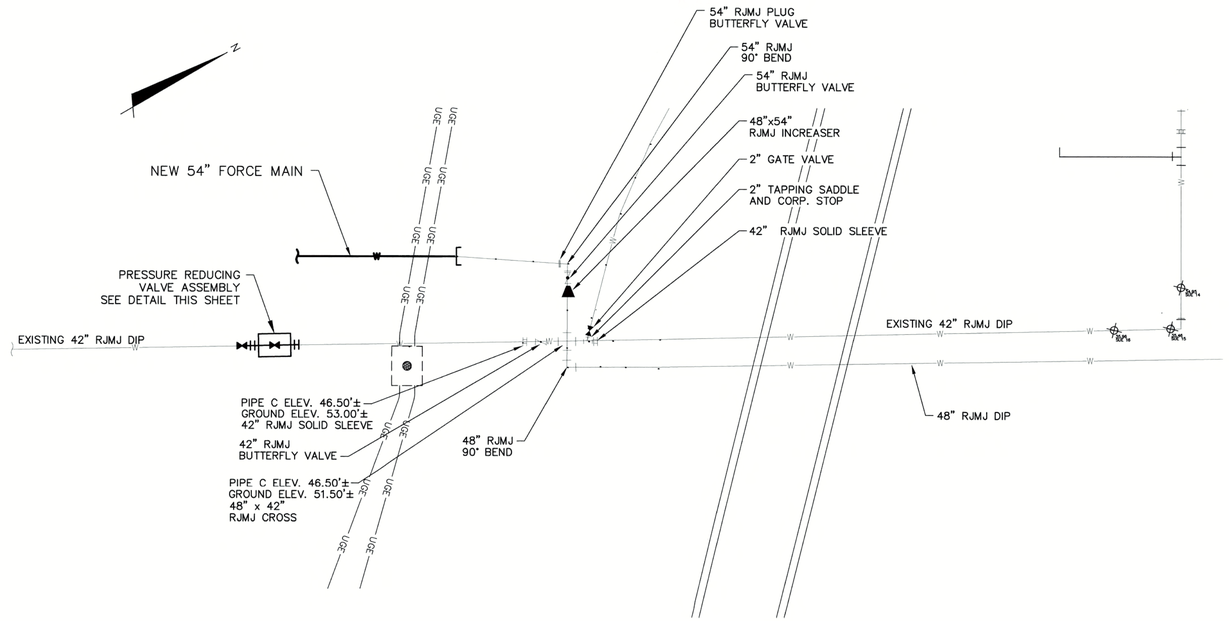
CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 025532 ANTHONY W. BOAHN
4-10-19

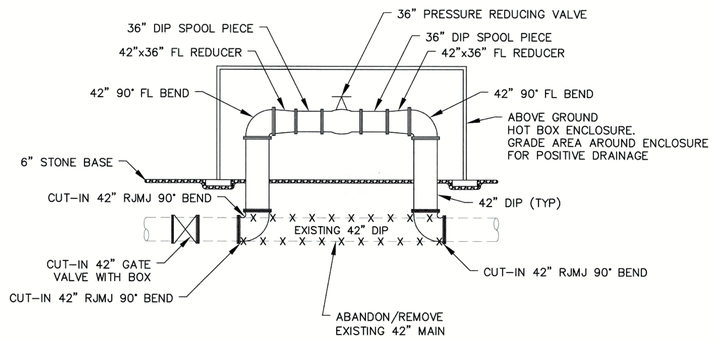
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO.: 5367-0038

SHEET NO: C-56



PLAN VIEW
1" = 20'



PRESSURE REDUCING VALVE ASSEMBLY DETAIL
N.T.S.

20' 0 20' 40'
SCALE: 1"=20'

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Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

54" RAW WATER MAIN PRESSURE REDUCING VALVE PLAN AND DETAIL

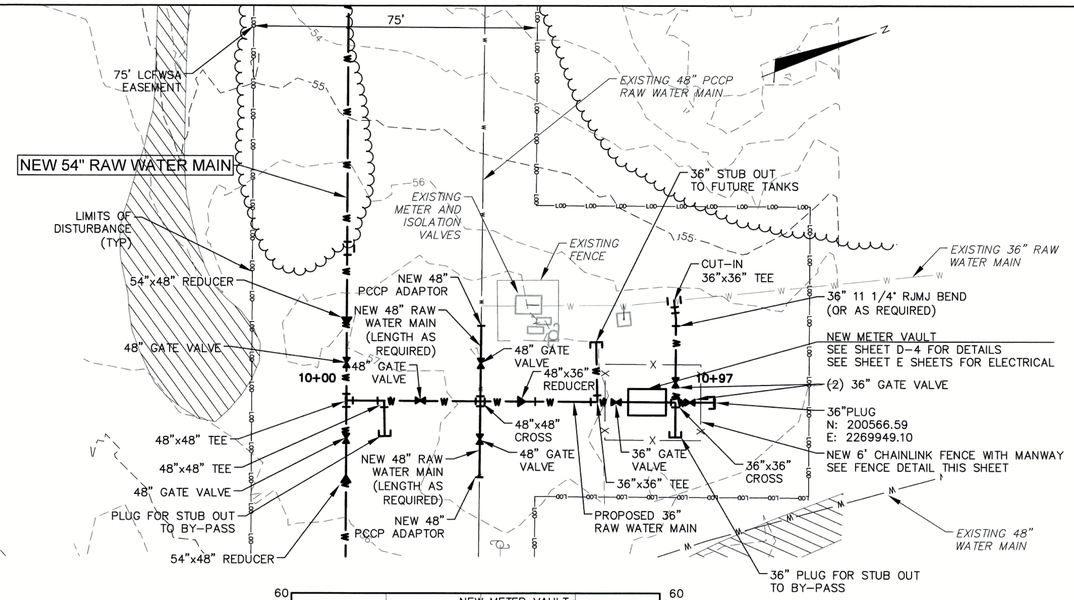
NORTH CAROLINA PROFESSIONAL SEAL 025012 ENGINEER ANTHONY W. BOAHN
4-10-19

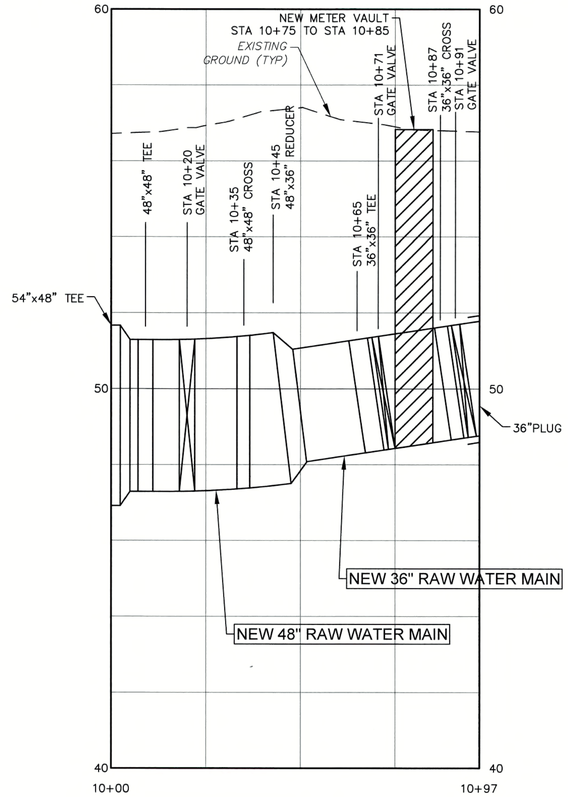
CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

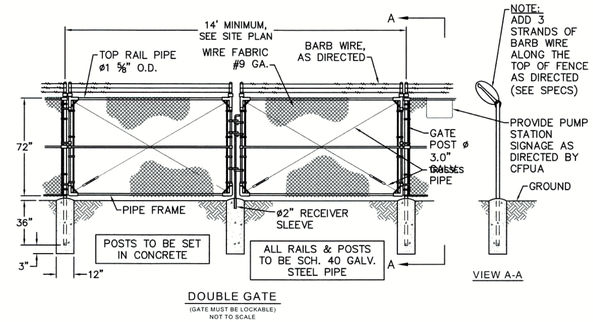
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

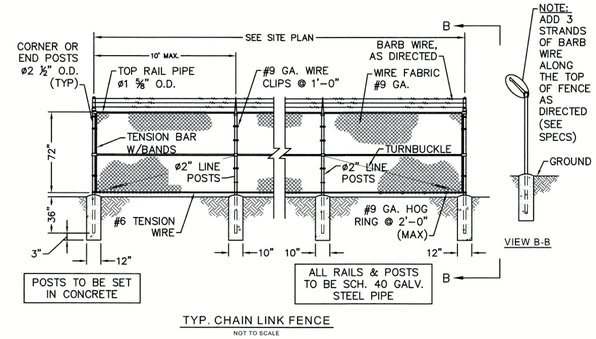
SHEET NO: **C-59**







DOUBLE GATE
(GATE MUST BE LOCKABLE)
NOT TO SCALE



TYP. CHAIN LINK FENCE
NOT TO SCALE

20' 0 20' 40'
SCALE: 1"=20' (Horiz.)
2' 0 2' 4'
SCALE: 1"=2' (Vert.)

GENERAL NOTES:
1. LAYOUT BASED ON STANDARD FITTING SIZES USING MAXIMUM JOINT DEFLECTION OF 2 DEGREES AND MINIMUM RADIUS OF 700 FT.
2. CONTRACTOR SHALL TAKE THE NECESSARY STEPS TO PROTECT THE EXISTING 48" RAW WATER MAIN.
3. ALL EXCAVATIONS (TRENCHING, BORING, BORE PITS, ETC) ARE UNCLASSIFIED. GEOTECHNICAL REPORT AND BORING LOGS HAVE BEEN PROVIDED IN PROJECT SPECIFICATIONS.
4. SITE SURVEY WAS PERFORMED BY MCKIM AND CREED IN 2017. ALL COORDINATES ARE TIED TO THE NORTH CAROLINA STATE PLAN COORDINATE SYSTEM (NAD 83 FEET).
5. THE LOCATION OF ALL EXISTING UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY LOCATIONS.
6. NEW 54" RAW WATER MAIN SHALL BE WELDED STEEL PIPE (THICKNESS MIN = 0.22, LINING = CEMENT MORTAR, COATING = POLYURETHANE) OR DUCTILE IRON PIPE (PC 150, LINING = CEMENT MORTAR, COATING = POLYWRAP). CONTRACTOR SHALL UTILIZE ONLY ONE MATERIAL UNLESS APPROVED BY ENGINEER OR MATERIAL IS SHOWN ON PLANS.

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FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025712 ENGINEER ANTHONY W. BOAHN 4-10-19

BRUNSWICK COUNTY METER VAULT

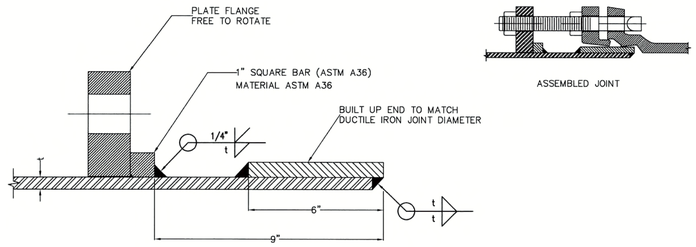
CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

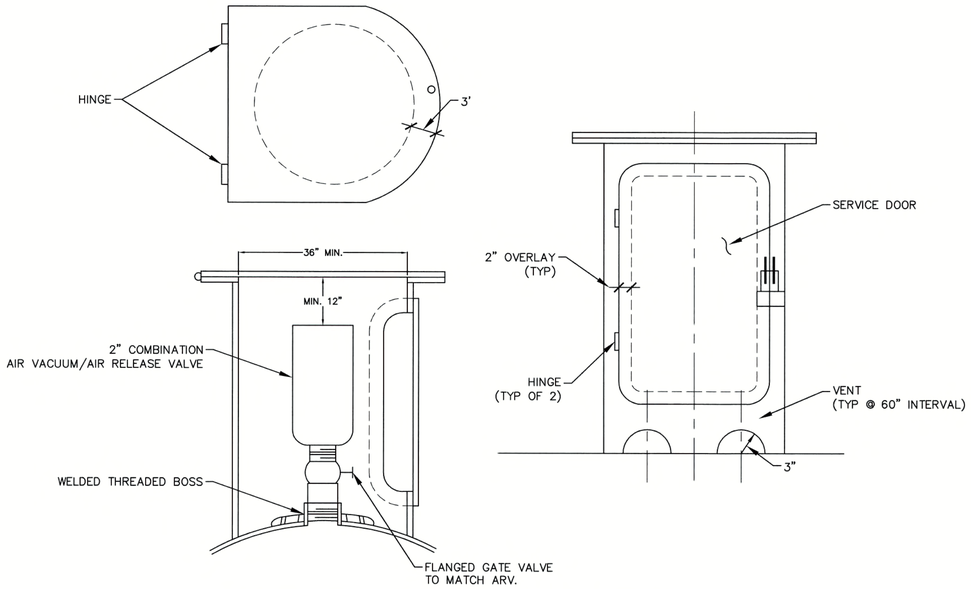
DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: C-60

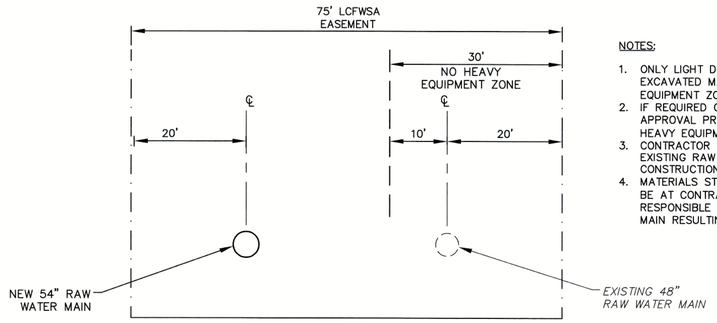
THRUST RESTRAINT SYSTEM FOR MJ CONNECTION



THRUST RESTRAINT SYSTEM FOR MJ CONNECTION
NOT TO SCALE



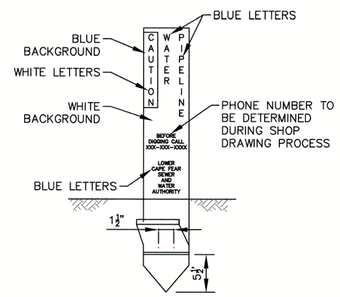
LIVINGSTON CREEK AIR VACUUM / AIR RELEASE DETAIL
NOT TO SCALE



NOTES:

1. ONLY LIGHT DUTY VEHICLES, MATERIAL STORAGE AND EXCAVATED MATERIALS SHALL BE ALLOWED IN "NO HEAVY EQUIPMENT ZONE".
2. IF REQUIRED CONTRACTOR SHALL SUBMIT PLAN FOR APPROVAL PRIOR TO TRAVERSING HEAVY EQUIPMENT IN "NO HEAVY EQUIPMENT ZONE".
3. CONTRACTOR SHALL TAKE NECESSARY STEPS TO PROTECT EXISTING RAW WATER MAIN AT ALL TIMES DURING CONSTRUCTION.
4. MATERIALS STORED IN "NO HEAVY EQUIPMENT ZONE" SHALL BE AT CONTRACTOR'S OWN RISK. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE TO EXISTING RAW WATER MAIN RESULTING FROM USE OF "NO HEAVY EQUIPMENT ZONE".

EASEMENT EQUIPMENT ACCESS AND STAGING
NOT TO SCALE



NOTES:

1. MARKERS SHALL BE CARSONITE TYPE CUM-375 OR APPROVED EQUAL. MARKERS SHALL BE PIGMENTED WITH UV RESISTANT RESINS OR COATED WITH CLEAR UV RESISTANT COATING.
2. DECALS SHALL BE AS SHOWN AND PROVIDED ON UV RESISTANT BACKING WITH TEXT CONFORMING TO THE FEDERAL OFFICE OF PIPELINE SAFETY STANDARDS AND DENOTING THE STANDARD NO-DIG SYMBOLS.

UTILITY MARKER DETAIL
NOT TO SCALE

McKIM & CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

54" RAW WATER MAIN DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 025812 ENGINEER ANTHONY W. BOANN
4-10-19

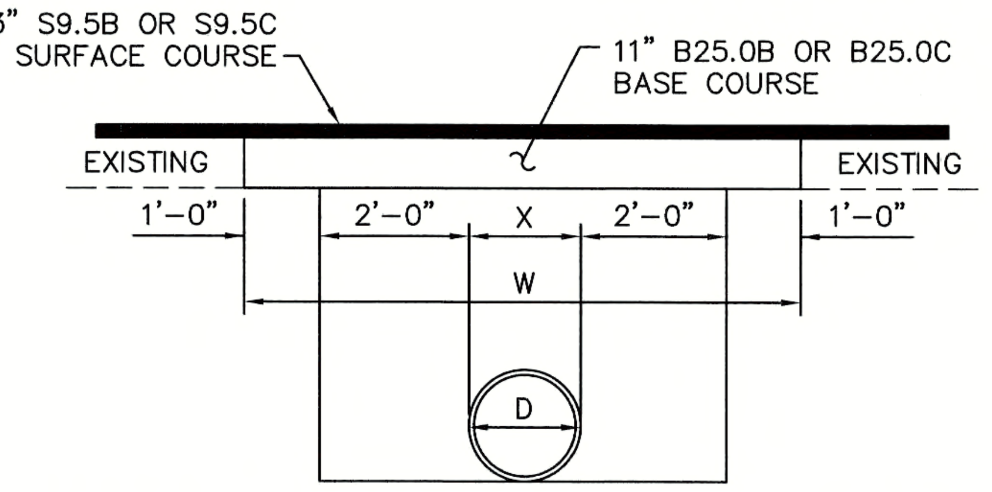
CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

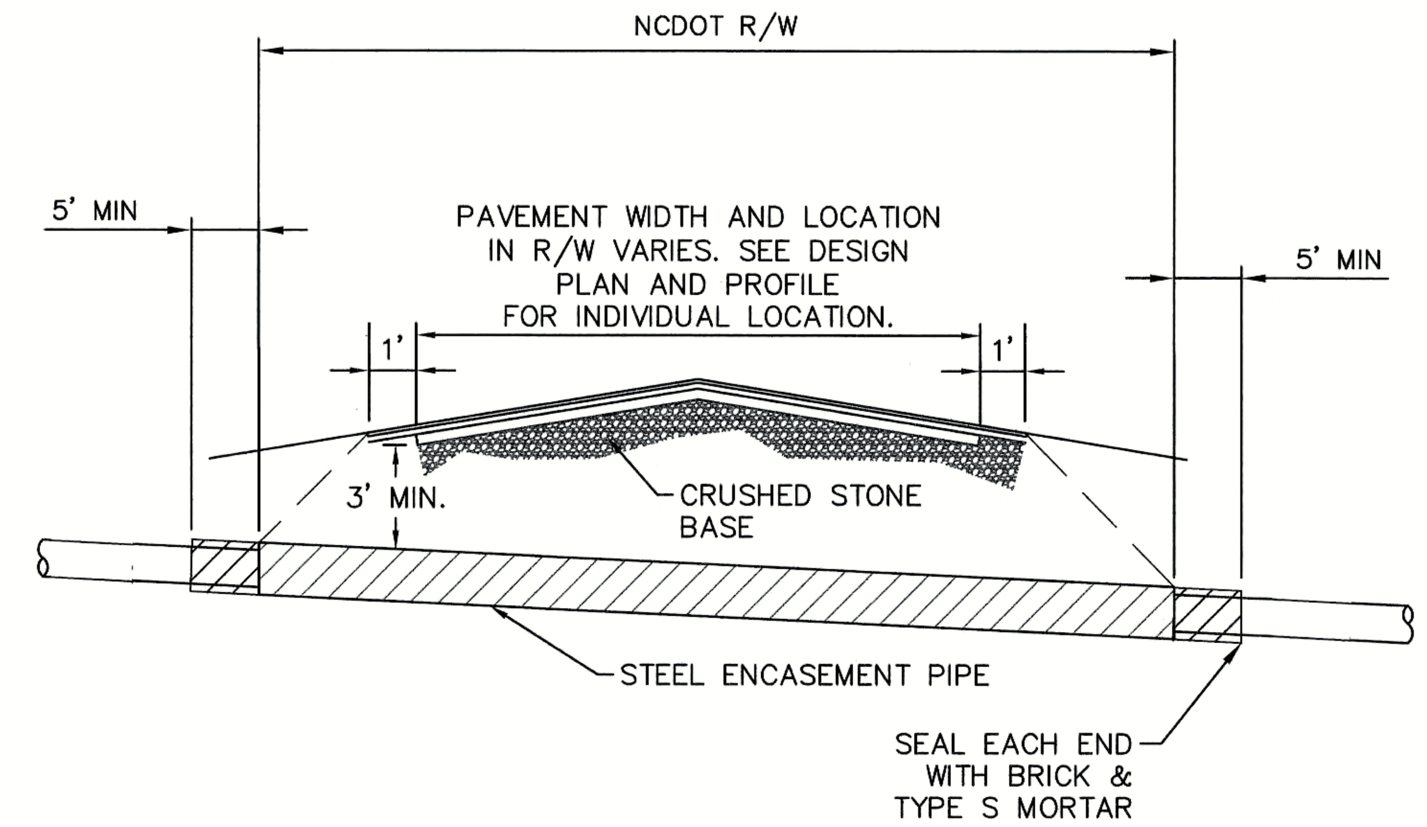
SHEET NO: **D-1**

D	X	W
12"	1'-4"	7'-4"
15"	1'-7"	7'-7"
18"	1'-10"	7'-10"
24"	2'-6"	8'-6"
30"	3'-1"	9'-1"
36"	3'-8"	9'-8"
42"	4'-5"	10'-5"
48"	5'-0"	11'-0"
54"	5'-0"	11'-0"



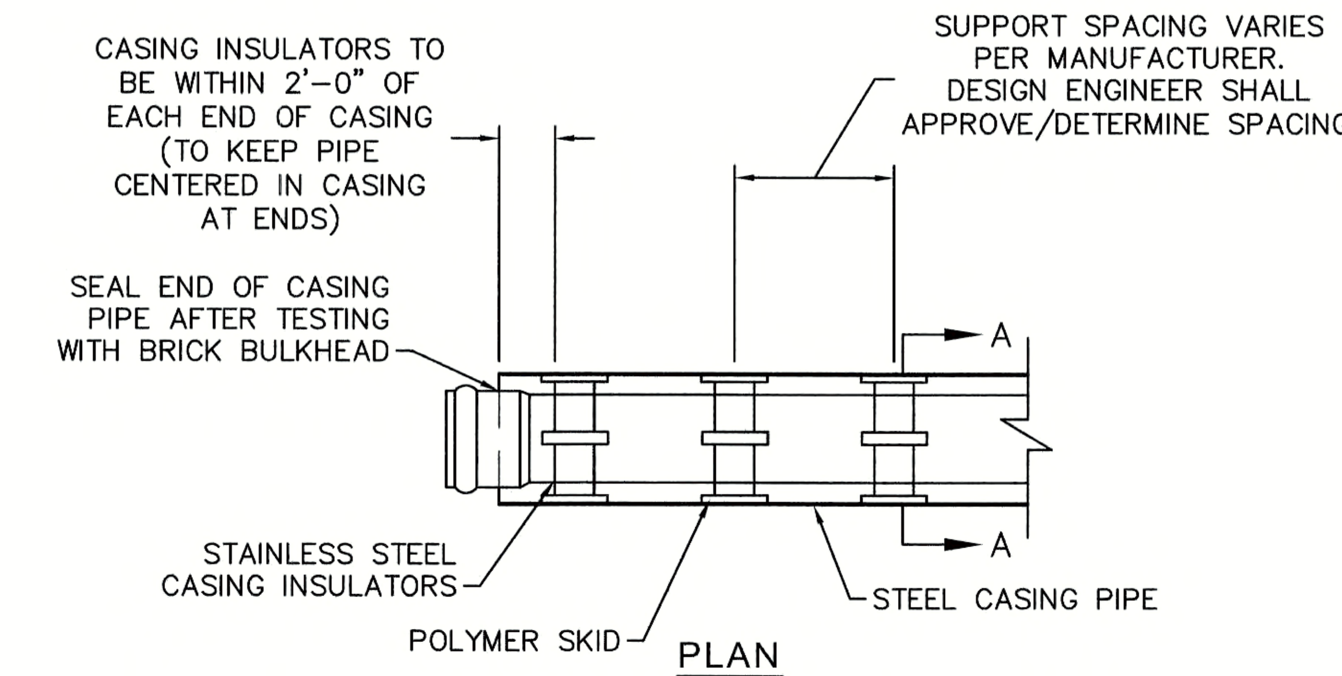
PAVEMENT REPAIRS ON ROADS TO BE RESURFACED
(PIPE IS PLACED UNDER EXISTING PAVEMENT)

NCDOT-PAVEMENT REPAIRS (WS-3)
NOT TO SCALE

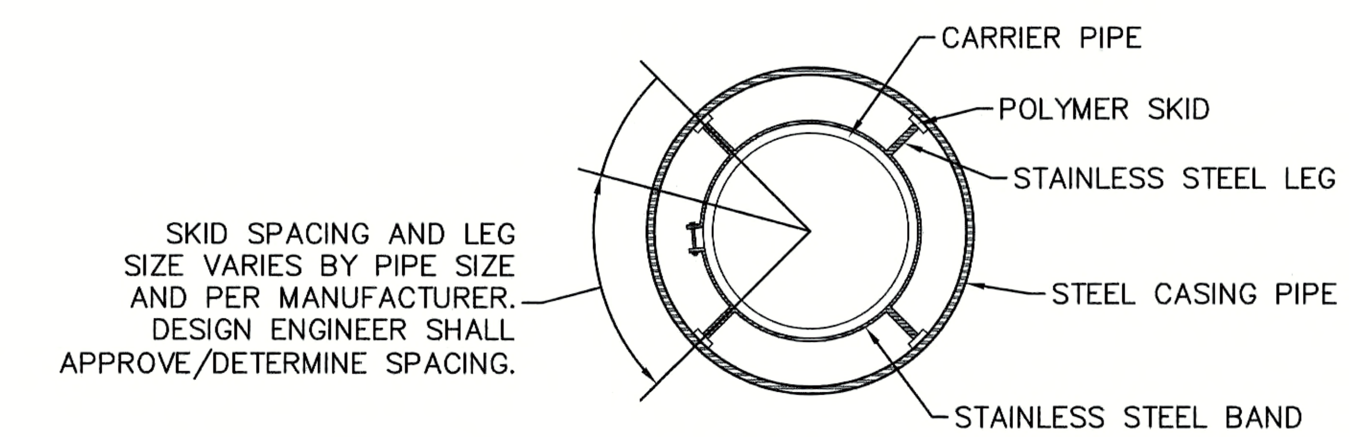


NOTES:
1. CASING WILL BE INSTALLED AT LINE AND GRADE SHOWN ON INDIVIDUAL PROFILE FOR EACH CROSSING. BORING/JACKING TO LINE AND GRADE IS REQUIRED.
2. TRACER WIRE SHALL BE TAPED AT 12' INTERVALS THROUGHOUT THE CASING.
3. PIPING THROUGH CASING SHALL BE RESTRAINED JOINT.
4. SEE DETAIL WS-8 FOR PIPE CASING SUPPORT DETAILS.
5. CASING SHALL EXTEND MIN 5' FROM NCDOT R/W.

TYPICAL BORING & JACKING DETAIL (WS-7)
NOT TO SCALE

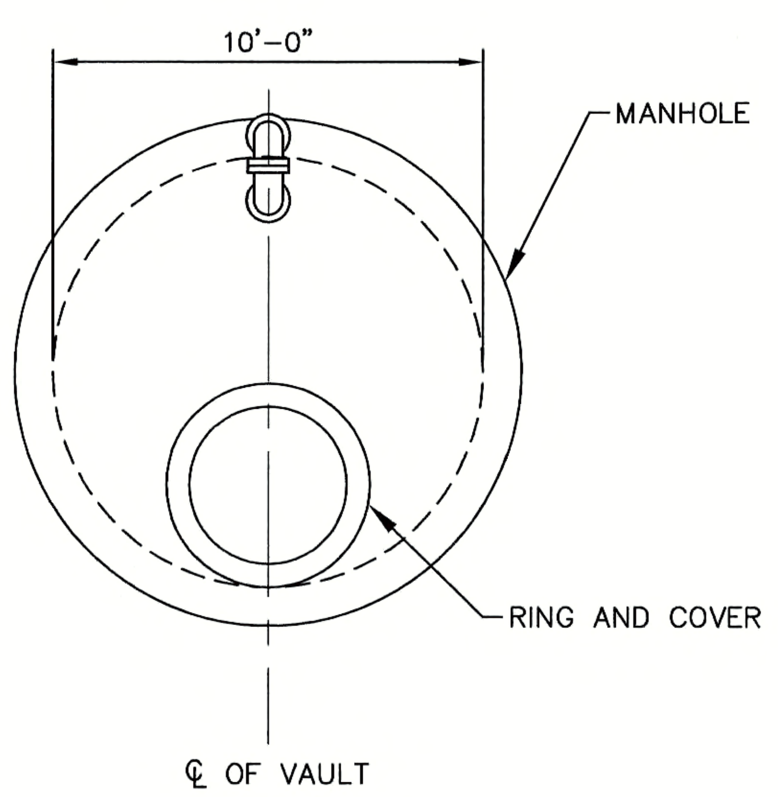


PLAN

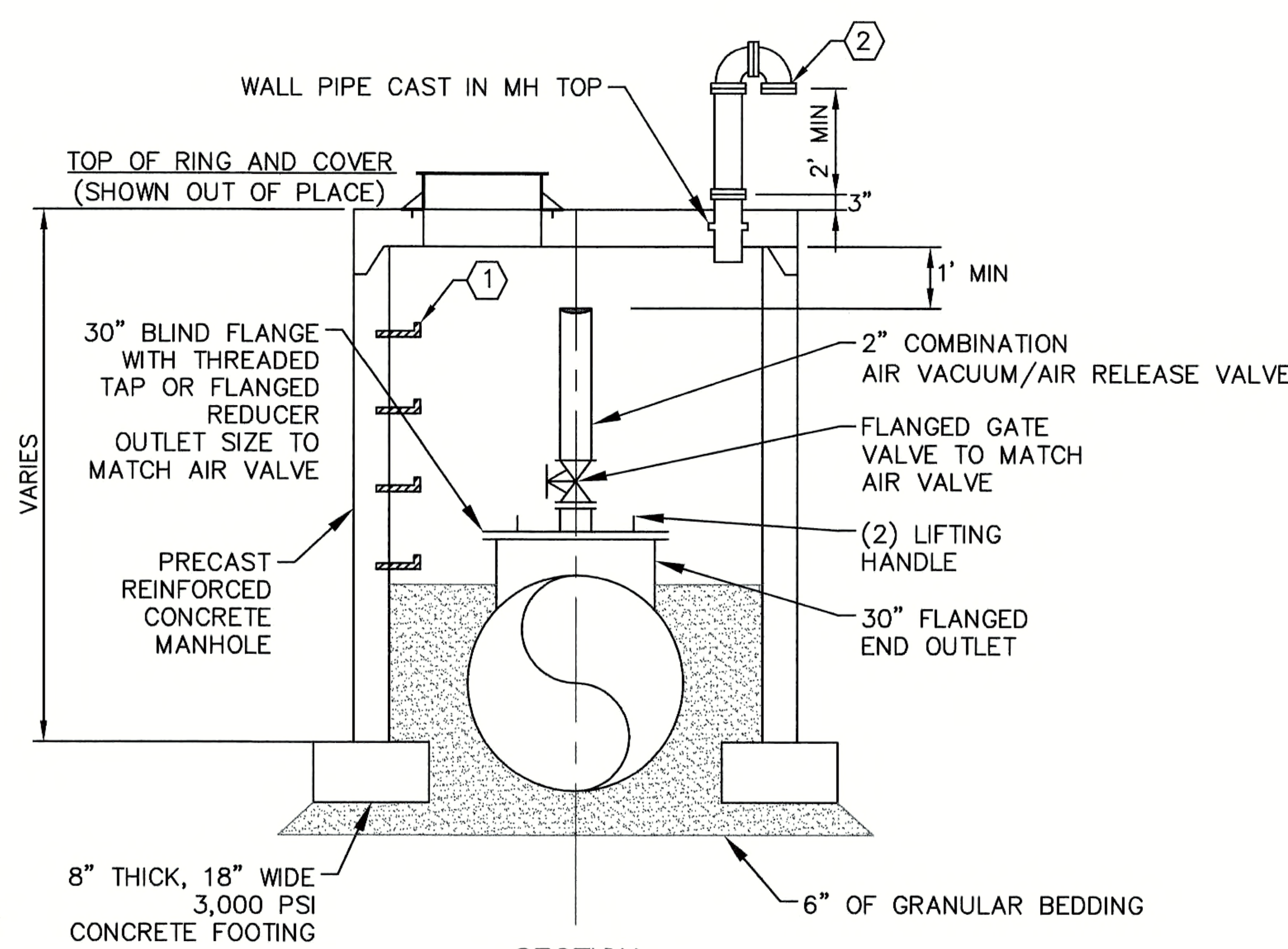


SECTION A-A

PIPE CASING SUPPORT DETAIL (WS-8)
NOT TO SCALE



TOP PLAN

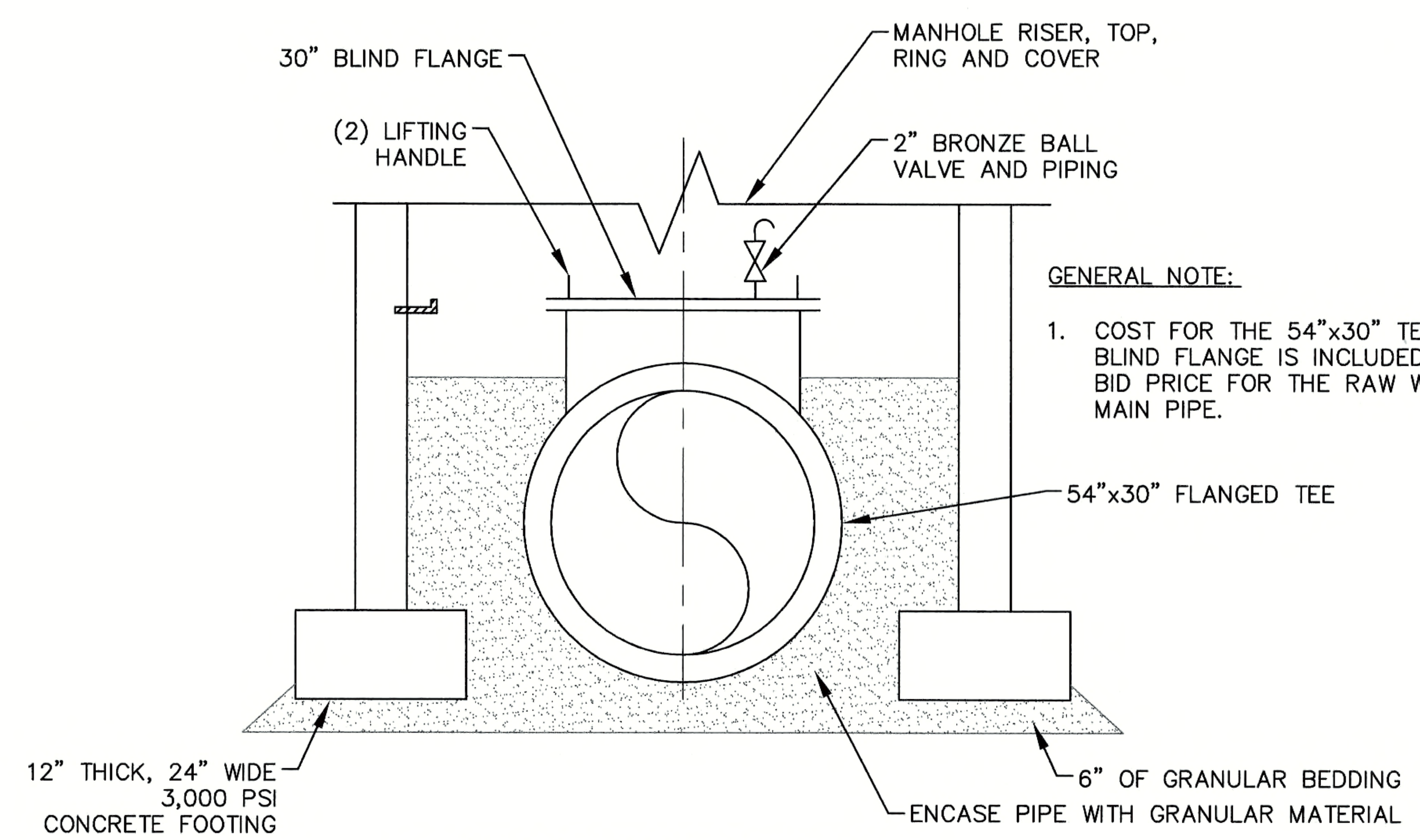


SECTION

GENERAL NOTE:
1. ALL PIPE AND FITTINGS SHALL BE STEEL OR DIP.

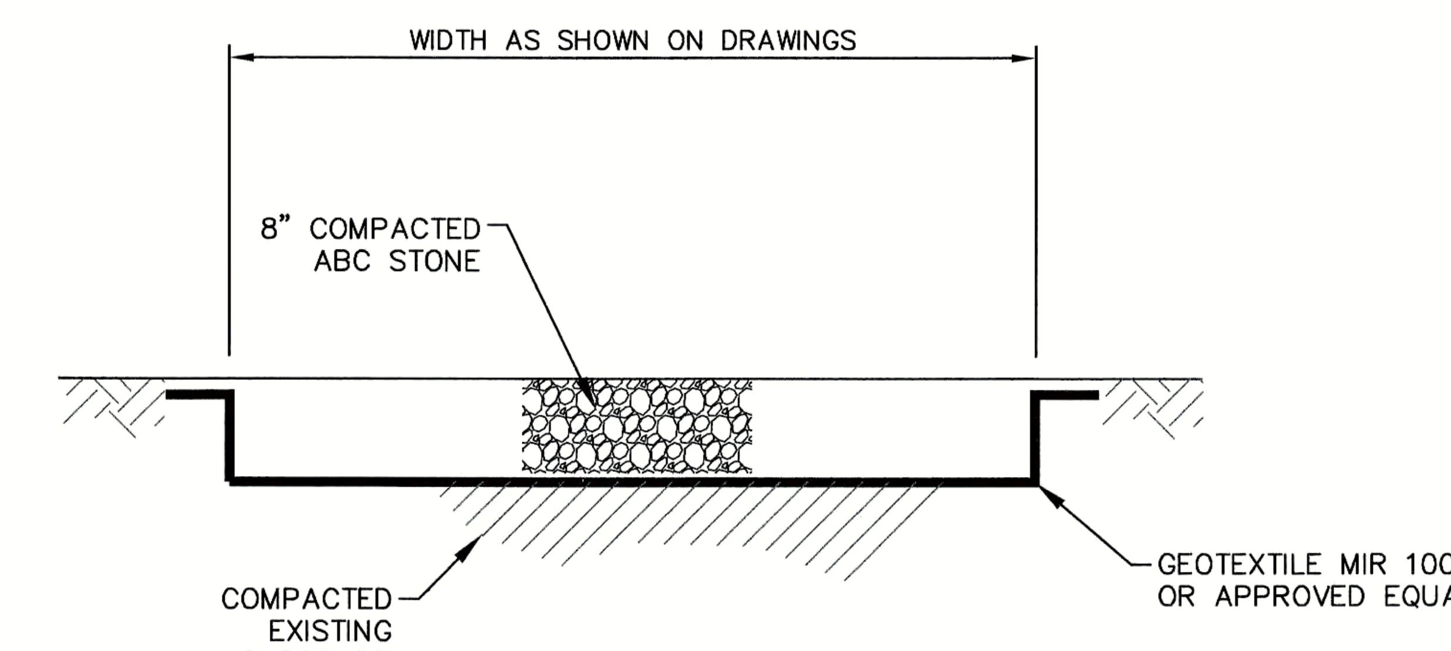
KEY NOTE:
(1) INSTALL STEEL REINFORCED COPOLYMER POLYPROPYLENE STEPS, SPACE 16" OC (SHOWN OUT OF PLACE).
(2) 8" VENT PIPE WITH FLANGED DIP RETURN BEND WITH STAINLESS STEEL INSECT SCREEN (SHOWN OUT OF PLACE), VENT PIPE SHALL BE DIP, PRIMED AND PAINTED PER PIPE MANUFACTURER'S RECOMMENDATIONS. COLOR TO BE SELECTED BY OWNER. IF REQUIRED TO MEETH-20 LOADING, EXTEND VENT PIPE OUT THE WALL AT NO ADDITIONAL COST.

COMBINATION AIR VACUUM / AIR RELEASE VALVE
NOT TO SCALE



GENERAL NOTE:
1. COST FOR THE 54"x30" TEE AND BLIND FLANGE IS INCLUDED IN THE BID PRICE FOR THE RAW WATER MAIN PIPE.

ACCESS MANHOLE DETAIL
NOT TO SCALE



TEMPORARY ROAD DETAIL
NOT TO SCALE

NOTES:
1. CONTRACTOR SHALL INVESTIGATE FOR THE PRESENCE OF EXISTING UTILITIES AND/OR SERVICES NOT SHOWN ON CONTRACT DRAWINGS.
2. PROOF ROLL SUB GRADE IN PRESENCE OF ENGINEER PRIOR TO PLACEMENT OF FABRIC.
3. AREAS OBSERVED TO YIELD SHALL BE REMOVED AND REPLACED AT ENGINEERS DIRECTION.

McKIM&CREED
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TELE: (910) 343-1048
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LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025512 ENGINEER ANTHONY W. BOAHN
4-10-19

54" RAW WATER MAIN DETAILS

CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

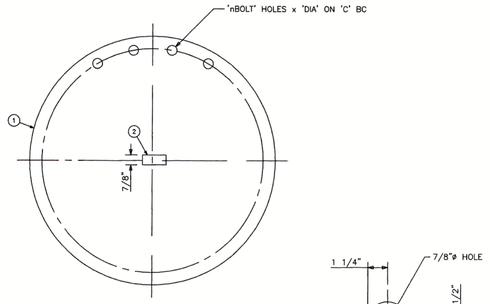
DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO.: 5367-0038
SHEET NO: D-2

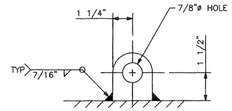
FLANGE DATA

CLASS	NOM	'A'	No. BOLT HOLES	'C'	'DIA'	'THK'
D	24	32.000	20	29.500	1.375	1.661

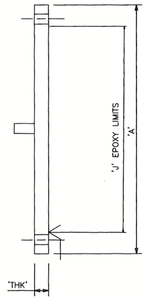
ITEM No	QTY	DESCRIPTION	REF SHEET
1	1	24" CLASS D BLIND FLANGE	

Mark No.	Ref Sheet





LUG DETAIL



Internal Finish: AWWA C210 Epoxy
External Finish: AWWA C222 Polyurethane
Machined Face: Rust Veto 344

RING FLANGE TANGENTIAL OUTLET w/COLLAR DETAIL DRAWING

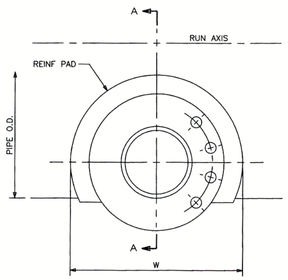
ROW	RUN PIPE		OUTLET PIPE			REINFORCING			FLANGE DATA							
	O.D.	t	O.D.	t*	H	T	w	W	CLASS	NOM	A	B	No. BOLTS HOLES	C	DIA	THK
D3-A	55.750	0.225	8.625	0.250	36.000	0.188	3.125	14.875	D	8	13.500	8.950	8	11.750	0.875	0.6875
D3-B	55.750	0.225	12.750	0.250	36.000	0.188	5.000	22.750	D	12	19.000	12.875	12	17.000	1.000	0.812

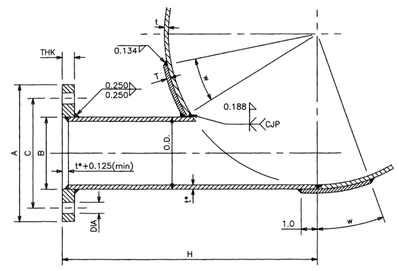
NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
2. FLANGE TO BE TWO-HOLED ON RUN AXIS UNLESS OTHERWISE SHOWN ON MARK No DWG.

LINING: C205 Cement Mortar
COATING: C222 Polyurethane

FLG EDGE & BACK: Rust Veto 344
FLG MACHINED FACE: Rust Veto 344

FD	FIN	GRD
INT	0	0
EXT	0	0





SECTION A-A

McKIM & CREED
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FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear
Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 028912 ENGINEER ANTHONY W. BOJAHN
4-10-19

54" RAW WATER MAIN DETAILS

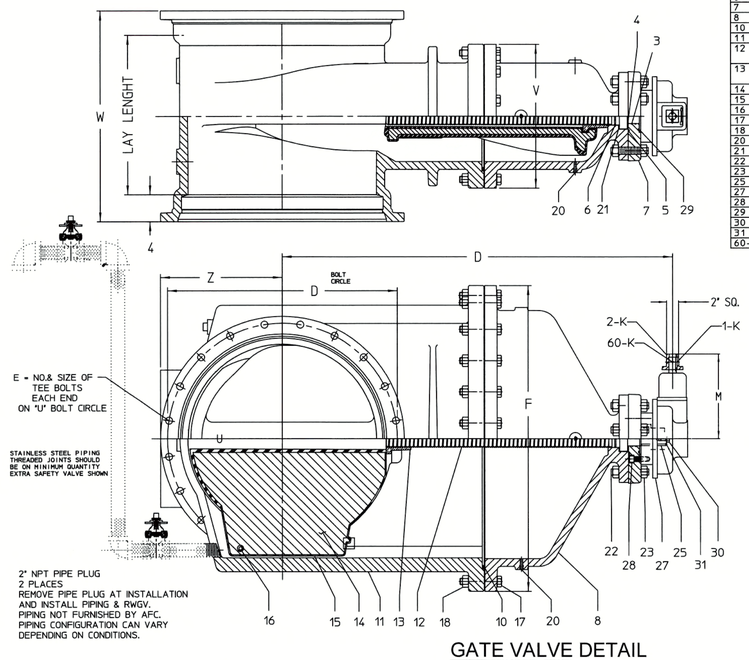
CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO:
D-3

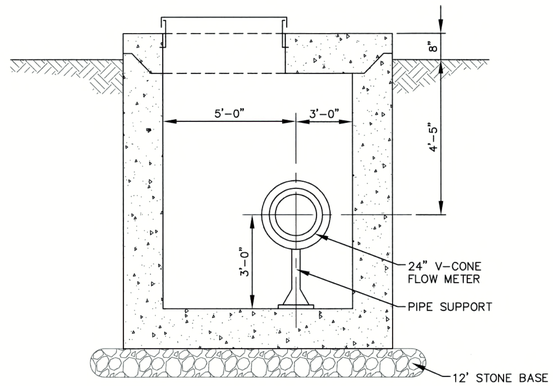
REF	DESCRIPTION	MATERIAL
1-K	KEY FOR OPER. NUT	STEEL
2-K	OPERATING NUT 2"SQ.	DUCTILE IRON ASTM A536
3	O-RING	NITRILE RUBBER
4	UPPER THRUST WASHER	DELRIN
5	STUFFING BOX GASKET	NITRILE RUBBER O-RING
6	O-RING	NITRILE RUBBER
7	STUFFING BOX	DUCTILE IRON ASTM A536
8	BONNET	DUCTILE IRON ASTM A536
10	THROAT FLANGE GASKET	NITRILE RUBBER
11	VALVE BODY	DUCTILE IRON ASTM A536
12	STEM	MANGANESE BRONZE ASTM B763 UNS C86200
13	WEDGE NUT	BRONZE ASTM B62 UNS C83600
14	RESILIENT WEDGE	DUCTILE IRON WITH EPDM RUBBER
15	WEDGE COVER	DELRIN
16	WEDGE COVER PIN	DELRIN
17	HEX HEAD BOLT	0304 STAINLESS STEEL
18	HEX NUT	0304 STAINLESS STEEL
20	PIPE PLUG	300 SERIES STAINLESS STEEL
21	LOWER THRUST WASHER	DELRIN
22	STUD	0304 STAINLESS STEEL
23	HEX NUT	0304 STAINLESS STEEL
25	KEY	HARDENED STEEL
27	BEVEL GEAR ACTUATOR	SEE TABLE
28	SOCKET HEAD CAPSCREW	0304 STAINLESS STEEL
29	ACTUATOR GASKET	NITRILE RUBBER O-RING
30	HEX HEAD BOLT	ASTM A307 PLATED STEEL
31	WASHER	STEEL
60-K	PIN FOR OPER. NUT	STAINLESS STEEL



NOTES:

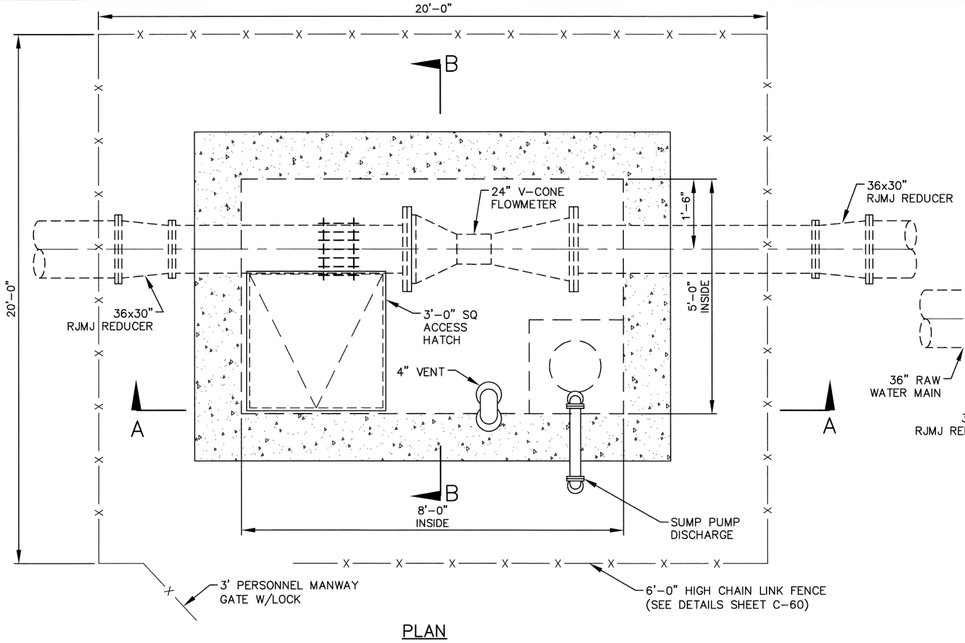
1. MECHANICAL JOINT ENS IN ACCORDANCE WITH ANSI/AWWA C111/A21.11.
2. STANDARD INTERNAL AND EXTERNAL COATING IS FUSION BONDED EPOXY.
3. WORKING PRESSURE IS 250 PSI.
4. OPEN DIRECTION AS SPECIFIED BY CUSTOMER.
5. VALVE MEETS OR EXCEEDS REQUIREMENTS OF ANSI/AWWA C515.
6. VALVES ARE CERTIFIED TO ANSI/NSF STANDARD 61.

GATE VALVE DETAIL
NOT TO SCALE

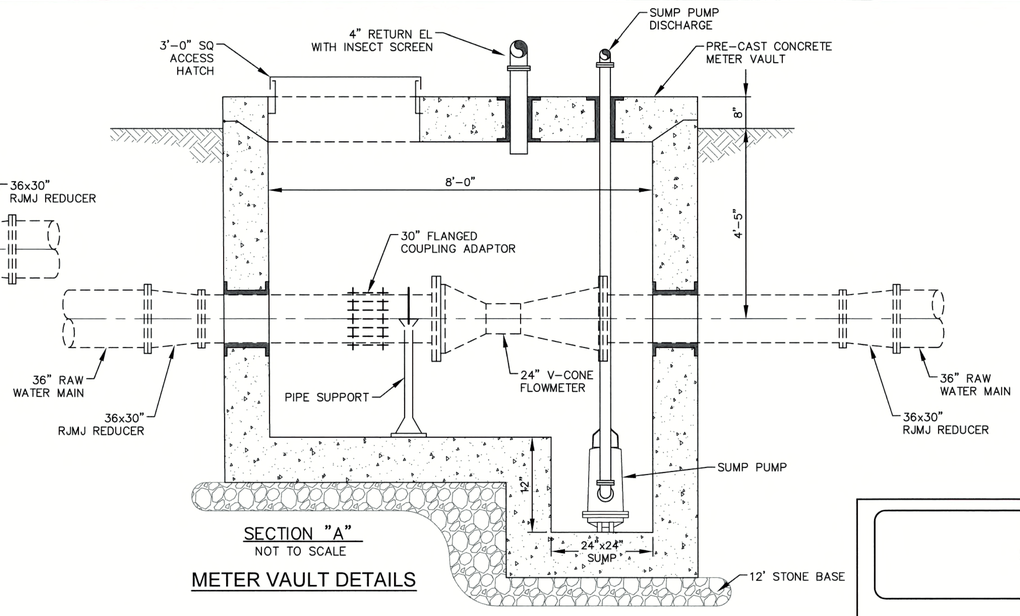


SECTION "B"
NOT TO SCALE

METER VAULT DETAILS



PLAN
NOT TO SCALE



SECTION "A"
NOT TO SCALE

METER VAULT DETAILS

54" RAW WATER MAIN DETAILS

DATE:	APR 2019
SCALE:	AS SHOWN
DRAWN BY:	JPV
CHECKED BY:	AWB
PROJECT NO. :	5367-0038

CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

NORTH CAROLINA PROFESSIONAL SEAL 025542 ENGINEER ANTHONY W. BOATH
4-10-19

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

SHEET NO: **D-4**

McKIM&CREED
243 NORTH FRONT ST
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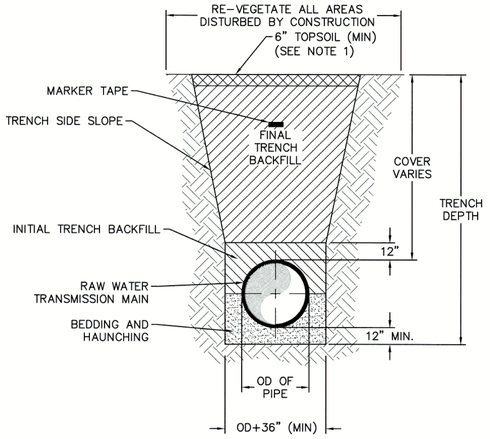
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

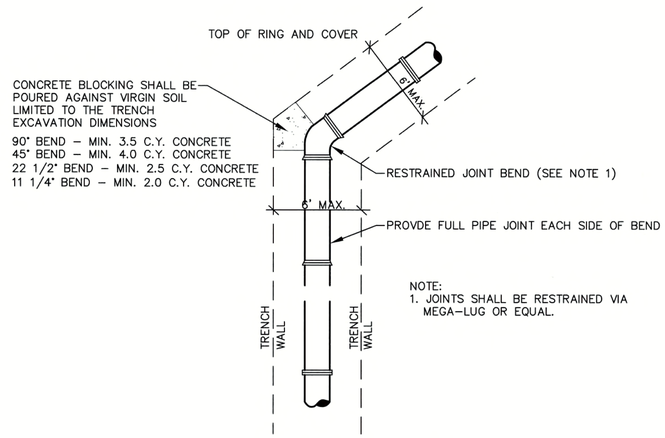
Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:



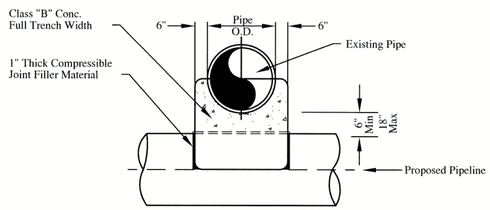
NOTES:
1. CONTRACTOR MAY ELECT TO STRIP AND STOCKPILE TOPSOIL AND REINSTALL UPON COMPLETION OF PIPE INSTALLATION.
2. REFER TO GEOTECHNICAL REPORT FOR SOIL CLASSIFICATION AND REQUIREMENTS FOR FINAL BACKFILL, INITIAL BACKFILL, BEDDING AND HAUNCHING.

TYPICAL PIPE EMBEDMENT DETAIL
NOT TO SCALE



NOTE:
1. JOINTS SHALL BE RESTRAINED VIA MEGA-LUG OR EQUAL.

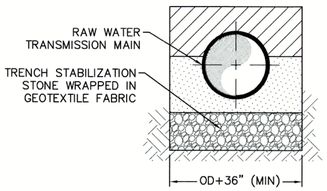
THRUST BLOCKING DETAIL
NOT TO SCALE



PROPOSED PIPELINE UNDER EXISTING PIPE

* FOR PIPELINES WHERE SUFFICIENT SEPARATION AND PROPER COMPACTION CANNOT BE ACHIEVED.

TYPICAL PIPELINE SUPPORT DETAIL
NOT TO SCALE



NOTES:
1. TRENCH STABILIZATION REQUIRED FOR WET OR SOFT AREAS AS DETERMINED BY THE ENGINEER.
2. DEPTH OF STONE SHALL BE 18" MINIMUM, OR AS DETERMINED BY THE ENGINEER.

TYPICAL PIPE EMBEDMENT DETAIL
NOT TO SCALE

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Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

54" RAW WATER MAIN DETAILS

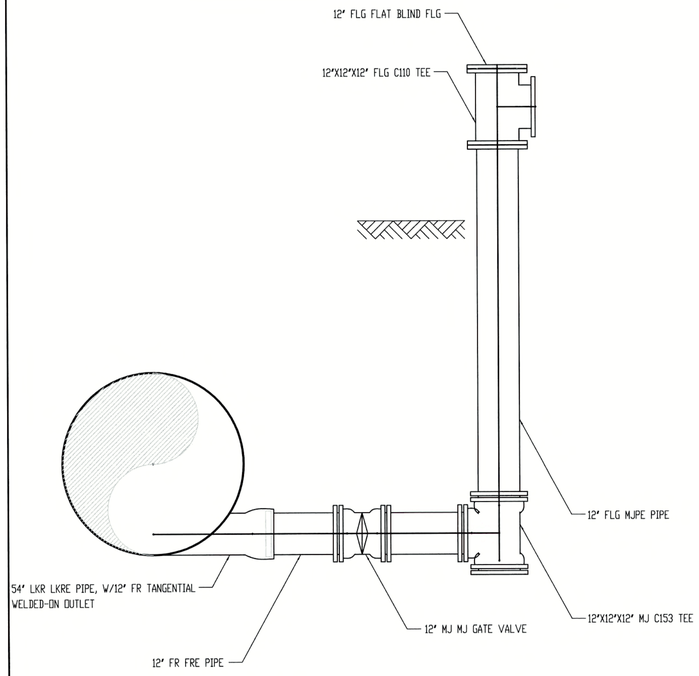
NORTH CAROLINA PROFESSIONAL SEAL 025870 ENGINEER ANTHONY W. BOAHN
4-10-19

CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

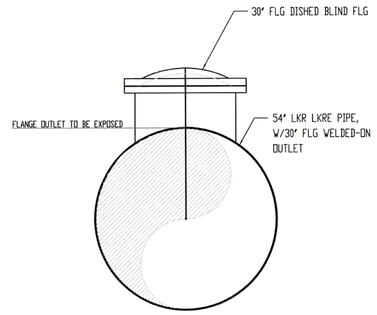
CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

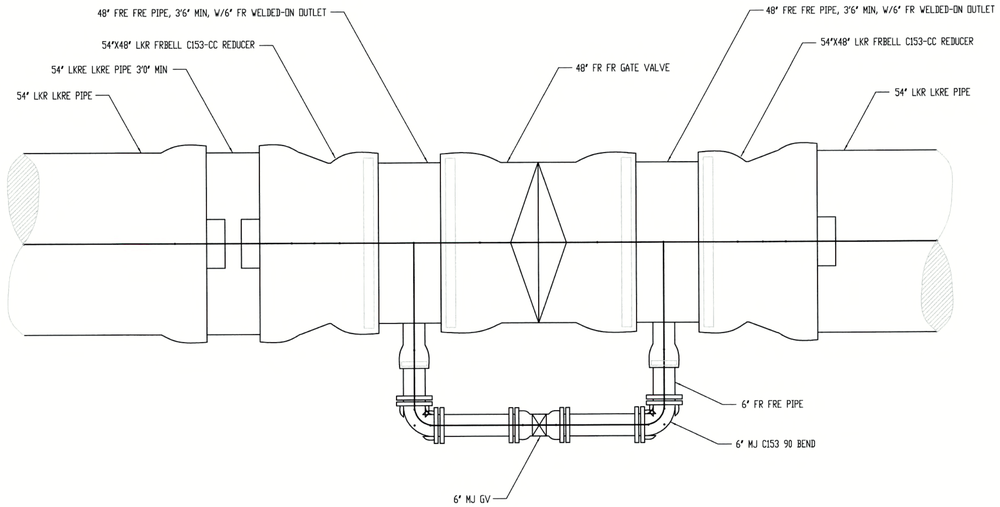
SHEET NO: **D-5**



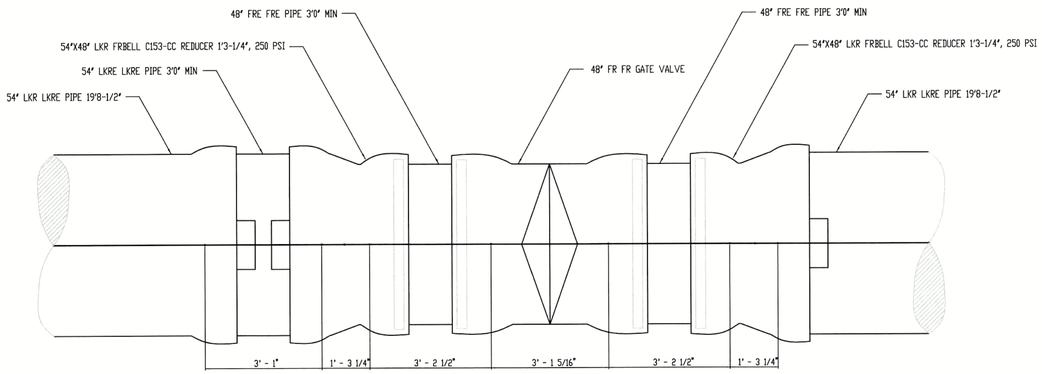
12" BLOW-OFF ASSEMBLY (DUCTILE)
NOT TO SCALE



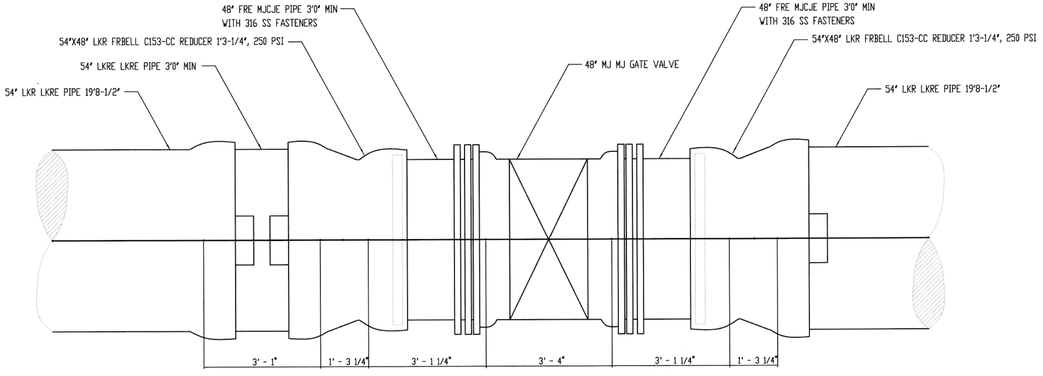
30" OUTLET MANWAY (DUCTILE)
NOT TO SCALE



48" GATE VALVE WITH BYPASS FLEX RING CONNECTION
NOT TO SCALE



48" GATE VALVE WITHOUT BYPASS FLEX RING CONNECTION
NOT TO SCALE



48" GATE VALVE WITHOUT BYPASS MJ CONNECTION
NOT TO SCALE

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Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

54" RAW WATER MAIN DETAILS

NORTH CAROLINA PROFESSIONAL SEAL 025813 ENGINEER ANTHONY W. BOAHN 4-10-19

CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: **D-6**

SEEDING SCHEDULE FOR STABILIZATION GRASS

SHOULDERS, SIDE DITCHES, SLOPES (MAX. 3:1)

DATE	TYPE	PLANTING RATE
AUG. 15 – NOV. 1	TALL FESCUE	300 LBS/ACRE
NOV. 1 – MAR. 1	TALL FESCUE & ABRUZZI RYE	300 LBS/ACRE 25 LBS/ACRE
MAR. 1 – APR. 15	TALL FESCUE	300 LBS/ACRE
APR. 15 – JUN. 30	HULLED COMMON BERMUDAGRASS	25 LBS/ACRE
JUL. 1 – AUG. 15	TALL FESCUE AND	120 LBS/ACRE
	*** BROWNTOP MILLET	35 LBS/ACRE
	*** OR SORGHUM – SUDAN HYBRIDS	30 LBS/ACRE

SHOULDERS, SIDE DITCHES, SLOPES (3:1 TO 2:1)

MAR. 1 – JUN. 1	SERICEA LESPEDEZA (SCARIFIED) &	50 LBS/ACRE
(MAR. 1 – APR. 15)	ADD TALL FESCUE	120 LBS/ACRE
(MAR. 1 – JUN. 30)	OR ADD WEEPING LOVERGRASS	10 LBS/ACRE
(MAR. 1 – JUN. 30)	OR ADD HULLED COMMON BERMUDAGRASS	25 LBS/ACRE
JUN. 1 – SEP. 1	*** TALL FESCUE AND	120 LBS/ACRE
	*** BROWNTOP MILLET	35 LBS/ACRE
	*** OR SORGHUM – SUDAN HYBRIDS	30 LBS/ACRE
SEP. 1 – MAR. 1	SERICEA LESPEDEZA (UNHULLED – UNSCARIFIED)	70 LBS/ACRE
	AND TALL FESCUE	120 LBS/ACRE
NOV. 1 – MAR. 1	ADD ABRUZZI RYE	25 LBS/ACRE

CONSULT CONSERVATION ENGINEER OR SOIL CONSERVATION SERVICE FOR ADDITIONAL INFORMATION CONCERNING OTHER ALTERNATIVES FOR VEGETATION OF DENUDED AREAS. THE ABOVE VEGETATION RATES ARE THOSE WHICH DO WELL UNDER LOCAL CONDITIONS, OTHER SEEDING RATE COMBINATIONS ARE POSSIBLE.

*** TEMPORARY -- RESEED ACCORDING TO OPTIMUM SEASON FOR DESIRED PERMANENT VEGETATION. DO NOT ALLOW TEMPORARY COVER TO GROW OVER 12" IN HEIGHT BEFORE MOWING,OTHERWISE FESCUE MAY BE SHADED OUT.

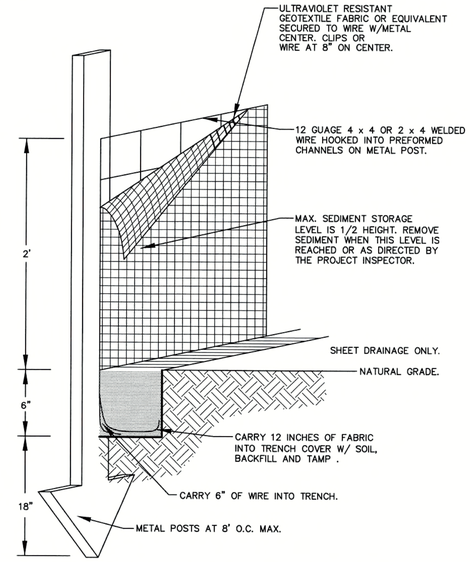
SEEDBED PREPARATION

1. CHISEL COMPACTED AREAS AND SPREAD TOPSOIL 3 INCHES DEEP OVER ADVERSE SOIL CONDITIONS, IF AVAILABLE.
2. RIP THE ENTIRE AREA TO 6 INCHES DEPTH.
3. REMOVE ALL LOOSE ROCK, ROOTS, AND OTHER OBSTRUCTIONS LEAVING SURFACE REASONABLY SMOOTH AND UNIFORM.
4. APPLY AGRICULTURAL LIME, FERTILIZER, AND SUPERPHOSPHATE UNIFORMLY AND MIX WITH SOIL (SEE BELOW*).
5. CONTINUE TILLAGE UNTIL A WELL – PULVERIZED, FIRM, REASONABLY UNIFORM SEEDBED IS PREPARED 4 TO 6 INCHES DEEP.
6. SEED ON A FRESHLY PREPARED SEEDBED AND COVER SEED LIGHTLY WITH SEEDING EQUIPMENT OR CULTIPACK AFTER SEEDING.
7. MULCH IMMEDIATELY AFTER SEEDING AND ANCHOR MULCH.
8. INSPECT ALL SEEDED AREAS AND MAKE NECESSARY REPAIRS OR RESEEDINGS WITHIN THE PLANTING SEASON, IF POSSIBLE. IF STAND SHOULD BE OVER 60% DAMAGED REESTABLISHED FOLLOWING ORIGINAL LIME, FERTILIZER AND SEEDING RATES.
9. CONSULT CONSERVATION INSPECTOR ON MAINTENANCE TREATMENT AND FERTILIZATION AFTER PERMANENT COVER IS ESTABLISHED.

* APPLY: AGRICULTURAL LIMESTONE – 2 TONS/ACRE OR 3 TONS/ACRE IN CLAY SOILS
FERTILIZER – 1000 LBS/ACRE (10-10-10)
SUPERPHOSPHATE – 500 LBS/ACRE (20%)
MULCH – 2 TONS/ACRE (SMALL GRAIN STRAW)
ANCHOR – ASPHALT EMULSION AT 450 GAL./ACRE

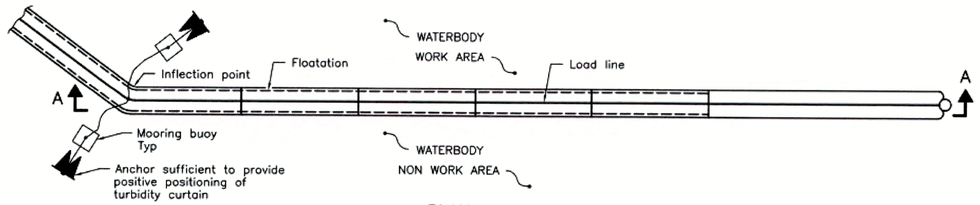
STABILIZATION TIMEFRAMES
(Effective Aug. 3, 2011)

SITE AREA DESCRIPTION	STABILIZATION	TIMEFRAME EXCEPTIONS
Perimeter dikes, swales, ditches, slopes	7 days	None
High Quality Water (HQW) Zones	7 days	None
Slopes steeper than 3:1	7 days	If slopes are 10' or less in length and are not steeper than 2:1, 14 days are allowed.
Slopes 3:1 or flatter	14 days	7 days for slopes greater than 50' in length.
All other areas with slopes flatter than 4:1	14 days	None, except for perimeters and HQW Zones.

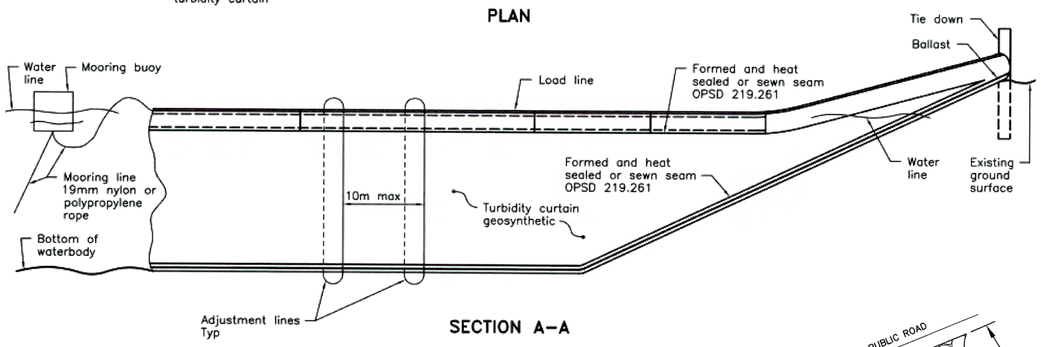


SILT FENCES SHOULD NOT BE USED AT PIPE OUTLETS OR IN AREAS OF CONCENTRATED FLOWS (CREEKS, DITCHLINES, SWALES ETC.).

SILT FENCE DETAIL
NOT TO SCALE



PLAN



SECTION A–A

A. FABRIC: 18–20 OZ PVC

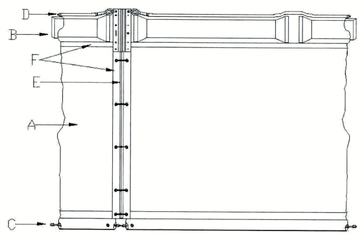
B. FLOTATION: 6"–12"

C. CHAIN BALLAST: 5/16"–3/8"

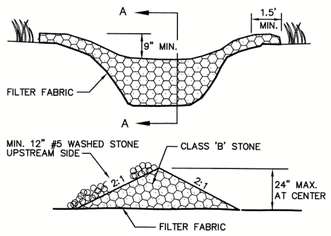
D. CABLE TENSION: 5/16" HG INSIDE POLY TUBING LOCATED ABOVE THE FLOTATION.

E. CONNECTION: BOLT ROPED ENDS CONSISTING OF ALUM CONNECTORS AT TOP AND #4 SS GROMMETS 12" APART AND FASTENED WITH PLASTIC WIRE TIES, STARTING BELOW THE CONNECTORS AND CONTINUING TO THE BOTTOM.

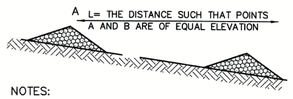
F. SEAMS: ALL SEAMS ARE DIALECTRIC OR THERMALLY BONDED TOGETHER.



TURBIDITY CURTAIN
NOT TO SCALE



SECTION A – A

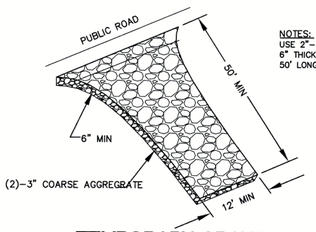


NOTES:

(1) STONE SHOULD BE PLACED OVER THE CHANNEL BANKS TO KEEP WATER FROM CUTTING AROUND THE DAM.

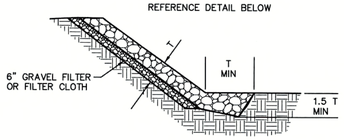
(2) STONE CHECK DAMS SHOULD BE SPACED IN A CHANNEL SO THAT THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF UPSTREAM DAM.

STONE CHECK DAM DETAIL
NOT TO SCALE



NOTES:
USE 2"–3" WASHED STONE, 6" THICK, 12' WIDE (MIN), 50' LONG (MIN)

TEMPORARY GRAVEL CONSTRUCTION ENTRANCE
NOT TO SCALE



THE DIAMETER OF THE LARGEST STONE SHALL NOT EXCEED 1.5 TIMES THE SIZE OF THE RIP-RAP. (EX. 12" FOR 8") MINIMUM THICKNESS (T) SHOULD BE 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT IN NO CASE LESS THAN 6".

1. EACH RIP RAP PLACEMENT SHALL BE BEDDED IN EITHER A 6 INCH LAYER OF STABILIZATION STONE OR A TYPE II NON-BIODEGRADABLE FILTER FABRIC. PLACEMENT OF RIP-RAP SHALL IMMEDIATELY FOLLOW THE PLACEMENT OF THIS LAYER. KEEP VOIDS TO A MINIMUM AND FORM A DENSE WELL GRADED MASS OF STONE. DO NOT DISLODGE THE UNDERLYING BASE OF FILTER WHEN PLACING STONE. COST OF THE STONE BASE OR FILTER SHALL BE INCLUDED IN THE COST OF THE PLACING OF RIP-RAP.
2. MAXIMUM STONE SIZE WHEN USING 8 INCH D50 WILL BE 12 INCHES AND THE MINIMUM THICKNESS OF THE RIP-RAP LAYER SHALL BE 18 INCHES.
3. MAXIMUM SLOPE OF THE CHANNEL BANK SHALL NOT EXCEED 2.0 HORIZONTAL TO 1.0 VERTICAL. FINISHED GRADE OF THE RIP-RAP IS TO BLEND WITH THE SURROUNDING AREA.
4. INSPECT RIP-RAP PERIODICALLY FOR SCOUR OR DISLODGED STONES (ESPECIALLY AFTER SEVERE STORMS) AND WEED BRUSH GROWTH.

RIP RAP PLACEMENT DETAIL
NOT TO SCALE

CONSTRUCTION SEQUENCE

1. INSTALL TEMPORARY SILT FENCING, CHECK DAMS, OR OTHER MEASURES AS SHOWN ON THE APPROVED PLANS, AND AS NOTED IN TECHNICAL SPECIFICATION SECTION 022410.
2. INSTALL TEMPORARY GRAVEL CONSTRUCTION ENTRANCE WHERE REQUIRED TO ACCESS WORK AREA.
3. PROTECT INLETS WITH SILT FENCING, SEDIMENT TRAPS OR OTHER APPROVED MEASURES AS SHOWN ON THE PLANS.
4. CALL FOR ONSITE INSPECTION BY ENVIRONMENTAL INSPECTOR AND OBTAIN CERTIFICATION OF COMPLIANCE, PRIOR TO CONSTRUCTION IN EACH AREA.
5. OPEN TRENCH, INSTALL PIPELINE, AND BACKFILL TRENCH.
6. STABILIZE SITE AS TRENCH IS RESTORED TO ORIGINAL GRADE WITH VEGETATION, PAVING, DITCH LININGS, ETC., AS NOTED IN TECHNICAL SPECIFICATION SECTIONS 022480, 022410, AND 022200.
7. WHEN VEGETATION HAS BECOME ESTABLISHED, AS NOTED IN TECHNICAL SPECIFICATION SECTION 022410, CALL FOR FINAL SITE INSPECTION BY ENVIRONMENTAL INSPECTOR.
8. REMOVE SILT FENCING & CHECK DAMS AFTER FINAL APPROVAL FROM ENVIRONMENTAL INSPECTOR.

McKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025972 ENGINEER ANTHONY W. BOHAN
4-10-19

54" RAW WATER MAIN EROSION CONTROL DETAILS

CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: APR 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

SHEET NO: **D-7**

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

ROY COOPER
GOVERNOR

JAMES H. TROGDON, III
SECRETARY

June 21, 2019

COUNTY: Bladen County. N.C.
NCDOT # E063-009-19-00027

SUBJECT: Kings Bluff Water Transmission Main

Mr. Don Betz, Executive Director (Second Party)
Lower Cape Fear Water and Sewer Authority
1107 New Pointe Blvd., Suite 17
Leland, N.C. 28451

Mr. Carel Vandermeyden, Director of Engineering (Third Party)
Cape Fear Public Utility Authority
235 Government Center Drive
Wilmington, N.C. 28403

Gentlemen,

Attached for your files is a copy of the Right of Way Encroachment Contract properly executed. This contract covers the following:

Proposed Road Crossing of Routes S.R. 1734 (Locks Road No. 1) Approx. 0.83 Miles NE of N.C. Hwy. 87 and S.R. 1735 (Black Rock Road) Approx. 0.50 Miles NE of NC Hwy. 87 with the Construction and/or Erection of, The Cape Fear Public Utility Authorities (Kings Bluff Water Transmission Main) Consisting of a 54" RAW Water Transmission Main.

APPROVED SUBJECT TO: Attached Special Provisions

Sincerely,

Greg Burns, PE,
DIVISION ENGINEER

GB/KLC/sln
Attachments

cc: Kenneth L. Clark, PE (District Engineer)
Nicky L. Garrell (County Maintenance Engineer)

Mailing Address:
NC DEPARTMENT OF TRANSPORTATION
DIVISION OF HIGHWAYS
1194 PRISON CAMP ROAD
WHITEVILLE, NC 28472

Telephone: (910) 642-3760
Fax: (910) 642-2984
Website: www.ncdot.gov

Location:
1194 PRISON CAMP ROAD
WHITEVILLE, NC 28472

SPECIAL PROVISIONS

R/W 16.1

LOWER CAPE FEAR WATER AND SEWER AUTHORITY

1. **WORK ZONE TRAFFIC CONTROL QUALIFICATIONS AND TRAINING PROGRAM**

   Effective July 1, 2010, all flagging operations within NCDOT Right of Way require qualified and trained Work Zone Flaggers.

   Effective July 1, 2011, qualified and trained Work Zone Traffic Control Supervisors will be required on Significant Projects.

   Training for this certification is provided by NCDOT approved training sources and by private entities that have been pre-approved to train themselves. If you have questions, contact our web site at http://www.ncdot.org/doh/preconstruct/wztc/WZTCTrainingProgram/default.html, or contact Stuart Bourne, P.E. with NCDOT Work Zone Traffic Control Unit at (919) 662-4338 or sbourne@ncdot.gov .

1. The encroaching party shall notify the District Engineer's office at telephone number (910) 642-3760) prior to beginning construction and after construction is complete.

2. An executed copy of this encroachment agreement shall be present at the construction site at all times during construction. If safety or traffic conditions warrant such an action, NCDOT reserves the right to further limit, restrict or suspend operations within the right of way.

3. NCDOT does not guarantee the right of way on this road, nor will it be responsible for any claim for damages brought about by any property owner by reason of this installation.

4. The encroaching party is required to contact the appropriate Utility Companies involved and make satisfactory arrangements to adjust the utilities in conflict with the proposed work prior to beginning construction.

5. Excavation within 500 feet of a signalized intersection will require notification by the encroaching party to the Division Traffic Engineer at telephone number (910) 486-1452. All traffic signal or detection cables must be located prior to excavation. Cost to replace or repair NCDOT signs, signals, or associated equipment shall be the responsibility of the encroaching party.

6. The encroaching party shall comply with all applicable Federal, State and local environmental regulations and shall obtain all necessary Federal, State and local environmental permits, including but not limited to, those related to sediment control, stormwater, wetland, streams, endangered species and historical sites.

7. The contractor shall not begin construction until after the traffic control and erosion control devices have been installed to the satisfaction of the District Engineer.

8. Trenching, bore pits and/or other excavations shall not be left open or unsafe overnight.

9. The Contractor shall comply with all OSHA requirements and provide a competent person on site to supervise excavation at all times.

10. All fill areas/backfill shall be compacted to 95% density in accordance with AASHTO T99 as modified by the NCDOT. All material to a depth of 8 inches below the finished surface of the subgrade shall be compacted to a density equal to at least 100% of that obtained by compacting a sample of the material in accordance with AASHTO T99 as modified by the Department. The subgrade shall be compacted at a moisture content which is approximately that required to produce the maximum density indicated by the above test method. The contractor shall dry or add moisture to the subgrade when required to provide a uniformly compacted and acceptable subgrade.

11. Vegetative cover shall be established on all disturbed areas in accordance with the recommendations of the Division Roadside Environmental Engineer or an approved Erosion Control Plan.

12. Proper temporary and permanent measures shall be used to control erosion and sedimentation in accordance with all local, State and Federal regulations.

13. All materials and workmanship shall conform to the N. C. Department of Transportation's Standards and Specifications Manuals.

14. Strict compliance with the Policies and Procedures for Accommodating Utilities on Highway Rights of Way manual shall be required.

15. The attached plans reflect the corrections and revisions as coordinated with the NCDOT District Office.

16. The resetting of the Control of Access fence shall be in accordance with the applicable NCDOT standard and as directed by the District Engineer.

17. Excavation material shall not be placed on pavement. Drainage structures shall not be blocked with excavation materials. Any drainage structure disturbed or damaged shall be restored to its original condition as directed by the District Engineer.

18. Any disturbed guardrail shall be reset according to the applicable standard or as directed by the District Engineer.

19. All driveways altered during construction shall be returned to a state comparable with the condition of the driveways prior to construction.

20. Right of Way monuments disturbed during construction shall be referenced by a registered Land Surveyor and reset after construction.

21. All roadway signs that are removed due to construction shall be reinstalled as soon as possible.

22. The party of the second part agrees to provide traffic control devices, lane closures, road closures, positive protection and/or any other warning or positive protection devices necessary for the safety of road users during construction and subsequent maintenance. This shall be performed in conformance with the latest NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures and amendments or supplements thereto. When there is no guidance provided in the NCDOT Roadway Standard Drawings and Standard Specifications for Roads and Structures, comply with the Manual on Uniform Traffic Control Devices for Streets and Highways and amendments or supplements thereto. Information as to the above rules and regulations may be obtained from the NCDOT District Engineer.

23. All lanes of traffic are to be open during the hours of 6:00 A.M. to 9:00 A.M. and from 4:00 P.M. to 7:00 P.M., or as designated by the District Engineer. Traffic shall be maintained at all times.

24. Ingress and egress shall be maintained to all businesses and dwellings affected by the project. Special attention shall be paid to police and fire stations, fire hydrants and hospitals.

25. Any work requiring equipment or personnel within 5' of the edge of any travel lane of an undivided facility and within 10' of the edge of any travel lane of a divided facility shall require a lane closure with appropriate tapers.

26. Work requiring lane or shoulder closures shall not be performed on both sides of the road simultaneously within the same area.

27. During non-working hours, equipment shall be parked as close to the right of way line as possible and be properly barricaded in order not to have any equipment obstruction within the Clear Recovery Area.

28. The utility shall be installed within 5 feet of the right of way line and outside the theoretical 1:1 slope from the edge of pavement to the bottom of the nearest excavation wall. When this is not possible, excavation inside the theoretical 1:1 slope from the existing edge of pavement to the bottom of the nearest excavation wall shall be made in accordance with the following conditions:

a. Positive excavation shoring, such as sheet piling, shall be installed. The design of the shoring shall include the effects of traffic loads. The shoring system shall be designed and sealed by a licensed North Carolina Professional Engineer. Shoring plans and design calculations shall be submitted to the Division Engineer for review and approval prior to construction. **Trench boxes shall not be accepted as positive shoring.**

b. The trench backfill material shall meet the Statewide Borrow Criteria. The trench shall be backfilled in accordance with Section 300-7 of the 2006 NCDOT Standard Specifications for Roads and Structures, which basically requires the backfill material to be placed in layers not to exceed 6 inches loose and compacted to at least 95% of the density obtained by compacting a sample in accordance with ASSHTO T99 as modified by DOT.

c. A qualified NCDOT inspector shall be on the site at all times during construction. The encroaching party shall reimburse NCDOT for the cost of providing the inspector. If NCDOT cannot supply an inspector, the encroaching party (not the utility contractor) should make arrangements to have a qualified inspector, under the supervision of a licensed North Carolina Professional Engineer, on the site at all times. The Professional Registered Engineer shall certify that the utility was installed in accordance with the encroachment agreement and that the backfill material meets the Statewide Borrow Criteria.

d. All trench excavation inside the limits of the theoretical one-to-one slope, as defined by the policy, shall be completely backfilled and compacted at the end of each construction day. No portion of the trench shall be left open overnight.

e. No roadway crossing for a pipeline greater than 2 inches in diameter shall be made in Columbus or Bladen Counties by the method known as driving or thumping, where an air compressor and a pilot shoe are used to compress material and create a bore hole, unless approved by the District Engineer.

29. Directional drilling methods have not been given statewide approval for use on NCDOT right of way. Under no condition shall jetting alone or wet boring with water of utility pipelines be allowed. Directional boring using jetting with a Bentonite (or equivalent material) slurry is approved at a minimum depth of ten (10) feet below the pavement surface [fifteen (15') feet below the surface of partial and/or full control of access roads] and two (2) feet below any ditch line. Directional boring is not allowed in embankment material. Directional boring is allowed beneath embankment material in naturally occurring soil. Any parallel installation utilizing the directional boring method shall be made at a minimum depth of three (3') feet (cover) below the ground surface and outside the theoretical 1:1 slope from the existing edge of pavement except where the parallel installation crosses a paved roadway. All directional bores shall maintain ten (10) feet minimum (clear) horizontal distance from the nearest part of any structure, including but not limited to bridges, footings, pipe culverts or box culverts. All directional bores shall maintain ten (10) feet minimum (clear) vertical and horizontal distance from the nearest part of pipe culverts or box culverts. Directional bores are not allowed beneath bridge footings, culvert wingwall footings or retaining walls. The tip of the drill string shall have a cutter head. Detection wire shall be installed with non-ferrous material. Any changes shall be submitted to the District Engineer for approval prior to construction. For multiple conduit installations (including perpendicular & parallel installations), install conduits with five (5) feet minimum (clear) horizontal separation between each conduit or install multiple conduits within a single duct. An overbore shall not be more than two (2") inches greater than the diameter of the pipe or encasement. An overbore exceeding two (2") inches greater than the diameter of the pipe or encasement will be considered if the encroachment agreement includes a statement signed and sealed by a licensed North Carolina Professional Engineer indicating that an overbore in excess of two (2") inches of the diameter of the pipe or encasement will arch and no damage will be done to the pavement or sub-grade. HDPE pipe installed by directional boring shall not be connected to existing pipe or fittings for one (1) week from the time of installation to allow tensional stresses to relax.

30. Alignment of directional bores at bridges and 48-inch culverts or larger should be (1) one foot off Right of Way. After completion of bore, encroaching party shall provide NCDOT with a certified bore log.

31. All 6" or smaller in diameter plastic gas mains shall meet current NCDOT standards (Polyethylene SDR-11) or the plans shall be sealed, signed and dated by a licensed North Carolina Professional Engineer. All plastic gas mains 8" or greater in diameter shall be sealed, signed, and dated by a licensed North Carolina Professional Engineer.

32. Regulator stations, metering stations, cathodic test stations and anode beds are not permitted within the NCDOT right of way. Header wires are permitted.

33. A performance and indemnity bond in the amount of $100,000.000 shall be posted with the NCDOT District Engineer's Office by the encroaching party prior to beginning any work within the NCDOT right of way. The bond shall be held for a minimum period of one year after completion of the installation and released only upon a final satisfactory inspection by NCDOT.

34. Upon completion of the installation of this encroachment, please summit one hard copy of the As Built plans (noted with any changes) sealed, signed, and dated by a licensed North Carolina Professional Engineer to the District Engineer within 30 days.

35. Vertical clearance of overhead power and communication lines shall meet the National Electrical Safety Code requirements except the minimum vertical clearance shall be 18' for crossings over NCDOT roadways and 15'-6" for parallel installations.

36. All utility access points, such as manholes, splice boxes and junction boxes shall be located at or outside the right of way line. Manholes, splice boxes, junction boxes and vaults shall not be placed in the ditch line, side slopes of the ditches or in the pavement. All manholes, splice boxes, junction boxes and vaults and covers shall be flush with the ground when located within the vehicle recovery area.

37. All utility facilities, including manholes, valve boxes, meter boxes, splice boxes, junction boxes, vaults and access covers, within NCDOT right of way shall have been designed for HS-20 loading rated for continuous traffic. If any proposed structure is not of a design pre-approved by NCDOT, the encroaching party shall submit details and design calculations signed and sealed by a Professional Engineer for approval prior to construction.

38. Any pavement replacement or repair required due to this installation shall be the responsibility of the encroaching party. Pavement repair or replacement shall be in accordance with the requirements of and to the satisfaction of the District Engineer

39. All temporary and final pavement markings are the responsibility of the encroaching party. Final pavement markings and sign plans shall be submitted to the Division Traffic Engineer at telephone number (910) 486-1452 for review and approval prior to installation.

40. Any utility marker required shall be as close to the right of way line as possible. If it is not feasible to install markers at or near the right of way line, written approval specific to the site shall be obtained from the District Engineer prior to installation.

41. Detection tape shall be buried in the trench approximately 1 foot above the fiber optic cable. Where conduit is installed in the right of way and is not of ferrous material, locating tape or detection wire shall be installed with the conduit.

42. Transportation Improvement Project (T.I.P.) ******* is scheduled for construction in the future. Any encroachment determined to be in conflict with the construction of this project shall be removed and/or relocated at the owner's expense. (Continue per spec.)

43. The encroaching party shall submit a letter from the Highway Contractor on NCDOT Project ***** to the NCDOT State Utility Agent stating that this encroachment will not be the basis of a claim for delay or additional cost against the Board of Transportation.

44. The work depicted on the plans and specifications submitted with the encroachment package appears to be an engineering design held out to the public. The engineering work appears to affect public safety and health. As such, the engineering drawings and specifications are required by GS-89C to be properly certified by a licensed North Carolina Professional Engineer. The plans and specifications have not been properly certified by a licensed North Carolina Professional Engineer and the encroaching party may be in violation of GS-89C.

45. In the Future Should NCDOT need to Remove or Replace the Existing Cross Line Pipe as Shown On Plan Drawing Sheet Page 1 of 8, Columbus County Utility Department Agrees to shut off and Remove Temporarily the 20 LF Section of 8" Ductile Iron Water Main at Approx. Station 9+50. Following Replacement of The Storm Drain, NCDOT will give Instructions to Columbus County Utility Department as to where, in Relationship to the Replaced Storm Drain, the 8" Ductile Iron Water Main will be Re-Installed.

SEEDING AND MULCHING: (East)

The kinds of seed and fertilizer, and the rates of application of seed, fertilizer, and limestone, shall be as stated below. During periods of overlapping dates, the kind of seed to be used shall be determined. All rates are in pounds per acre.

All Roadway Areas

March 1 - August 31		**September 1 - February 28**	
50#	Tall Fescue	50#	Tall Fescue
10#	Centipede	10#	Centipede
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Waste and Borrow Locations

March 1 – August 31		**September 1 - February 28**	
75#	Tall Fescue	75#	Tall Fescue
25#	Bermudagrass (hulled)	35#	Bermudagrass (unhulled)
500#	Fertilizer	500#	Fertilizer
4000#	Limestone	4000#	Limestone

Note: 50# of Bahiagrass may be substituted for either Centipede or Bermudagrass only upon Engineer's request.

Approved Tall Fescue Cultivars

Adventure	Brookstone	Grande	Rebel Jr
Adventure II	Bonanza	Guardian	Rebel II
Airlie	Bonanza II	Houndog	Red Coat
Amigo	Bulldog 51	Inferno	Renegade
Anthem	Chapel Hill	Jaguar	Safari
Anthem II	Chesapeake	Jaguar III	Shelby
Apache	Chieftain	Kentucky 31	Shenandoah
Apache II	Coronado	Kitty Hawk	Southern Choice II
Arid	Crossfire II	Monarch	South Paw
Arid II	Debutante	Montauk	Tempo
Arid III	Duster	Mustang	Titan
Aztec II	Escalade	Olympic	Tomahawk
Barfexas	Falcon	Pacer	Tacer
Barfexas II	Falcon III	Paraiso	Trailblazer
Barrera	Finelawn	Pixie	Tribute
Barrington	Finelawn I	Pyramid	Trooper
Bingo	Finelawn Petite	Quest	Wolfpack
Bravo	Genesis	Rebel	Wrangler

On cut and fill slopes 2:1 or steeper Centipede shall be applied at the rate of 5 pounds per acre and add 20# of Sericea Lespedeza from January 1 - December 31.

Fertilizer shall be 10-20-20 analysis. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as a 10-20-20 analysis.

TEMPORARY SEEDING:

Fertilizer shall be the same analysis as specified for *Seeding and Mulching* and applied at the rate of 400 pounds and seeded at the rate of 50 pounds per acre. Sweet Sudan Grass, German Millet or Browntop Millet shall be used in summer months and Rye Grain during the remainder of the year. The Engineer will determine the exact dates for using each kind of seed.

FERTILIZER TOPDRESSING:

Fertilizer used for topdressing on all roadway areas except slopes 2:1 and steeper shall be 10-20-20. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided grade and shall be applied at the rate of 500 pounds per acre. Upon the 1-2-2 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 10-20-20 analysis.

Fertilizer used for topdressing on slopes 2:1 and steeper and waste and borrow areas shall be 16-8-8 grade and shall be applied at the rate of 500 pounds per acre. Upon written approval of the Engineer, a different analysis of fertilizer may be used provided the 2-1-1 ratio is maintained and the rate of application adjusted to provide the same amount of plant food as 16-8-8 analysis.

SUPPLEMENTAL SEEDING:

The kinds of seed and proportions shall be the same as specified for *Seeding and Mulching*, with the exception that no centipede seed will be used in the seed mix for supplemental seeding. The rate of application for supplemental seeding may vary from 25# to 75# per acre. The actual rate per acre will be determined prior to the time of topdressing and the Contractor will be notified in writing of the rate per acre, total quantity needed, and areas on which to apply the supplemental seed. Minimum tillage equipment, consisting of a sod seeder shall be used for incorporating seed into the soil as to prevent disturbance of existing vegetation. A clodbuster (ball and chain) may be used where degree of slope prevents the use of a sod seeder.

MOWING:

The minimum mowing height on this project shall be 4 inches.

ROUTE SR1734; SR1735; PROJECT KINGS BLUFF RAW WATER MAIN COUNTY OF STATE OF NORTH CAROLINA BLADEN

DEPARTMENT OF TRANSPORTATION

-AND-

LOWER CAPE FEAR WATER AND SEWER AUTHORITY

-AND-

CAPE FEAR PUBLIC UTILITY AUTHORITY

THREE PARTY RIGHT OF WAY ENCROACHMENT AGREEMENT ON PRIMARY AND SECONDARY SYSTEM

THIS AGREEMENT, made and entered into this the 21 day of JUNE, 20 19, by and between the Department of Transportation, party of the first part; and LOWER CAPE FEAR WATER AND SEWER AUTHORITY party of the second part; and CAPE FEAR PUBLIC UTILITY AUTHORITY party of the third part,

WITNESSETH

THAT WHEREAS, the party of the second part desires to encroach on the right of way of the public road designated as Route(s) SR1734; SR1735; , located SR 1734 0.83 miles NE of NC-87, SR 1735 0.50 miles NE of NC-87

with the construction and/or erection of: a 54" raw water tranmission main

WHEREAS, it is to the material advantage of the party of the second part to effect this encroachment, and the party of the first part in the exercise of authority conferred upon it by statute, is willing to permit the encroachment within the limits of the right of way as indicated, subject to the conditions of this agreement;

NOW, THEREFORE, IT IS AGREED that the party of the first part hereby grants to the party of the second part the right and privilege to make this encroachment as shown on attached plan sheet(s), specifications and special provisions which are made a part hereof upon the following conditions, to wit:

That the installation, operation, and maintenance of the above described facility will be accomplished in accordance with the party of the first part's latest POLICIES AND PROCEDURES FOR ACCOMMODATING UTILITIES ON HIGHWAY RIGHTS-OF-WAY, and such revisions and amendments thereto as may be in effect at the date of this agreement. Information as to these policies and procedures may be obtained from the Division Engineer or State Utility Agent of the party of the first part.

That the said party of the second part binds and obligates himself to install and maintain the encroaching facility in such safe and proper condition that it will not interfere with or endanger travel upon said highway, nor obstruct nor interfere with the proper maintenance thereof, to reimburse the party of the first part for the cost incurred for any repairs or maintenance to its roadways and structures necessary due to installation and existence of the facilities of the party of the second part, and if at any time the party of the first part shall require the removal of or changes in the location of the said facilities, that the said party of the second part binds himself, his successors and assigns, to promptly remove or alter the said facilities, in order to conform to the said requirement, without any cost to the party of the first part.

That the party of the second part agrees to provide during construction and any subsequent maintenance proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with the latest Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the Division Engineer of the party of the first.

That the party of the second part hereby agrees to indemnify and save harmless the party of the first part from all damages and claims for damage that may arise by reason of the installation and maintenance of this encroachment.

That the party of the second part agrees to restore all areas disturbed during installation and maintenance to the satisfaction of the Division Engineer of the party of the first part. The party of the second part agrees to exercise every reasonable precaution during construction and maintenance to prevent eroding of soil; silting or pollution of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces or other property; or pollution of the air. There shall be compliance with applicable rules and regulations of the North Carolina Division of Environmental Management, North Carolina Sedimentation Control Commission, and with ordinances and regulations of various counties, municipalities and other official agencies relating to pollution prevention and control. When any installation or maintenance operation disturbs the ground surface and existing ground cover, the party of the second part agrees to remove and replace the sod or otherwise reestablish the grass cover to meet the satisfaction of the Division Engineer of the party of the first part.

That the party of the second part agrees to assume the actual cost of any inspection of the work considered to be necessary by the Division Engineer of the party of the first part.

That the party of the second part agrees to have available at the construction site, at all times during construction, a copy of this agreement showing evidence of approval by the party of the first part. The party of the first part reserves the right to stop all work unless evidence of approval can be shown.

Provided the work contained in this agreement is being performed on a completed highway open to traffic; the party of the second part agrees to give written notice to the Division Engineer of the party of the first part when all work contained herein has been completed. Unless specifically requested by the party of the first part, written notice of completion of work on highway projects under construction will not be required.

That in the case of noncompliance with the terms of this agreement by the party of the second part, the party of the first part reserves the right to stop all work until the facility has been brought into compliance or removed from the right of way at no cost to the party of the first part.

That it is agreed by both parties that this agreement shall become void if actual construction of the work contemplated herein is not begun within one (1) year from the date of authorization by the party of the first part unless written waiver is secured by the party of the

second part from the party of the first part.

During the performance of this contract, the second party, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor"), agrees as follows:

a. Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the U. S. Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

b. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

c. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

d. Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.

e. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to,

(1) withholding of payments to the contractor under the contract until the contractor complies, and/or
(2) cancellation, termination or suspension of the contract, in whole or in part.

f. Incorporation of Provisions: The contractor shall include the provisions of paragraphs "a" through "f" in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Department of Transportation to enter into such litigation to protect the interests of the State, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

That when title to the subject that constitutes the aforesaid encroachment passes from the party of the second part and vests in the party of the third part, the party of the third part agrees to assume all responsibilities and rights and to perform all obligations as agreed to herein by the party of the second part.

R/W (166) : Party of the Second Part certifies that this agreement is true and accurate copy of the form R/W (166) incorporating all revisions to date.

IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed the day and year first above written.

DEPARTMENT OF TRANSPORTATION

BY: _____
DIVISION ENGINEER

WITNESS:

JAMIE MABE FITZSIMMONS NOTARY PUBLIC BRUNSWICK CO., NC

WITNESS:

Donna S. Pope
Clerk to the Board

CAPE FEAR PUBLIC UTILITY AUTHORITY SEAL

LOWER CAPE FEAR WATER AND SEWER AUTHORITY NORTH CAROLINA CORPORATE SEAL

Executive Director
Lower Cape Fear Water & Sewer Authority
Second Party

DIRECTOR OF ENGINEERING
CAPE FEAR PUBLIC UTILITY AUTHORITY
Third Party

VERIFICATION OF COMPLIANCE WITH ENVIRONMENTAL REGULATIONS

(Check Appropriate Box)

☐ Permits from the N.C. Department of Environment and Natural Resources and the U.S. Army Corp of Engineers are not required for this project. However, all applicable federal and state regulations have been followed.

☑ The required permits from the N.C. Department of Environment and Natural Resources and the U.S. Army Corp of Engineers have been obtained for this project. Copies of permits and Completion Certificates are attached.

☑ All applicable NPDES Stormwater Permit requirements have been met for this project. (The applicant should contact the N.C. Division of Water Quality in Raleigh to determine if a stormwater permit is required.)

☑ The project is in compliance with all applicable sedimentation and erosion control laws and regulations.

Project Name: Kings Bluff 54" Raw Water Transmission Main

Township: Rieglewood, NC County: Bladen

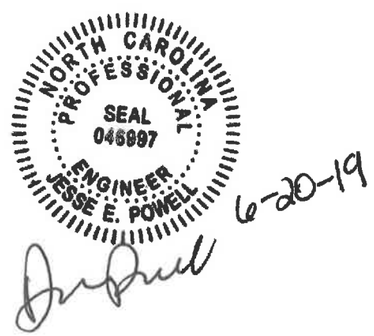
Project Engineer: McKim & Creed Phone No.: 910-343-1048

Project Contact: Jess Powell

Applicant's Name: Craig Wilson, CFPUA

Date Submitted: 6/20/2019

P.E. SEAL



Form VCER-1
June 1, 2006

National Pollutant Elimination System (NPDES)
Stormwater Permit Compliance Certification

I Jess Powell, a duly authorized representative of Cape Fear Public Utility Authority, an industrial/commercial/residential facility requesting attachment to a North Carolina Department of Transportation highway drainage system at Riegelwood, NC in Bladen County, do hereby certify the following:

Check appropriate box and circle type of facility

☑ The Industrial / Commercial / Residential facility does not require an NPDES stormwater permit.

☐ The Industrial / Commercial / Residential facility does require an NPDES stormwater permit. The permit has been obtained and a Stormwater Pollution Prevention Plan (SPPP) is in place. Appropriate structural stormwater best management practices (BMP) are designed and installed as required by the Department of Environment and Natural Resources (DENR) and/or the local governing agency. All structural stormwater BMP's are located outside of NCDOT right –of-way.

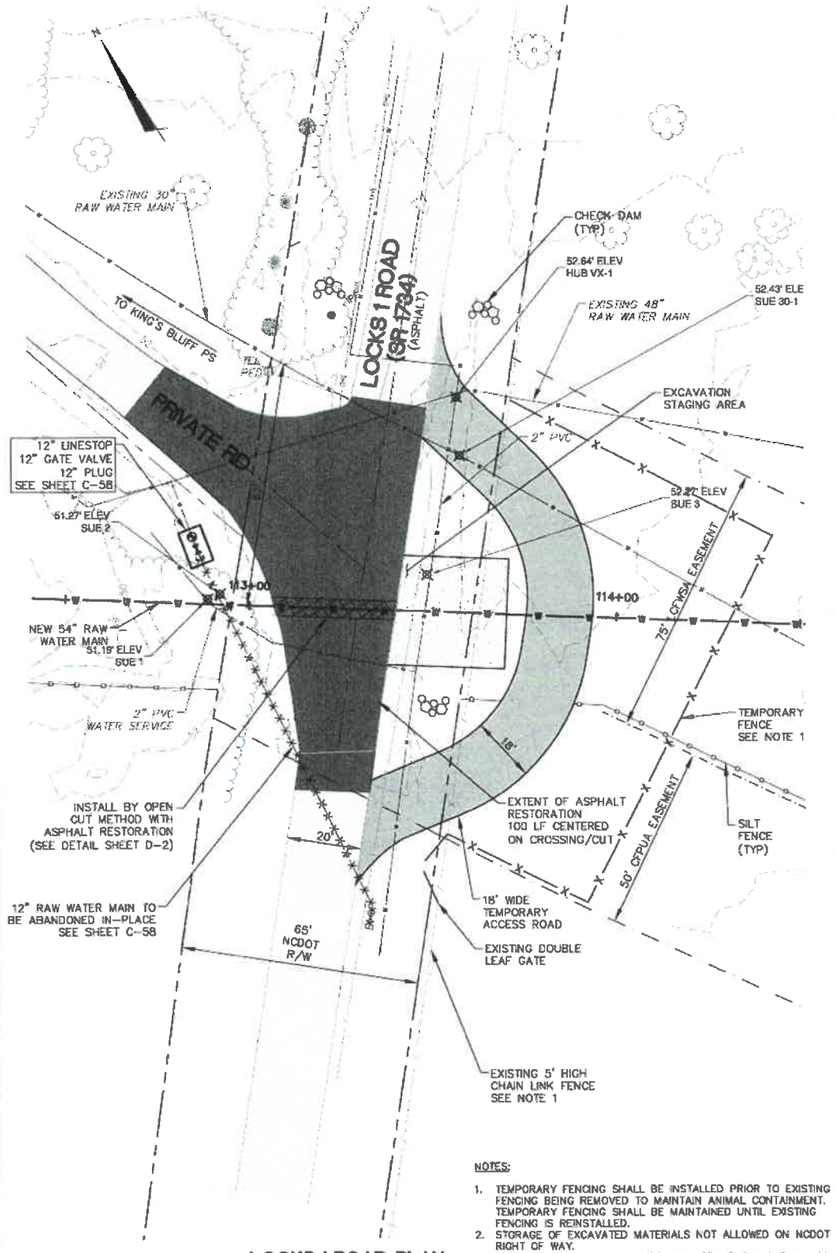
I understand if the Department of Transportation determines the facility is not in compliance with NPDES stormwater requirements, the Department will report the noncompliance to the DENR Division of Water Quality. I also understand that falsification of this certification may result in penalty of law against the facility and me as prescribed in the North Carolina General Statutes.

Signature: _____

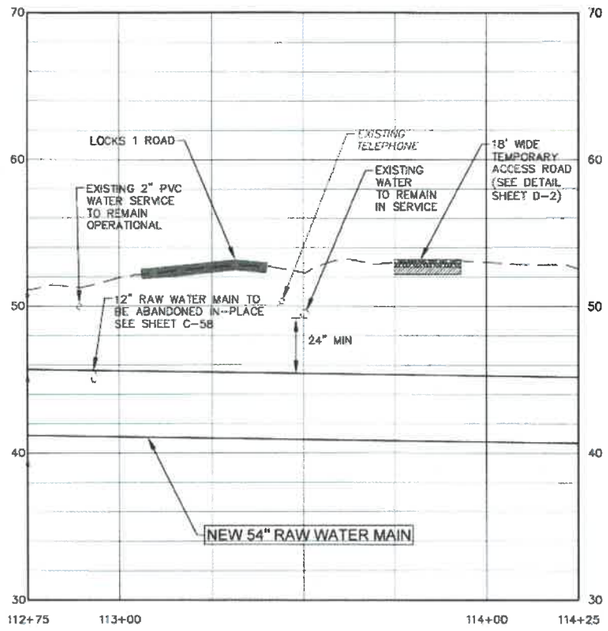
Date: 6/20/2019

Note: If the applicant has a question as to whether an NPDES stormwater permit is required, he or she may contact the N.C. Division of Water Quality in Raleigh at (919) 733-5083 (ask for Stormwater and General Permits Unit).

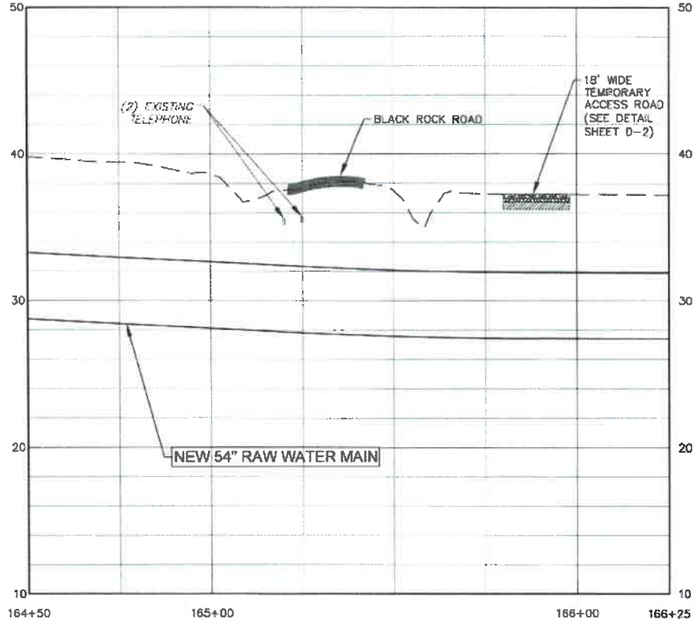
Form NPDES-1
May 22, 2006



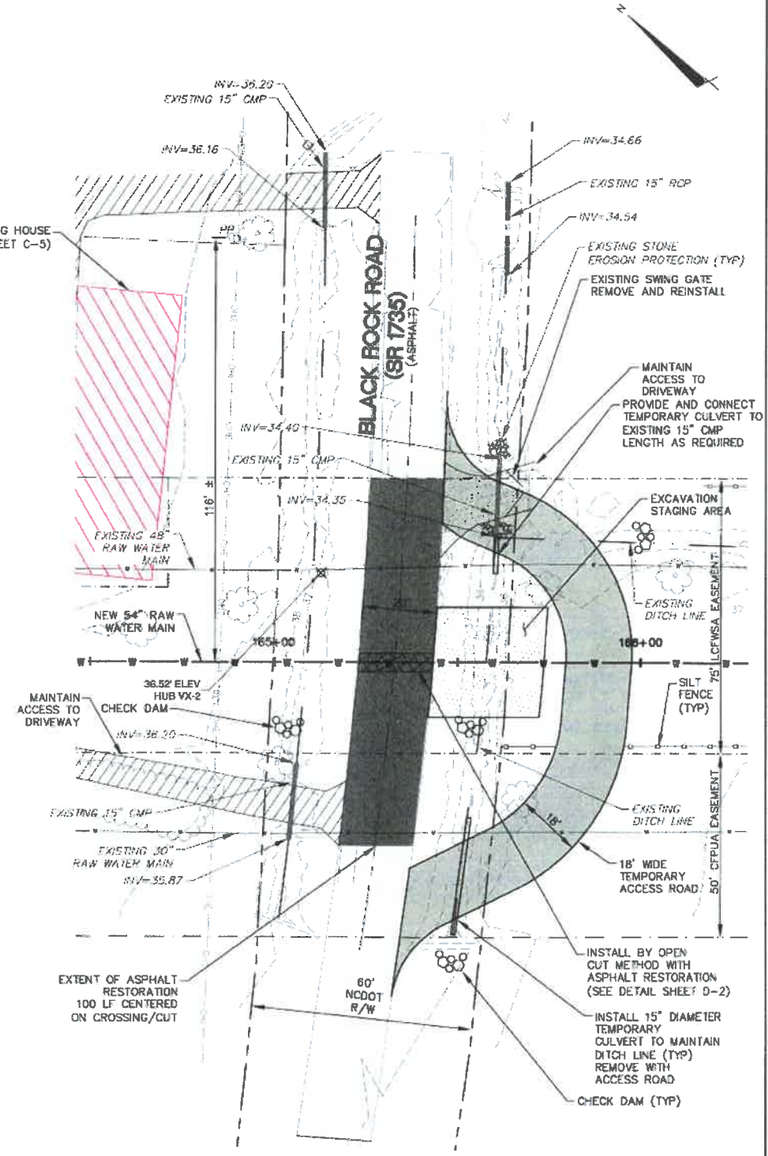
LOCKS 1 ROAD PLAN



LOCKS 1 ROAD PROFILE



BLACK ROCK ROAD PROFILE



BLACK ROCK ROAD PLAN

NOTES:

1. TEMPORARY FENCING SHALL BE INSTALLED PRIOR TO EXISTING FENCING BEING REMOVED TO MAINTAIN ANIMAL CONTAINMENT. TEMPORARY FENCING SHALL BE MAINTAINED UNTIL EXISTING FENCING IS REINSTALLED.
2. STORAGE OF EXCAVATED MATERIALS NOT ALLOWED ON NCDOT RIGHT OF WAY.
3. CONTRACTOR SHALL COMPLETE ALL WORK SHOWN WITHIN NCDOT RIGHT OF WAY, LCFWSA EASEMENT AND CFPUA EASEMENT.
4. PROVIDE FOR POSITIVE DRAINAGE AT ALL TIMES FOR CONSTRUCTION AND OPERATION OF THE TEMPORARY ROAD.
5. CONTRACTOR SHALL MAINTAIN TRAFFIC DURING CONSTRUCTION AND PROVIDE TRAFFIC CONTROL DEVICES PER NCDOT STANDARDS.

20' 0 20' 40'
SCALE: 1"=20' (Horiz.)
5' 0 5' 10'
SCALE: 1"=5' (Vert.)

McKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship Sustainability Service

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025812 ENGINEER ANTHONY W. BOHAN
4-10-19

ROAD INTERSECTION PLANS AND PROFILES

CAPE FEAR
PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

DATE: MAY 2019
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO.: 5367-0038

SHEET NO: C-51

Appendix C

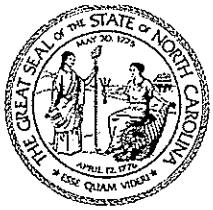
Laboratory Soil Analysis Data

Appendix C - Laboratory Soil Analysis Data

Identification Number	Depth (ft)	As-Is Resistivity (ohm-cm)	"Wetted" Resistivity (ohm-cm)	pH	Chloride (ppm)	Sulfate (ppm)	Redox (mV)	Presence of Sulfides
A-1	3.5' - 5.0'	32,000	17,000	6.6	45	25	332	N
A-2	6.0' - 7.5'	100,000	72,000	5.9	45	<10	392	N
A-3	6.0' - 7.5'	39,000	35,000	4.8	50	<10	430	N
A-4	3.5' - 5.0'	120,000	102,000	4.9	45	<10	423	N
A-5	6.0' - 7.5'	58,000	47,000	4.8	50	35	389	N
A-6	6.0' - 7.5'	9,100	8,100	6.5	45	<10	328	N
A-7	6.0' - 7.5'	6,000	5,000	3.9	70	<10	354	N
A-8	3.5' - 5.0'	7,100	5,700	3.9	45	<10	347	N
A-9	3.0' - 6.0'	60,000	36,000	4.6	45	<10	417	N
B-R-1A	6.0' - 7.5'	15,000	15,000	4.5	45	<10	348	N
C-1A	6.0' - 7.5'	24,000	21,000	7.3	70	65	324	N
C-3A	3.5' - 5.0'	22,000	22,000	4.6	50	<10	368	T
C-4A	6.0' - 7.5'	52,000	40,000	4.5	50	<10	377	N
R-10A	3.5' - 5.0'	17,000	14,000	4.8	45	<10	335	N
R-11B	1.0' - 2.5'	48,000	22,000	4.6	45	<10	473	N
R-12	6.0' - 7.5'	42,000	29,000	4.8	45	<10	429	N
R-2B	6.0' - 7.5'	25,000	20,000	7.6	45	<10	301	N
R-3A	3.5' - 5.0'	10,000	9,900	7.1	45	<10	321	N
R-4A	3.5' - 5.0'	19,000	15,000	6.6	45	25	359	N
R-5B	6.0' - 7.5'	24,000	20,000	4.7	45	<10	362	N
R-6B	3.5' - 5.0'	25,000	22,000	4.3	45	<10	366	N
R-6B	6.0' - 7.5'	42,000	37,000	4.9	45`	<10	370	N
R-8B	6.0' - 7.5'	4,400	6,100	7.2	45	30	299	N
R-9A	3.5' - 5.0'	16,000	17,000	5.3	45	<10	325	N
RT-7A	3.5' - 5.0'	27,000	30,000	5.4	45	35	313	N
RT-7B	3.5' - 5.0'	19,000	16,000	7.7	45	25	297	N
W-10A	6.0' - 7.5'	53,000	45,000	4.4	45	<10	417	N
W-11A	6.0' - 7.5'	Could Not Test						
W-14A	3.5' - 5.0'	Could Not Test						
W-15B	3.5' - 5.0'	11,000	13,000	4.5	70	<10	352	N
W-16A	3.5' - 5.0'	33,000	22,000	4.8	45	<10	320	N
W-17B	6.0' - 7.5'	1,100	1,100	9.2	45	30	159	N
W-17D	13.0 - 14.5'	4,200	4,200	5.5	160	30	79	N
W-17E	12.0' - 13.5'	3,100	3,100	7.6	45	<10	270	N
W-17G	6.4' - 7.9'	1,300	1,400	7.7	50	180	158	N
W-17H	7.0'	4,900	4,800	6.8	45	160	136	N
W-18A	6.0' - 7.5'	14,000	18,000	4.4	50	<10	417	N
W-19A	3.5' - 5.0'	4,400	4,100	3.8	50	65	464	N
W-1B	8.5' - 10.0'	33,000	27,000	6.3	45	<10	385	N
W-20A	3.5' - 5.0'	45,000	38,000	6.3	45	20	381	N
W-21A	3.5' - 5.0'	32,000	22,000	7.8	45	<10	251	N
W-23A	6.0' - 7.5'	26,000	20,000	6.5	50	<10	386	N
W-24A	6.0' - 7.5'	20,000	19,000	5.3	45	<10	308	N
W-25A	3.5' - 5.0'	7,100	5,100	4.9	50	65	379	N
W-26A	3.5' - 5.0'	7,000	6,600	5.0	50	40	434	N
W-26B	3.5' - 5.0'	84,000	65,000	4.7	45	<10	379	N
W-27B	6.0' - 7.5'	20,000	13,000	4.5	45	60	368	N
W-2A	6.0' - 7.5'	3,500	6,300	4.6	50	<10	391	N
W-2B	3.5' - 5.0'	>1,100,000	45,000	8.6	45	<10	234	N
W-3B	3.5' - 5.0'	33,000	30,000	5.9	45	<10	424	N
W-5B	6.0' - 7.5'	12,000	9,200	4.3	45	<10	424	N
W-6B	6.0' - 7.5'	10,500	10,500	4.4	45	<10	470	N
W-7A	6.0' - 7.5'	13,000	11,000	7.5	50	25	324	N
W-8A	6.0' - 7.5'	56,000	52,000	4.8	45	<10	406	N
W-9A	6.0' - 7.5'	65,000	37,000	4.5	45	<10	467	N

Appendix D
NCDEQ
Public Water
Supply Permit

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Director



NORTH CAROLINA
Environmental Quality

May 11, 2019

Lower Cape Fear Water and Sewer Authority
Attention: Don Betz, Executive Director
1107 New Pointe Boulevard #17
Leland, North Carolina 28451

Re: Engineering Plans and Specifications Approval
Distribution Extension
Kings Bluff Raw Water Transmission Main
LCFWSA – Kings Bluff
Water System No.: NC5009013, Bladen County
Serial No.: 19-00159

Dear Applicant:

Enclosed please find one copy of the "Application for Approval..." together with one copy of the referenced engineering plans and specifications bearing the Division of Water Resources stamp of approval for the referenced project. These engineering plans and specifications are approved under Division of Water Resources Serial Number 19-00159, dated May 11, 2019. **This project approval has the following condition: The crossing of the proposed raw water transmission main with the existing pond on Sheet C-3 near Sta. 130+50 must have a minimum of 5 feet of cover per the *Recommended Standards for Water Works* (Ten States Standards).**

Engineering plans and specifications prepared by Anthony W. Boahn, P.E., call for the installation of approximately 73,000 feet of 54-inch raw water transmission main, 555 feet of 48-inch raw water transmission main, 100 feet of 36-inch raw water transmission main, valves and associated appurtenances to parallel the existing 48-inch raw water transmission main and add capacity to the raw water supply. The proposed welded steel (alternate bid option for ductile iron) raw water transmission main will span three counties (Bladen County, Columbus County, and Brunswick County) and be installed between the Kings Bluff Raw Water Pump Station and the 3 MG reservoir and intermediate booster pump station located approximately 2,300 feet past the meter vault for Brunswick County's Northwest Water Treatment Plant.

Please note that in accordance with 15A NCAC 18C .0309(a), no construction, alteration, or expansion of a water system shall be placed into service or made available for human consumption until

the Public Water Supply Section has issued Final Approval. Final Approval will be issued and mailed to the applicant upon receipt of both an Engineer's Certification and an Applicant's Certification submitted in accordance with 15 A NCAC 18C .0303 (a) and (c).

The plans and specifications in the foregoing application are approved insofar as the protection of public health is concerned as provided in the rules, standards and criteria adopted under the authority of Chapter 130A-317 of the General Statutes. This approval does not constitute a warranty of the design, construction or future operation of the water system.

One copy of the "Application for Approval..." and a copy of the plans and specifications with a seal of approval from the department are enclosed. One copy of the enclosed documents in a digital format (CD) is being forwarded to our Fayetteville Regional Office. The second copy of the CD is being retained in our office.

If the Public Water Supply Section can be of further service, please call (919) 707-9100.

Sincerely,

L.A. Rapp-Plummer /for

Robert W. Midgette, P.E.
Operations Branch Head
Public Water Supply Section

RWM/LARP

Enclosures: Approval Documents

cc: Heidi Cox, Fayetteville Regional Office
Bladen County Health Department
McKim & Creed, Inc.

North Carolina Department of Environmental Quality
Division of Water Resources

Authorization to Construct

Project Applicant:	**Lower Cape Fear Water and Sewer Authority**
Public Water System Name and Water System No.:	**LCFWSA - KINGS BLUFF** **NC5009013**
Project Name:	**Kings Bluff Raw Water Transmission Main**
Serial No.:	**19-00159**
Issue Date:	**May 11, 2019**
Expiration Date:	24 Months after Issue Date

In accordance with NCAC 18C .0305, this Authorization to Construct must be posted at the primary entrance to the job site during construction.

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Director

NORTH CAROLINA
Environmental Quality

May 11, 2019

Lower Cape Fear Water and Sewer Authority
ATTN: Don Betz
1107 New Pointe Blvd #17
Leland, NC 28451

Re: **Authorization to Construct (This is not a Final Approval)**
Issue Date: May 11, 2019
Kings Bluff Raw Water Transmission Main
Serial No.: 19-00159 Water System No.: NC5009013
Bladen County

Dear Applicant:

This letter is to confirm that a complete Engineer's Report and a Water System Management Plan have been received, and that engineering plans and specifications have been approved by the Department for **Kings Bluff Raw Water Transmission Main, Serial No.: 19-00159.**

The "Authorization to Construct" is valid for 24 months from the issue date. Authorization to construct may be extended if the Rules Governing Public Water Supplies and site conditions have not changed (see Rule .0305). The "Authorization to Construct" and the engineering plans and specifications approval letter shall be posted at the primary entrance of the job site before and during construction.

Upon completion of the construction or modification, **and prior to placing the new construction or modification into service,** the applicant must submit an Engineer's Certification and Applicant's Certification to the Public Water Supply Section.

- **Engineer's Certification:** in accordance with Rule .0303 (a), the applicant shall submit a certification statement signed and sealed by a registered professional engineer stating that construction was completed in accordance with approved engineering plans and specifications, including any provisions stipulated in the Department's engineering plan and specification approval letter.
- **Applicant's Certification:** in accordance with Rule .0303 (c), the applicant shall submit a signed certification statement indicating that the requirements for an Operation and Maintenance Plan and Emergency Management Plan have been satisfied in accordance with Rule .0307 (d) and (e) and that the system has a certified operator in accordance with Rule .1300. The "Applicant's Certification" form is available at http://www.ncwater.org/ (click on Public Water Supply Section, Plan Review, Plan Review Forms).

Certifications can be sent by mail, fax or attachment to an e-mail message to **PWSSection.PlanReview@ncdenr.gov.**

If this "Authorization to Construct" is for a new public water system, the owner must submit a completed **application for an Operating Permit** and the appropriate fee. For a copy of the application for an Operating Permit please call (919) 707-9085.

Once the certifications and permit application and fee (if applicable) are received and determined adequate, the Department will issue a Final Approval letter to the applicant. In accordance with Rule .0309 (a), **no portion of this project shall be placed into service until the Department has issued Final Approval.**

Please contact us at (919) 707-9100 if you have any questions or need additional information.

Sincerely,

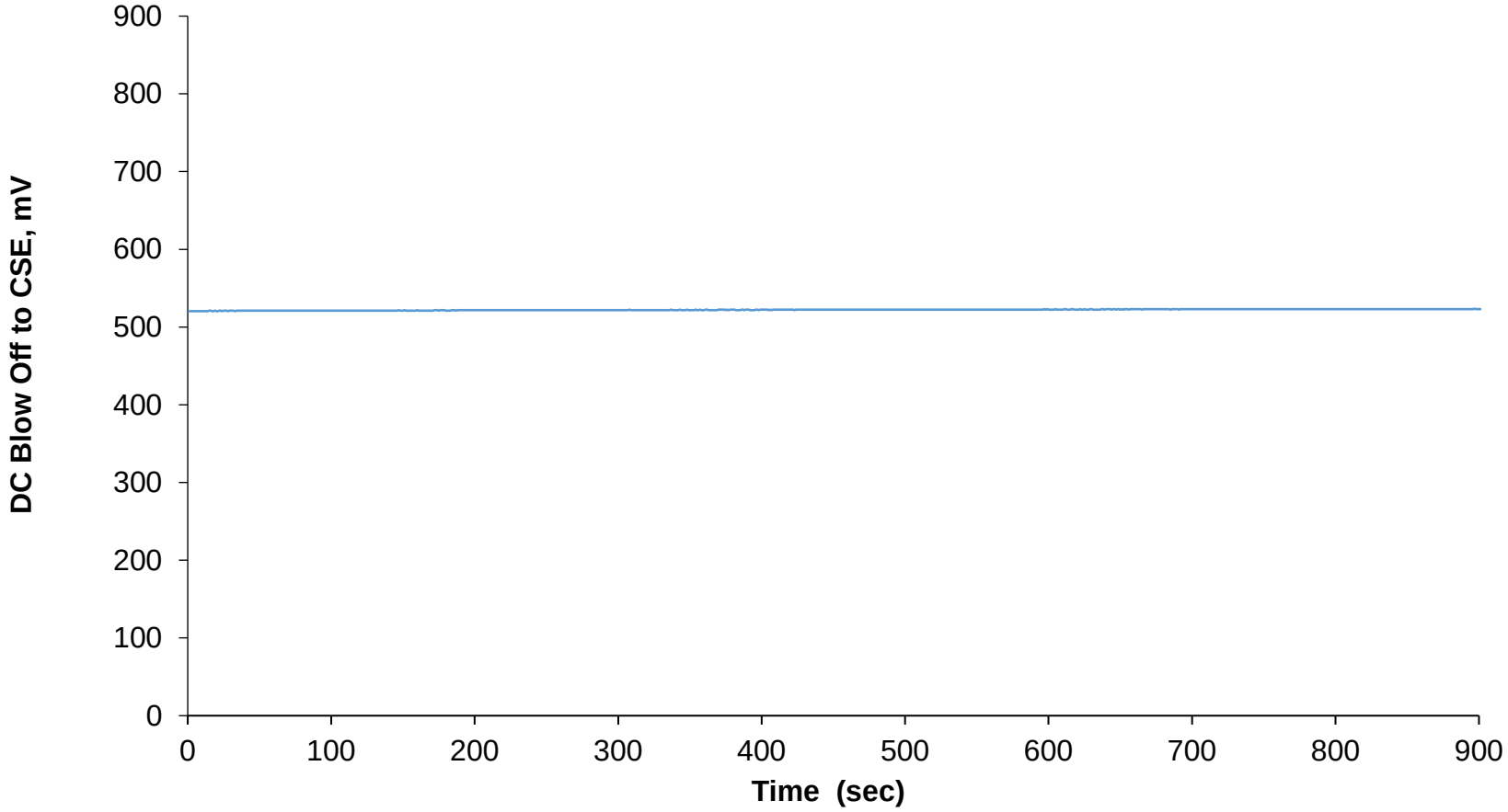
Robert W. Midgette, P.E., Operations Branch Head
Public Water Supply Section
Division of Water Resources

cc: HEIDI COX, Regional Engineer
McKim & Creed, Inc.

Appendix D

Stray Current Testing Results

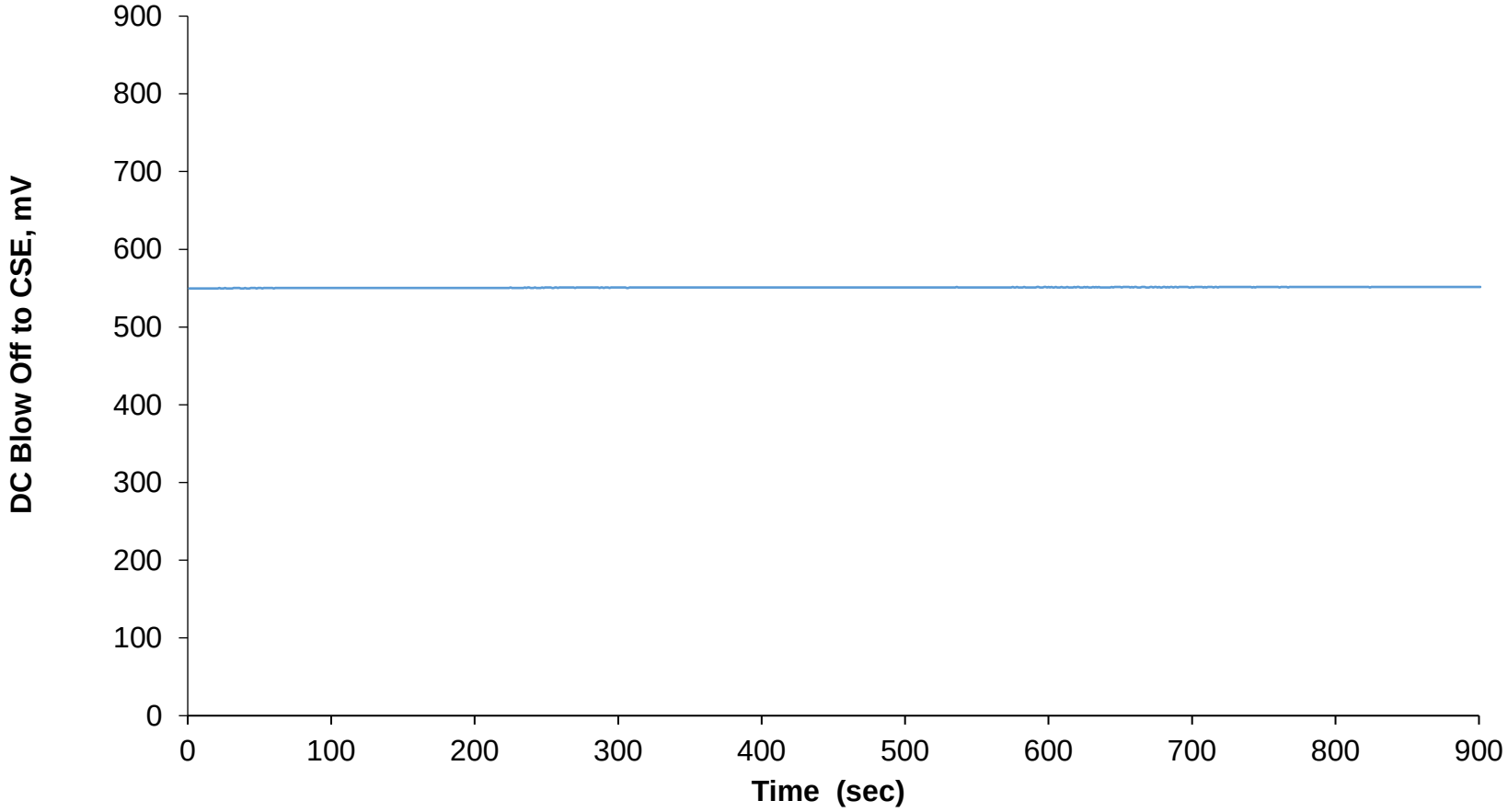
Kings Bluff Raw Water Transmission Main
Cape Fear Public Utility Authority
54-inch Raw Water Transmission Main
Stray Current Measurement at Blow Off Location 1



DC Blow Off to CSE
Min: 520.4 mV
Max: 523.7 mV
Delta: 3.2 mV
Average: 522.1 mV

Test Date: 6/26/18
Test Time: 1:47 pm to 2:02 pm
Duration: 900 Seconds
Frequency: 1 reading/sec

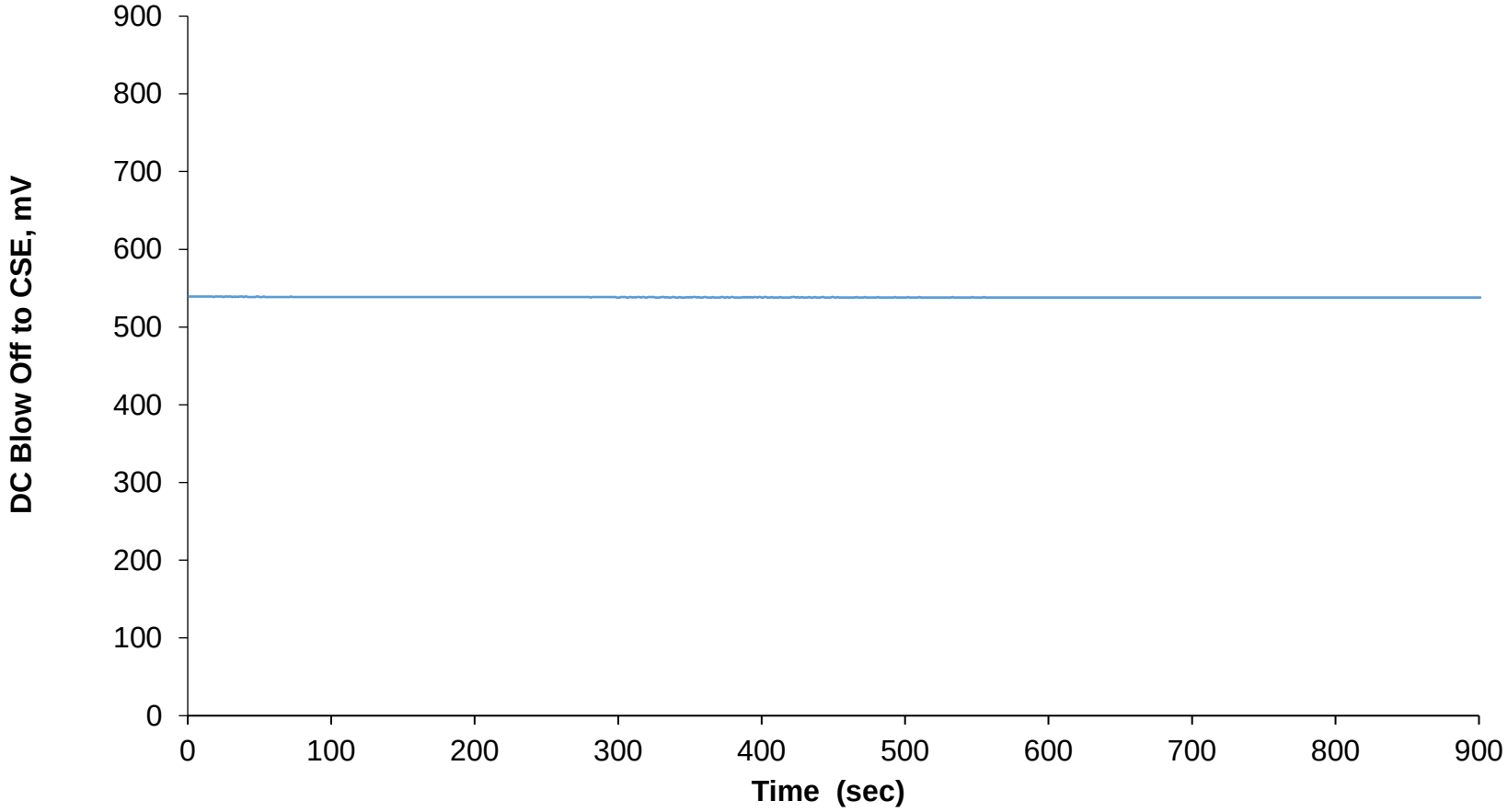
Kings Bluff Raw Water Transmission Main
Cape Fear Public Utility Authority
54-inch Raw Water Transmission Main
Stray Current Measurement at Blow Off Location 2



DC Blow Off to CSE
Min: 549.6 mV
Max: 551.6 mV
Delta: 1.9 mV
Average: 550.9 mV

Test Date: 6/26/18
Test Time: 3:05 pm to 3:20 pm
Duration: 900 Seconds
Frequency: 1 reading/sec

Kings Bluff Raw Water Transmission Main
Cape Fear Public Utility Authority
54-inch Raw Water Transmission Main
Stray Current Measurement at Blow Off Location 3



DC Blow Off to CSE
Min: 537.9 mV
Max: 539.2 mV
Delta: 1.3 mV
Average: 538.2 mV

Test Date: 6/26/18
Test Time: 11:51 am to 12:06 pm
Duration: 900 Seconds
Frequency: 1 reading/sec

Appendix E
NCDEQ
Erosion &
Sedimentation
Control Permit

05367-0038

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
S. DANIEL SMITH
Interim Director

NORTH CAROLINA
Environmental Quality

March 22, 2019

LETTER OF APPROVAL WITH MODIFICATIONS AND PERFORMANCE RESERVATIONS

Cape Fear Public Utility Authority
ATTN: Carel Vandermeyden, Director of Engineering
235 Government Center Drive
Wilmington, NC 28403

RE: Project Name: Kings Bluff Raw Water Transmission Main
Acres Approved: 121.4
Project ID: COLUM-2019-008
County: Brunswick/Columbus/Bladen City: Riegelwood
Address: Various
River Basin: Cape Fear
Stream Classification: Other
Submitted By: Jess Powell, PE, McKim & Creed, Inc.
Date Received by LQS: February 25, 2019, March 15, 2019 and March 22, 2019
Plan Type: Utility

Dear Mr. Vandermeyden:

This office has reviewed the subject erosion and sedimentation control plan. We find the plan to be acceptable and hereby issue this Letter of Approval. The enclosed Certificate of Approval must be posted at the job site. This plan approval shall expire three (3) years following the date of approval, if no land-disturbing activity has been undertaken, as is required by Title 15A NCAC 4B .0129.

Please be aware that your project will be covered by the enclosed NPDES Construction Stormwater General Permit NCG010000. Please become familiar with all the requirements and conditions of this permit in order to achieve compliance.

Title 15A NCAC 4B .0118(a) requires that a copy of the approved erosion control plan be on file at the job site. Also, this letter gives the notice required by G.S. 113A-61.1(a) of our right of periodic inspection to ensure compliance with the approved plan.

North Carolina's Sedimentation Pollution Control Act is performance-oriented, requiring protection of existing natural resources and adjoining properties. If, following the commencement of this project, the erosion and sedimentation control plan is inadequate to meet the requirements of the Sedimentation Pollution Control Act of 1973 (North Carolina General Statute 113A-51 through 66), this office may require revisions to the plan and implementation of the revisions to ensure compliance with the Act.

Acceptance and approval of this plan is conditioned upon your compliance with Federal and State water quality laws, regulations, and rules. In addition, local city or county ordinances or rules may also apply to this land-disturbing activity. This approval does not supersede any other permit or approval.

Please note that this approval is based in part on the accuracy of the information provided in the Financial Responsibility Form, which you provided. You are requested to file an amended form if there is any change in the information included on the form. In addition, it would be helpful if you notify this office of the proposed starting date for this project. Please notify us if you plan to have a preconstruction conference.

Your cooperation is appreciated.

Sincerely,

Rhonda Hall

Rhonda Hall
Regional Engineering Associate
Land Quality Section

Enclosures: Certificate of Approval
Modifications and Performance Reservations
NPDES Permit

cc: Jess Powell, PE, McKim & Creed, Inc.
243 North Front Street, Wilmington, NC 28401

MODIFICATIONS AND PERFORMANCE RESERVATIONS

Project Name: Kings Bluff Raw Water Transmission Main
Project ID: COLUM-2019-008
County: Ciolumbus

1. This plan approval shall expire three (3) years following the date of approval, if no land-disturbing activity has been undertaken, as is required by Title 15A NCAC 4B .0129.

2. The developer is responsible for the control of sediment on-site. If the approved erosion and sedimentation control measures prove insufficient, the developer must take those additional steps necessary to stop sediment from leaving this site (NCGS 113A-57(3)). Each sediment storage device must be inspected after each storm event (NCGS 113A-54.1(e)). Maintenance and/or clean out is necessary anytime the device is at 50% capacity. All sediment storage measures will remain on site and functional until all grading and final landscaping of the project is complete (15A NCAC 04B .0113).

3. Any and all existing ditches on this project site are assumed to be left undisturbed by the proposed development unless otherwise noted. The removal of vegetation within any existing ditch or channel is prohibited unless the ditch or channel is to be regarded with side slopes of 2 horizontal to 1 vertical or less steep (15A NCAC 04B .0124 (d)). Bank slopes may be mowed, but stripping of vegetation is considered new earth work and is subject to the same erosion control requirements as new ditches (NCGS 113A-52(6)).

4. The developer is responsible for obtaining any and all permits and approvals necessary for the development of this project prior to the commencement of this land disturbing activity. This could include our agency's Stormwater regulations and the Division of Water Resources' enforcement requirements within Section 401 of the Clean Water Act, the U.S. Army Corps of Engineers' jurisdiction of Section 404 of the Clean Water Act, the Division of Coastal Management's CAMA requirements, the Division of Solid Waste Management's landfill regulations, the Environmental Protection Agency and/or The U.S. Army Corps of Engineers jurisdiction of the Clean Water Act, local County or Municipalities' ordinances, or others that may be required. This approval cannot supersede any other permit or approval; however, in the case of a Cease and Desist Order from the Corps of Engineers, that Order would only apply to wetland areas. All highland would still have to be in compliance with the N.C. Sedimentation Pollution Control Act.

5. If any area on site falls within the jurisdiction of Section 401 or 404 of the Clean Water Act, the developer is responsible for compliance with the requirements of the Division of Water Resources (DWR), the Corps of Engineers and the Environmental Protection Agency (EPA) respectively. Any erosion control measures that fall within jurisdictional wetland areas must be approved by the aforementioned agencies prior to installation. The Land Quality Section must be notified of a relocation of the measures in question to the transition point between the wetlands and the uplands to assure that the migration of sediment will not occur. If that relocation presents a problem or contradicts any requirements of either DWR, the Corps, or the EPA, it is the responsibility of the developer to inform the Land Quality Section regional office so that an adequate contingency plan can be made to assure sufficient erosion control remains on site. Failure to do so will be considered a violation of this approval (NCGS 113A-54.1(b)).

6. Any borrow material brought onto this site must be from a legally operated mine or other approved source. Any soil waste that leaves this site can be transported to a permitted mine or separately permitted construction sites without additional permits under NCGS 74-49(7)(d). Disposal at any other location would have to be included as a permit revision for this approval.

7. This permit allows for a land disturbance, as called for on the application plan, not to exceed **121.4** acres. Exceeding that acreage will be a violation of this permit and would require a revised plan and additional application fee. Any addition in impervious surface, over that already noted on the approved plan, would also require a revised plan to verify the appropriateness of the erosion control measures and stormwater retention measures (NCGS 113A-54.1(b)). As proposed, the land disturbance width of the utility line should be limited as reflected on the application plans.

8. The construction detail for the proposed silt fence requires reinforcing wire and **steel** posts a maximum of eight (8) feet apart. Omission of the reinforcing wire is a construction change that necessitates more posts for support, i.e., the spacing distance needs to be reduced to no greater than six (6) feet apart (E&SC Planning & Design Manual 6.63, Rev. 6/06).

9. A graveled construction entrance must be located at each point of access and egress available to construction vehicles during the grading and construction phases of this project. Access and egress from the project site at a point without a graveled entrance will be considered a violation of this approval. Routine maintenance of the entrances is critical (113A-54.1(b)).

10. As a condition of the provided NPDES General Stormwater Permit (NCG010000), groundcover stabilization must meet specific time frames. Slopes (including cuts, fills, and ditch banks) that are steeper than 3 horizontal to 1 vertical left exposed will, within seven (7) calendar days after completion of any phase of grading, be provided with groundcover. Slopes that are 3 horizontal to 1 vertical or flatter will be provided with groundcover within fourteen (14) calendar days.

11. As a part of routine monitoring of the approved land-disturbing activity, the financially responsible party shall assure inspections of the area covered by the approved plan after each phase of the plan has been completed and after establishment of temporary ground cover in accordance with North Carolina General Statute 113A-54.1(e).

Appendix F
NCDEQ
CAMA Permit

☒ CAMA / ☐ DREDGE & FILL

GENERAL PERMIT

№ 72371

A B C (D)

☒ New ☐ Modification ☐ Complete Reissue ☐ Partial Reissue

Previous permit # _____

Date previous permit issued _____

As authorized by the State of North Carolina, Department of Environmental Quality and the Coastal Resources Commission in an area of environmental concern pursuant to 15A NCAC 07H. 1600 ☐ Rules attached.

Applicant Name LCFWSA c/o Don Betz

Address 1107 New Pointe Rd. Suite 17

City Leland State NC ZIP 28451

Phone # (910) 383-1919 E-Mail —

Authorized Agent Kim Williams (LMG)

Project Location: County Brunswick

Street Address/ State Road/ Lot #(s) LCFWSA Utility Easement along Northwest Rd.

Subdivision _____

City Leland ZIP _____

Phone # (___) _____ River Basin CFR

Adj. Wtr. Body Rattlesnake Branch / Hood Creek (nat) /man /unkn)

Closest Maj. Wtr. Body CFR

Affected AEC(s): ☐ CW ☐ EW ☒ PTA ☐ ES ☒ PTS ☐ OEA ☐ HHF ☐ IH ☐ UBA ☐ N/A ☐ PWS: _____

ORW: yes / (no) PNA yes / (no)

Type of Project/ Activity Installation of a 54" Utility line (water main) via open cut (Scale: —)

Pier (dock) length _____

Fixed Platform(s) _____

Floating Platform(s) _____

Finger pier(s) _____

Groin length _____

number _____

Bulkhead/ Riprap length _____

avg distance offshore _____

max distance offshore _____

Basin, channel _____

cubic yards _____

Boat ramp _____

Boathouse/ Boatlift _____

Beach Bulldozing _____

Other 54" by 14 miles

Shoreline Length N/A

SAV: not sure yes (no)

Moratorium: n/a yes (no)

Photos: yes (no)

Waiver Attached: yes (no)

* All work must be done in accordance with the attached drawings dated received by DCM on December 3, 2018.

* Any modifications must be approved by this office

A building permit may be required by: Brunswick Co. ☐ See note on back regarding River Basin rules.

(Note Local Planning Jurisdiction)

Notes/ Special Conditions Rule 07H. 1600 and all other federal, State, and local regulations apply.

Kim Williams

Agent or Applicant Printed Name

Signature ** Please read compliance statement on back of permit **

$400 —

Application Fee(s)

74013

Check #

Brooks Surgan

Permit Officer's Printed Name

Signature

12/11/18

Issuing Date

12/11/19

Expiration Date

Statement of Compliance and Consistency

This permit is subject to compliance with this application, site drawing and attached general and specific conditions. Any violation of these terms may subject the permittee to a fine or criminal or civil action; and may cause the permit to become null and void.

This permit must be on the project site and accessible to the permit officer when the project is inspected for compliance. The applicant certifies by signing this permit that 1) prior to undertaking any activities authorized by this permit, the applicant will confer with appropriate local authorities to confirm that this project is consistent with the local land use plan and all local ordinances, and 2) a written statement or certified mail return receipt has been obtained from the adjacent riparian landowner(s).

The State of North Carolina and the Division of Coastal Management, in issuing this permit under the best available information and belief, certify that this project is consistent with the North Carolina Coastal Management Program.

River Basin Rules Applicable To Your Project:

☐ Tar - Pamlico River Basin Buffer Rules ☐ Other:_____

☐ Neuse River Basin Buffer Rules

If indicated on front of permit, your project is subject to the Environmental Management Commission's Buffer Rules for the River Basin checked above due to its location within that River Basin. These buffer rules are enforced by the NC Division of Water Resources. Contact the Division of Water Resources at the Washington Regional Office (252-946-6481) or the Wilmington Regional Office (910-796-7215) for more information on how to comply with these buffer rules.

Division of Coastal Management Offices

Morehead City Headquarters
400 Commerce Ave
Morehead City, NC 28557
252-808-2808/ 1-888-4RCOAST
Fax: 252-247-3330
(Serves: Carteret, Craven, Onslow - North of New River Inlet- and Pamlico Counties)

Washington District
943 Washington Square Mall
Washington, NC 27889
252-946-6481
Fax: 252-948-0478
(Serves: Beaufort, Bertie, Hertford, Hyde, Tyrrell and Washington Counties)

Elizabeth City District
401 S. Griffin St.
Ste. 300
Elizabeth City, NC 27909
252-264-3901
Fax: 252-264-3723
(Serves: Camden, Chowan, Currituck, Dare, Gates, Pasquotank and Perquimans Counties)

Wilmington District
127 Cardinal Drive Ext.
Wilmington, NC 28405-3845
910-796-7215
Fax: 910-395-3964
(Serves: Brunswick, New Hanover, Onslow - South of New River Inlet- and Pender Counties)

Appendix G
US Army Corps of Engineers Wetland Permit

U.S. ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT

Action Id. **SAW-2015-00403** County: **Bladen/Columbus/Brunswick** U.S.G.S. Quad: **Multiple**

GENERAL PERMIT (REGIONAL AND NATIONWIDE) VERIFICATION

Permittee: **Lower Cape Fear Water and Sewer Authority**
Attn: Don Betz

Address: **1107 New Pointe Blvd., Suite 17**
Leland NC, 28451
Telephone Number: **(910) 383-1919**

Size (acres) **127.3 acres (14 miles x 75' width)** Nearest Town **Leland, NC**
Nearest Waterway **Lindscomb Branch** River Basin **Lower Cape Fear**
USGS HUC **03030005** Coordinates Latitude: **34.3396**
Longitude: **-78.2163**

Location description: **This project would include the installation of a 5' diameter water main pipe that would be installed parallel to an existing 35 year old water line. The work will take place in an existing 75' x 14 mile long water line easement.**

Description of projects area and activity: **The proposed work will include the installation of 14 miles of 5' diameter water line into an existing water line easement. The project will start at the kings Bluff Pump Station in Bladen County and will end at a water storage tank near the Brunswick County Northwest Water Treatment Plant. The project impacts are outlined following the special conditions section of this permit. The new pipe will be an aerial crossing over Livingston Creek . (diagram attached to this permit) This project has been combined with SAW-2017-01759.**

Applicable Law: ☒ Section 404 (Clean Water Act, 33 USC 1344)
☒ Section 10 (Rivers and Harbors Act, 33 USC 403)

Authorization: Regional General Permit Number and/or Nationwide Permit Number: **12 Utility Line Activities**
SEE ATTACHED RGP or NWP GENERAL, REGIONAL AND/OR SPECIAL CONDITIONS

Your work is authorized by the above referenced permit provided it is accomplished in strict accordance with the attached conditions and your submitted application and attached information dated January 22, 2019. Any violation of the attached conditions or deviation from your submitted plans may subject the permittee to a stop work order, a restoration order, a Class I administrative penalty, and/or appropriate legal action.

This verification will remain valid until the expiration date identified below unless the nationwide and/or regional general permit authorization is modified, suspended or revoked. If, prior to the expiration date identified below, the nationwide and/or regional general permit authorization is reissued and/or modified, this verification will remain valid until the expiration date identified below, provided it complies with all requirements of the modified nationwide permit. If the nationwide and/or regional general permit authorization expires or is suspended, revoked, or is modified, such that the activity would no longer comply with the terms and conditions of the nationwide permit, activities which have commenced (i.e., are under construction) or are under contract to commence in reliance upon the nationwide and/or regional general permit, will remain authorized provided the activity is completed within twelve months of the date of the nationwide and/or regional general permit's expiration, modification or revocation, unless discretionary authority has been exercised on a case-by-case basis to modify, suspend or revoke the authorization.

Activities subject to Section 404 (as indicated above) may also require an individual Section 401 Water Quality Certification. You should contact the NC Division of Water Resources (telephone 919-807-6300) to determine Section 401 requirements.

For activities occurring within the twenty coastal counties subject to regulation under the Coastal Area Management Act (CAMA), prior to beginning work you must contact the N.C. Division of Coastal Management in Wilmington, NC.

This Department of the Army verification does not relieve the permittee of the responsibility to obtain any other required Federal, State or local approvals/permits.

If there are any questions regarding this verification, any of the conditions of the Permit, or the Corps of Engineers regulatory program, please contact **Gary Beecher at (910) 251-4694 or Gary. H.Beecher@usace.army.mil**.

SAW-2015-00403

Corps Regulatory Official: [signature] JAN 22, 2019
Date: **January 22, 2019**
Expiration Date of Verification: **NWP 12 Will expire on March 18, 2022**

A. Determination of Jurisdiction:

1. ☒ There are waters, including wetlands, on the above described project area that may be subject to Section 404 of the Clean Water Act (CWA) (33 USC § 1344) and/or Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403). This preliminary determination is not an appealable action under the Regulatory Program Administrative Appeal Process (Reference 33 CFR Part 331). However, you may request an approved JD, which is an appealable action, by contacting the Corps district for further instruction. Please note, if work is authorized by either a general or nationwide permit, and you wish to request an appeal of an approved JD, the appeal must be received by the Corps and the appeal process concluded prior to the commencement of any work in waters of the United States and prior to any work that could alter the hydrology of waters of the United States.

2. ☐ There are Navigable Waters of the United States within the above described project area subject to the permit requirements of Section 10 of the Rivers and Harbors Act (RHA) (33 USC § 403) and Section 404 of the Clean Water Act (CWA) (33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

3. ☐ There are waters, including wetlands, within the above described project area that are subject to the permit requirements of Section 404 of the Clean Water Act (CWA) (33 USC § 1344). Unless there is a change in the law or our published regulations, this determination may be relied upon for a period not to exceed five years from the date of this notification.

4. ☐ A jurisdiction determination was not completed with this request. Therefore, this is not an appealable action. However, you may request an approved JD, which is an appealable action, by contacting the Corps for further instruction.

5. ☐ The aquatic resources within the above described project area have been identified under a previous action. Please reference the approved jurisdictional determination issued . Action ID: **SAW-** .

B. Basis For Jurisdictional Determination: **This site exhibits wetland criteria as described in the 1987 Corps Wetland Delineation Manual and the Atlantic and Gulf Coastal Plain Regional Supplement.**

C. Remarks: **The water bodies this project crosses through exhibit Ordinary High Water Marks as indicated by changes in soil character and absence of terrestrial vegetation. These water bodies include: Livingston Creek, Rattlesnake Branch, Mill Creek , Hood Creek & Bear Branch.**

D. Attention USDA Program Participants

This delineation/determination has been conducted to identify the limits of Corps' Clean Water Act jurisdiction for the particular site identified in this request. The delineation/determination may not be valid for the wetland conservation provisions of the Food Security Act of 1985. If you or your tenant are USDA Program participants, or anticipate participation in USDA programs, you should request a certified wetland determination from the local office of the Natural Resources Conservation Service, prior to starting work.

E. Appeals Information for Approved Jurisdiction Determinations (as indicated in A2 and A3 above).

If you object to this determination, you may request an administrative appeal under Corps regulations at 33 CFR Part 331. Enclosed you will find a Notification of Appeal Process (NAP) fact sheet and Request for Appeal (RFA) form. If you request to appeal this determination you must submit a completed RFA form to the following address:

US Army Corps of Engineers
South Atlantic Division
Attn: Jason Steele, Review Officer
60 Forsyth Street SW, Room 10M15
Atlanta, Georgia 30303-8801
Phone: (404) 562-5137

SAW-2015-00403

In order for an RFA to be accepted by the Corps, the Corps must determine that it is complete, that it meets the criteria for appeal under 33 CFR part 331.5, and that it has been received by the Division Office within 60 days of the date of the NAP. Should you decide to submit an RFA form, it must be received at the above address by _____.
It is not necessary to submit an RFA form to the Division Office if you do not object to the determination in this correspondence.

Corps Regulatory Official: _____
Gary Beecher

Date of JD: **January 22, 2019** Expiration Date of JD: **PJD does not expire**

The Wilmington District is committed to providing the highest level of support to the public. To help us ensure we continue to do so, please complete our Customer Satisfaction Survey, located online at http://corpsmapu.usace.army.mil/cm_apex/f?p=136:4:0.

Copy furnished via e-mail to:

Kim Williams
Land Management Group

3805 Wrightsville Avenue, Suite 15
Wilmington, NC 28403
(910) 452-0001
kwilliams@lmgroup.net

SPECIAL CONDITIONS

1. If required A 401 Water Quality Certification from the North Carolina Division of Water Resources must be obtained. The permittee shall provide the Corps with a copy of the required certification or waiver of certification from the state prior to proceeding with the work in waters of the U.S. The permittee shall comply with all conditions of the state certification.

2. Temporary discharge of excavated or fill material into wetlands and waters of the United States will be for the absolute minimum period of time necessary to accomplish the work. All authorized temporary wetland, stream, and tributary impacts will be returned to pre-disturbance grade and contour, and re-vegetated. In wetland areas where sewer installation via trenching is authorized, wetland topsoil will be segregated from the underlying subsoil, and the top 6 to 12 inches of the trench will be backfilled with topsoil from the trench.

3. Upon completion of work that involves temporary stream impacts, streambeds are to be restored to pre-project elevations and widths using natural streambed material such that the impacted stream reach mimics the adjacent upstream and downstream reach. The impacted area shall be backfilled with natural streambed material to a depth of at least 12 inches or to the bottom depth of the impacted area if shallower than 12 inches. An engineered in-stream structure or material can be used to provide protection of a buried structure if it provides benefits to the aquatic environment and can be accomplished by a natural streambed design.

4. Upon completion of work that involves temporary stream impacts, streambeds are to be restored to pre-project elevations and widths using natural streambed material such that the impacted stream reach mimics the adjacent upstream and downstream reach. The impacted area shall be backfilled with natural streambed material to a depth of at least 12 inches or to the bottom depth of the impacted area if shallower than 12 inches. An engineered in-stream structure or material can be used to provide protection of a buried structure if it provides benefits to the aquatic environment and can be accomplished by a natural streambed design.

5. Cleared wetland areas shall be re-vegetated to the maximum extent practicable with native species of canopy, shrub, and herbaceous species. Fescue grass shall not be used. The re-vegetated and replanted areas should follow the descriptions on the attached Miscellaneous Planting Details.

6. Since the following waters are classified as Anadromous Fish Spawning Areas by the NC WRC no work shall take place in these waters between February 15th and June 30th. These waters include: Weyman Creek, Livingston Creek and Hood Creek.

Proposed Impacts Inventory for SAW-2015-00403

1. Impacts Summary

1a. Where are the impacts associated with your project? (check all that apply):

- ☑ Wetlands
- ☑ Open Waters
- ☑ Streams-tributaries
- ☐ Pond Construction
- ☐ Buffers

2. Wetland Impacts

2a. Site # * (?)	2a1 Reason * (?)	2b. Impact type * (?)	2c. Type of W. *	2d. W. name *	2e. Forested *	2f. Type of Jurisdicition * (?)	2g. Impact area *
W1	Water line installation	T	Riverine Swamp Forest	N/A	No	Both	0.590 (acres)
W2	Water line installation	T	Unknown	N/A	Yes	Both	0.110 (acres)
W3	Water line installation	T	Unknown	N/A	No	Both	0.043 (acres)
W4	Water line installation	T	Unknown	N/A	No	Both	0.320 (acres)
W5	Water line installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.620 (acres)
W6	Water line installation	T	Unknown	N/A	No	Both	0.011 (acres)
W7	Water line installation	T	Unknown	N/A	No	Both	0.018 (acres)
W8	Water line installation	T	Riverine Swamp Forest	N/A	No	Both	0.240 (acres)
W9	Water line installation	T	Unknown	N/A	Yes	Both	0.028 (acres)
W10	Water line installation	T	Unknown	N/A	No	Both	0.120 (acres)
W11	Water line installation	T	Unknown	N/A	No	Both	0.230 (acres)
W12	Water line installation	T	Unknown	N/A	No	Both	0.190 (acres)
W13	Water line installation	T	Unknown	N/A	No	Both	0.040 (acres)
W14	Water line installation	T	Unknown	N/A	No	Both	0.013 (acres)
W15	Water line installation	T	Unknown	N/A	No	Both	0.030 (acres)
W16	Water line installation	T	Unknown	N/A	No	Both	0.020 (acres)
W17	Water line installation	T	Unknown	N/A	No	Both	0.045 (acres)
W18	Water line installation	T	Unknown	N/A	Yes	Both	0.126 (acres)
W19	Water line installation	T	Unknown	N/A	No	Both	0.171 (acres)
W20	Water line installation	T	Unknown	N/A	Yes	Both	0.373 (acres)
W21	Water line installation	T	Unknown	N/A	Yes	Both	0.057 (acres)

W22	Water line installation	T	Unknown	N/A	Yes	Both	0.222 (acres)
W23	Water line installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.890 (acres)
W24	Water line installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.260 (acres)
W25	Water line installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.250 (acres)
W26	Water line installation	T	Unknown	N/A	Yes	Both	0.110 (acres)
W27	Water line installation	T	Riverine Swamp Forest	N/A	No	Both	0.040 (acres)
W28	Water line installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.068 (acres)
W29	Water line installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.126 (acres)
W30	Water line installation	T	Riverine Swamp Forest	N/A	No	Both	0.186 (acres)
W31	Water Line Installation	T	Riverine Swamp Forest	N/A	No	Both	0.033 (acres)
W32	Water Line Installation	T	Riverine Swamp Forest	N/A	No	Both	0.243 (acres)
W33	Water Line Installation	T	Riverine Swamp Forest	N/A	No	Both	0.560 (acres)
W34	Water Line Installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.078 (acres)
W35	Water Line Installation	T	Unknown	N/A	No	Both	0.311 (acres)
W36	Water Line Installation	T	Unknown	N/A	No	Both	0.239 (acres)
W37	Water Line Installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.820 (acres)
W38	Water Line Installation	T	Riverine Swamp Forest	N/A	No	Both	0.190 (acres)
W39	Water Line Installation	T	Riverine Swamp Forest	N/A	Yes	Both	0.054 (acres)
W40	Water Line Installation	T	Unknown	N/A	No	Both	0.069 (acres)
W41	Water Line Installation	T	Unknown	N/A	No	Both	0.026 (acres)
W42	Water Line Installation	T	Unknown	N/A	Yes	Both	0.033 (acres)
W43	Water Line Installation	T	Unknown	N/A	Yes	Both	0.017 (acres)

2g. Total Temporary Wetland Impact

8.220

2g. Total Permanent Wetland Impact

0.000

2g. Total Wetland Impact

8.220

2h. Comments:

3. Stream Impacts

	3a. Reason for impact * (?)	3b.Impact type *	3c. Type of impact *	3d. S. name *	3e. Stream Type * (?)	3f. Type of Jurisdiction *	3g. S. width *	3h. Impact length *
S1	Water Line Installation	Temporary	Excavation	Beaverdam Creek	Perennial	Both	5 Average (feet)	50 (linear feet)
S2	Water Line Installation	Temporary	Excavation	Weyman Creek	Perennial	Both	4 Average (feet)	50 (linear feet)
S3	Water Line Installation	Temporary	Excavation	Double Branch	Perennial	Both	4 Average (feet)	50 (linear feet)

S4	Water Line Installation	Temporary	Excavation	UT to Livingston Creek	Perennial	Both	4 Average (feet)	50 (linear feet)
S5	Water Line Installation	Temporary	Excavation	Mill Creek	Perennial	Both	5 Average (feet)	50 (linear feet)
S6	Water Line Installation	Temporary	Excavation	UT to Mill Creek	Perennial	Both	4 Average (feet)	50 (linear feet)
S7	Water Line Installation	Temporary	Excavation	UT to Mill Creek	Perennial	Both	4 Average (feet)	50 (linear feet)
S8	Water Line Installation	Temporary	Excavation	Bear Branch	Perennial	Both	5 Average (feet)	50 (linear feet)
S9	Water Line Installation	Temporary	Excavation	UT to Mill Creek	Perennial	Both	4 Average (feet)	50 (linear feet)
S10	Water Line Installation	Temporary	Excavation	UT to Mill Creek	Perennial	Both	4 Average (feet)	50 (linear feet)
S11	Water Line Installation	Temporary	Excavation	UT to Mill Creek	Perennial	Both	4 Average (feet)	50 (linear feet)
S12	Water Line Installation	Temporary	Excavation	UT to Hood Creek	Perennial	Both	4 Average (feet)	50 (linear feet)
S13	Water Line Installation	Temporary	Excavation	Rattlesnake Branch	Perennial	Both	50 Average (feet)	50 (linear feet)
S14	Water Line Installation	Temporary	Excavation	Hood Creek	Perennial	Both	30 Average (feet)	50 (linear feet)
S15	Water Line Installation	Temporary	Excavation	UT to Hood Creek	Perennial	Both	5 Average (feet)	50 (linear feet)
S16	Water Line Installation	Temporary	Excavation	UT to Hood Creek	Perennial	Both	5 Average (feet)	50 (linear feet)

3i. Total jurisdictional ditch impact in square feet:

0

3i. Total permanent stream impacts:

0

3i. Total temporary stream impacts:

800

3i. Total stream and ditch impacts:

800

3j. Comments:

4. Open Water Impacts

4a. Site #	4a1. Impact Reason	4b. Impact type	4c. Name of waterbody	4d. Activity type	4e. Waterbody type	4f. Impact area
O1	Water Line Installation	T	N/A	Excavation	Pond	0.09
O2	Water Line Installation	T	N/A	Excavation	Ditch	0.01
O3	Water Line Installation	T	N/A	Excavation	Ditch	0.04
O4	Water Line Installation	T	N/A	Excavation	Ditch	0.07
O5	Water Line Installation	T	N/A	Excavation	Ditch	0.01
O6	Water Line Installation	T	N/A	Excavation	Ditch	0.01
O7	Water Line Installation	T	N/A	Excavation	Ditch	0.04
O8	Water Line Installation	T	N/A	Excavation	Ditch	0.01
O9	Water Line Installation	T	N/A	Excavation	Ditch	0.01
O10	Water Line Installation	T	N/A	Excavation	Ditch	0.02

4g. Total temporary open water Impacts:

0.31

4g. Total permanent open water impacts:

0.00

4g. Total open water impacts:

0.31

Action ID Number: **SAW-2015-00403** **County: Bladen/Columbus/Brunswick**

Permittee: **Attn: Don Betz**
Lower Cape Fear Water and Sewer Authority

Project Name: **Hwy 87 Waterline Lower Cape Fear Water & Sewer Authority LMG PJD**

Date Verification Issued: **January 22, 2019**

Project Manager: **Gary Beecher**

Upon completion of the activity authorized by this permit and any mitigation required by the permit, sign this certification and return it to the following address:

US ARMY CORPS OF ENGINEERS
WILMINGTON DISTRICT
Attn: Gary Beecher

Please note that your permitted activity is subject to a compliance inspection by a U. S. Army Corps of Engineers representative. Failure to comply with any terms or conditions of this authorization may result in the Corps suspending, modifying or revoking the authorization and/or issuing a Class I administrative penalty, or initiating other appropriate legal action.

I hereby certify that the work authorized by the above referenced permit has been completed in accordance with the terms and condition of the said permit, and required mitigation was completed in accordance with the permit conditions.

_____ _____

Signature of Permittee **Date**

N

SCALE 1" = 1,000'
(when printed at 11"x17")

*Boundaries are approximate and are not meant to be absolute.
Map Source: 2016 NC OneMap Aerial Photography

Kings Bluff Raw Water Main
Bladen, Columbus, & Brunswick Counties

October 2018
LMG18.212

LMG
LAND MANAGEMENT GROUP
a DAVEY company
www.lmgroup.net
3805 Wrightsville Avenue; Suite 15
Wilmington, NC 28403
Phone: 910.452.0001 Fax: 910.452.0060

Overview Map Showing Impact Areas
Sheet 1 of 5

Kings Bluff Raw Water Main
Bladen, Columbus, & Brunswick Counties

October 2018
LMG18.212

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Overview Map
Showing Impact Areas
Sheet 2 of 5

N

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Kings Bluff Raw Water Main
Bladen, Columbus, & Brunswick Counties

October 2018
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Overview Map
Showing Impact Areas
Sheet 3 of 5

N

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Kings Bluff Raw Water Main
Bladen, Columbus, & Brunswick Counties

October 2018
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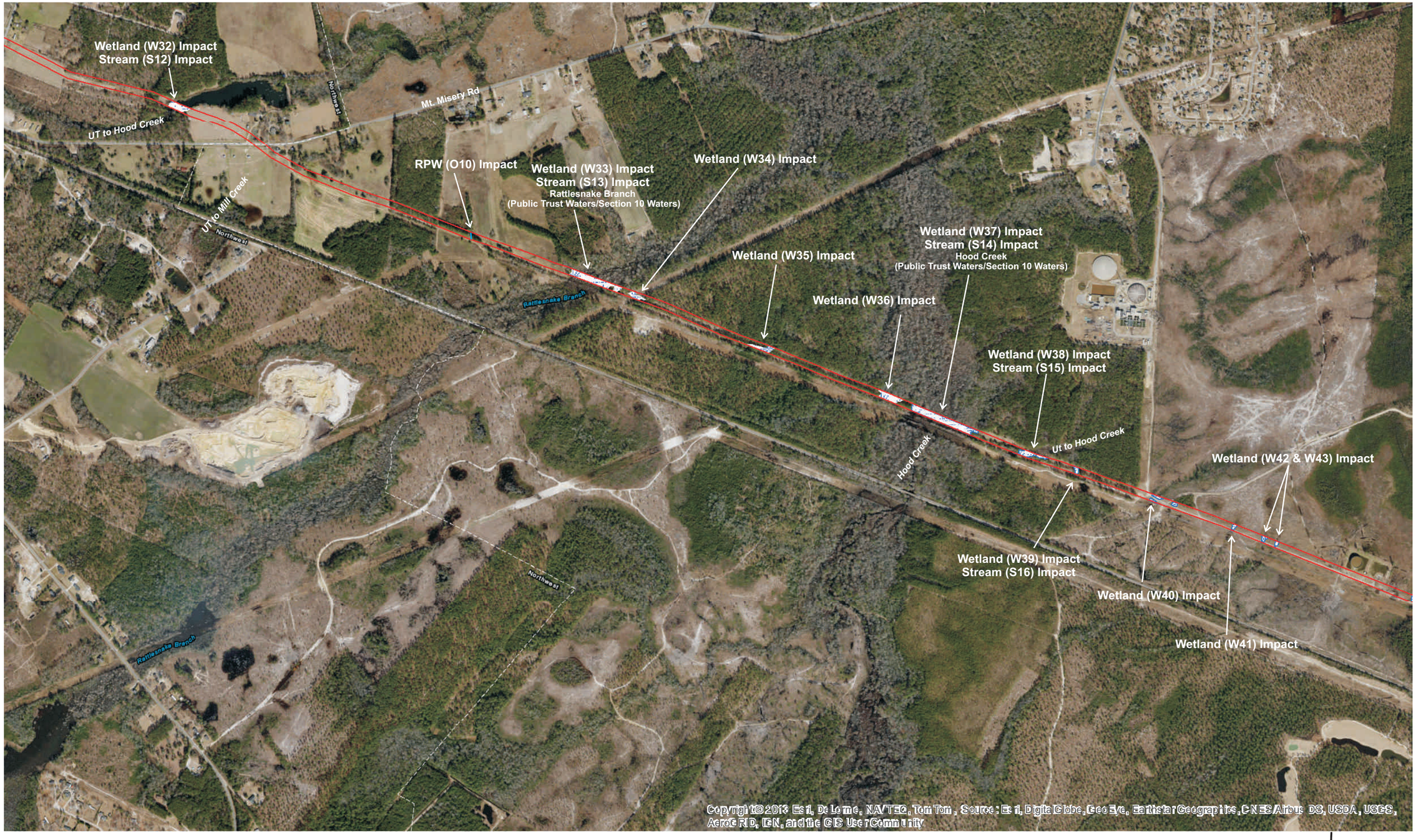
Overview Map
Showing Impact Areas
Sheet 4 of 5

N

SCALE 1" = 1,000'
(when printed at 11"x17")

Boundaries are approximate and are not meant to be absolute.



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Bladen, Columbus, & Brunswick Counties

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Overview Map
Showing Impact Areas
Sheet 5 of 5

N

SCALE 1" = 1,000'
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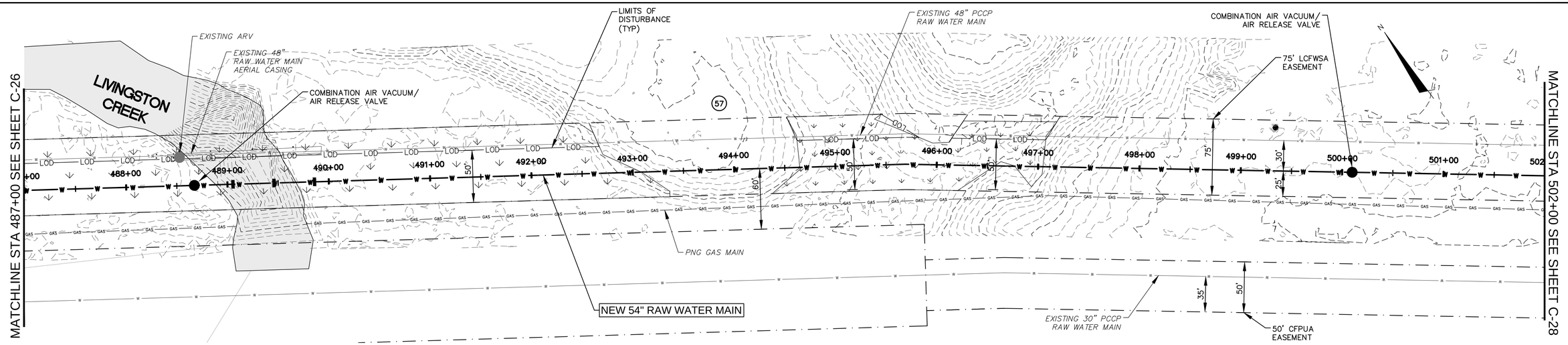
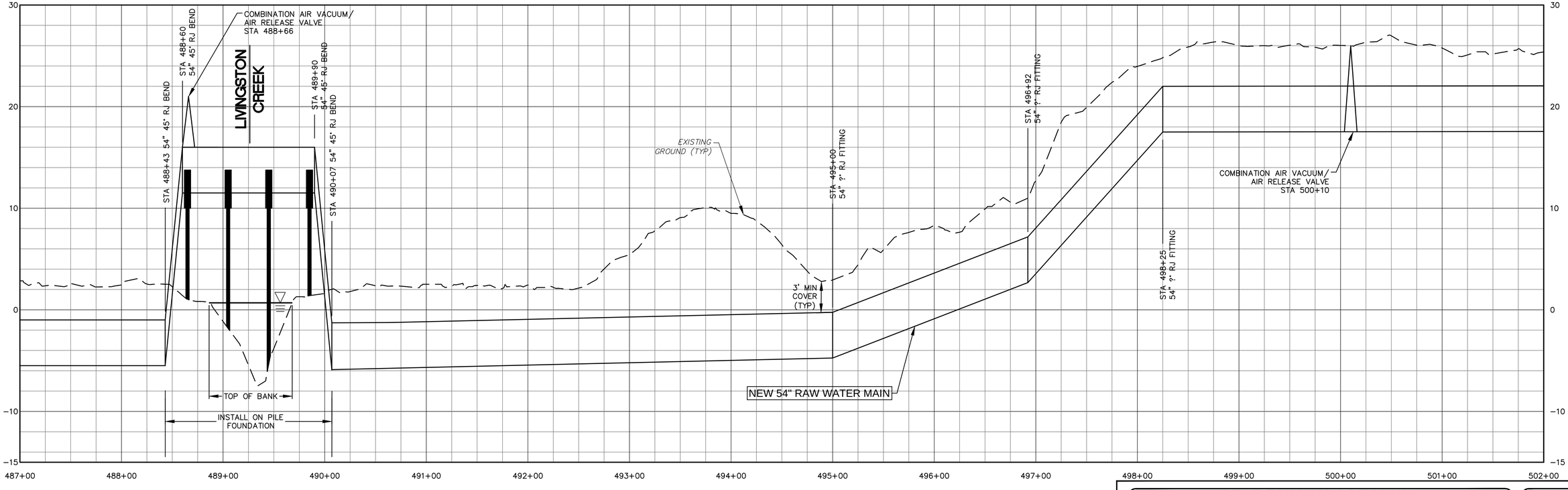




GENERAL NOTES:

1. LAYOUT BASED ON STANDARD FITTING SIZES USING MAXIMUM JOINT DEFLECTION OF 2 DEGREES AND MINIMUM RADIUS OF _ FT.
2. CONTRACTOR SHALL TAKE THE NECESSARY STEPS TO PROTECT THE EXISTING 48" RAW WATER MAIN.
3. ALL EXCAVATIONS (TRENCHING, BORING, BORE PITS, ETC) ARE UNCLASSIFIED. GEOTECHNICAL REPORT AND BORING LOGS HAVE BEEN PROVIDED IN PROJECT SPECIFICATIONS.
4. SITE SURVEY WAS PERFORMED BY MCKIM AND CREED IN 2017. ALL COORDINATES ARE TIED TO THE NORTH CAROLINA STATE PLAN COORDINATE SYSTEM (NAD 83 FEET).
5. THE LOCATION OF ALL EXISTING UTILITIES ARE APPROXIMATE. CONTRACTOR SHALL FIELD VERIFY LOCATIONS.
6. NEW 54" RAW WATER MAIN SHALL BE WELDED STEEL PIPE (THICKNESS MIN = 0.22, LINING = CEMENT MORTAR, COATING = POLYURETHANE) OR DUCTILE IRON PIPE (PC 150, LINING = CEMENT MORTAR, COATING = POLYWRAP). CONTRACTOR SHALL UTILIZE ONLY ONE MATERIAL UNLESS APPROVED BY ENGINEER OR MATERIAL IS SHOWN ON PLANS.

KEY NOTES:

① CONTACT PRIOR TO ACCESSING EASEMENT.
② 75' LCFWSA EASEMENT IS LIMITS OF DISTURBANCE.
③ ALL WORK PERFORMED WITHIN DELINEATED WETLANDS MUST MEET ALL PERMIT REQUIREMENTS.

50' 0 50' 100'
SCALE: 1"=50' (Horiz.)
5' 0 5' 10'
SCALE: 1"=5' (Vert.)

54" RAW WATER MAIN PLAN AND PROFILE STA 487+00 TO STA 502+00

DATE: JULY 2018
SCALE: AS SHOWN
DRAWN BY: JPV
CHECKED BY: AWB
PROJECT NO. : 5367-0038

MCKIM&CREED
243 NORTH FRONT ST
WILMINGTON, NORTH CAROLINA 28401
TELE: (910) 343-1048
FAX: (910) 251-8282
LICENSE: F-1222

Cape Fear Public Utility Authority
Stewardship. Sustainability. Service.

REV:	DESCRIPTION	DATE:

NORTH CAROLINA PROFESSIONAL SEAL 025512 ENGINEER ANTHONY W. BOAHN

CAPE FEAR PUBLIC UTILITY AUTHORITY
KINGS BLUFF RAW WATER TRANSMISSION MAIN

CAPE FEAR PUBLIC UTILITY AUTHORITY
235 GOVERNMENT CENTER DRIVE
WILMINGTON, NC 28403
OFFICE: (910)332-6560

SHEET NO: C-27

Appendix H
NCDEQ
401 Water Quality Certification

ROY COOPER
Governor
MICHAEL S. REGAN
Secretary
LINDA CULPEPPER
Director

NORTH CAROLINA
Environmental Quality

January 11, ~~2018~~ 2019

Brunswick County
DWR Project: 2012-0083v2

Lower Cape Fear Water and Sewer Authority
Mr. Don Betz
1107 New Pointe Boulevard, Suite 17
Leland NC 28451

Subject Property: **Kings Bluff Raw Water Transmission Main**

Approval of 401 Water Quality Certification with Additional Conditions

Dear Mr. Betz,

You have our approval, in accordance with the attached conditions and those listed below, to temporarily impact 8.22 acres of 404 wetlands and approximately 800 linear feet of stream in order to install a 5-inch diameter water main parallel to an existing one as described in the application received by the N.C. Division of Water Resources (DWR) on November 30, 2018. After reviewing your application, we have decided that the impacts are covered by General Water Quality Certification Number 4133 (GC4133).

In addition, you should obtain or otherwise comply with any other required federal, state or local permits before you go ahead with your project including (but not limited to) Erosion and Sediment Control, Non-discharge, and stormwater regulations. Also, this approval to proceed with your proposed impacts or to conduct impacts to waters as depicted in your application shall expire upon expiration of the 404 Permit. This Certification can also be found on line at: http://portal.ncdenr.org/web/wq/swp/ws/401/certsandpermits.

This approval is for the purpose and design that you described in your application. If you change your project, you must notify us and you may be required to send us a new application. If the property is sold, the new owner must be given a copy of this Certification and approval letter and is thereby responsible for complying with all conditions. If total fills for this project (now or in the future) exceed one acre of wetland or 150 linear feet of stream, compensatory mitigation may be required as described in 15A NCAC 2H .0506 (h). **This approval requires you to follow the conditions listed in the attached certification and any additional conditions listed below.**

The Additional Conditions of the Certification are:

1. This approval is for the purpose and design described in your application. The plans and specifications for this project are incorporated by reference as part of the Certification. If you change your project, you must notify the Division and you may be required to submit a new application package with the appropriate fee. If the property is sold, the new owner must be given a copy of this approval letter and General Certification and is responsible for complying with all conditions. Any new owner must notify the Division and request the Certification be issued in their name {15A NCAC 02H .0501 and .0502}.

2. Any final construction plans for this project must include or reference the application and plans approved by the Division under this authorization letter and certification. The applicant will also be required to evaluate all acquired permits to assure that they are consistent and all relative impacts are accounted for and shown on the construction plans. [15A NCAC 02H .0502 (b) and 15A NCAC 02H .0506 (4)] The applicant shall require his contractors (and/or agents) to comply with all of the terms of this Certification and shall provide each of its contractors (and/or agents) a copy of this Certification.

3. Turbidity Standard

   The turbidity standard of 50 NTUs (Nephelometric Turbidity Units) shall not be exceeded as described in 15 A NCAC 2B .0220. Appropriate sediment and erosion control practices must be used to meet this standard. Turbidity curtains shall be used as appropriate. Please notify this Office if any turbidity issues arise at 910.796.7215

4. This General Certification shall expire on the same day as the expiration date of the corresponding General Permit. The conditions in effect on the date of issuance of the Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration of this Certification.

5. The permittee shall require its contractors and/or agents to comply with the terms of this permit in the construction and maintenance of this project and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project a copy of this certification. A copy of this certification including all conditions shall be available at the project site during the construction and maintenance of this project. [15A NCAC 02H .0507 (c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

6. Continuing Compliance:

7. The applicant/permittee and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with 303(d) of the Clean Water Act), and any other appropriate requirements

of State and Federal law. If the Division determines that such standards or laws are not being met, including failure to sustain a designated or achieved use, or that State or Federal law is being violated, or that further conditions are necessary to assure compliance, than the Division may reevaluate and modify this General Water Quality Certification. [15A NCAC 02H .0507(d)]

8. All mechanized equipment operated near surface waters or wetlands will be regularly inspected and maintained to prevent contamination of waters and wetlands from fuels, lubricants, hydraulic fluids or other potential toxic chemicals. In the event of a hydrocarbon or chemical spill, the permittee/contractor shall immediately contact the Division of Water Quality, between the hours of 8 am to 5 pm at the Wilmington Regional Office at 910.796.7215 and after hours and on weekends call (800) 858-0368. Management of such spills shall comply with provisions of the North Carolina Oil Pollution and Hazardous Substances Control Act. [15A NCAC 02H .0506 (b)(3) and (c)(3), 15A NCAC 02B .0200 (3)(f), and GS 143 Article 21A].

9. Fueling, lubrication and general equipment maintenance should not take place within 50 feet of a waterbody or wetlands to prevent contamination by fuel and oils. [15A NCAC 02H .0506 (b)(3) and (c)(3) and 15A NCAC 02B .0200 (3)(f)].

10. This certification grants permission to the director, an authorized representative of the Director, or DEQ staff, upon the presentation of proper credentials, to enter the property during normal business hours 15A NCAC 02H.0502(e).

11. Certificate of Completion

    Upon completion of all work approved within the 401 Water Quality Certification or applicable Buffer Rules, and any subsequent modifications, the applicant and/or authorized agent is required to return a completed certificate of completion form to the NCDEQ DWR 401 and Buffers Unit North Carolina Division of Water Resources, 1617 Mail Service Center, Raleigh, NC, 27699 within ten days of project completion. The certification of completion is available at: http://portal.ncdenr.org/web/wq/swp/ws/401/certsandpermits/apply/forms).

Violations of any condition herein set forth may result in revocation of this Certification and may result in criminal and/or civil penalties. The authorization to proceed with your proposed impacts or to conduct impacts to waters as depicted in your application and as authorized by this Certification shall expire upon expiration of the 404 or CAMA Permit.

This approval and its conditions are final and binding unless contested.

This Certification can be contested as provided in Articles 3 and 4 of General Statute 150B by filing a written petition for an administrative hearing to the Office of Administrative Hearings (hereby known as OAH). A petition form may be obtained from the OAH at http://www.ncoah.com/ or by calling the OAH Clerk's Office at (919) 431-3000 for information. Within sixty (60) calendar days of receipt of this notice, a petition must be filed with

the OAH. A petition is considered filed when the original and one (1) copy along with any applicable OAH filing fee is received in the OAH during normal office hours (Monday through Friday between 8:00 am and 5:00 pm, excluding official state holidays). The petition may be faxed to the OAH at (919) 431-3100, provided the original and one copy of the petition along with any applicable OAH filing fee is received by the OAH within five (5) business days following the faxed transmission.

Mailing address for the OAH:

If sending via US Postal Service:	*If sending via delivery service (UPS, FedEx, etc):*
Office of Administrative Hearings 6714 Mail Service Center Raleigh, NC 27699-6714	Office of Administrative Hearings 1711 New Hope Church Road Raleigh, NC 27609-6285

One (1) copy of the petition must also be served to DEQ:

William F. Lane, General Counsel
Department of Environmental Quality
1601 Mail Service Center
Raleigh, NC 27699-1601

This letter completes the review of the Division of Water Resources under Section 401 of the Clean Water Act. If you have any questions, please telephone Chad Coburn in the DWR Wilmington Regional Office at (910)796-7379 or Chad.Coburn@ncdenr.gov.

Sincerely,

DocuSigned by:
Morella Sanchez-King
E3ABA14AC7DC434...

Morella Sanchez-King, Assistant Regional Supervisor
Water Quality Regional Operations Section
Wilmington Regional Office
Division of Water Resources, NCDEQ

Enclosure: GC4133

cc: Kim Williams – Land Management Group, Inc. (via email)
Gary Beecher - USACE Wilmington Regulatory Field Office (via email)

STATE OF NORTH CAROLINA
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF WATER RESOURCES

WATER QUALITY GENERAL CERTIFICATION NO. 4133

GENERAL CERTIFICATION FOR PROJECTS ELIGIBLE FOR US ARMY CORPS OF ENGINEERS

- **NATIONWIDE PERMIT 12 (UTILITY LINE ACTIVITIES)**

Water Quality Certification Number 4133 is issued in conformity with the requirements of Section 401, Public Laws 92-500 and 95-217 of the United States and subject to the North Carolina Regulations in 15A NCAC 02H .0500 and 15A NCAC 02B .0200 for the discharge of fill material to surface waters and wetland areas as described in 33 CFR 330 Appendix A (B) (12) of the US Army Corps of Engineers regulations.

The State of North Carolina certifies that the specified category of activity will not violate applicable portions of Sections 301, 302, 303, 306 and 307 of the Public Laws 92-500 and 95-217 if conducted in accordance with the conditions hereinafter set forth.

Effective date: December 1, 2017

Signed this day: December 1, 2017

By

for Linda Culpepper
Interim Director

Activities meeting any one (1) of the following thresholds or circumstances require *written approval* for a 401 Water Quality Certification from the Division of Water Resources (DWR):

a) If any of the Conditions of this Certification (listed below) cannot be met; or
b) Total permanent impacts to wetlands or open waters equal to or greater than one-tenth (1/10) acre within the entire utility project; or
c) Any permanent impacts to streams; or
d) Total temporary impacts to streams greater than 500 feet within the entire utility project; or
e) Any stream relocation or stream restoration; or
f) Any high-density utility line and associated facilities project, as defined in 15A NCAC 02H .1003(2)(a) and by the density thresholds specified in 15A NCAC 02H .1017, which:
    i. Disturbs one acre or more of land (including a project that disturbs less than one acre of land that is part of a larger common plan of development or sale); and
    ii. Has permanent wetland, stream or open water impacts; and
    iii. Is proposing new built-upon area; and
    iv. Does not have a stormwater management plan reviewed and approved under a state stormwater program[1] or a state-approved local government stormwater program[2].

    Projects that have vested rights, exemptions, or grandfathering from state or locally-implemented stormwater programs and projects that satisfy state or locally-implemented stormwater programs through use of community in-lieu programs **require written approval**; or
g) Any permanent impacts to waters, or to wetlands adjacent to waters, designated as: ORW (including SAV), HQW (including PNA), SA, WS-I, WS-II, Trout, or North Carolina or National Wild and Scenic River; or
h) Any permanent impacts to coastal wetlands [15A NCAC 07H .0205], or Unique Wetlands (UWL); or
i) Any impact associated with a Notice of Violation or an enforcement action for violation(s) of NC Wetland Rules (15A NCAC 02H .0500), NC Isolated Wetland Rules (15A NCAC 02H .1300), NC Surface Water or Wetland Standards (15A NCAC 02B .0200), or State Regulated Riparian Buffer Rules (15A NCAC 02B .0200); or
j) Any impacts to subject water bodies and/or state regulated riparian buffers along subject water bodies in the Neuse, Tar-Pamlico, or Catawba River Basins or in the Randleman Lake, Jordan Lake or Goose Creek Watersheds (or any other basin or watershed with State Regulated Riparian Area Protection Rules [Buffer Rules] in effect at the time of application) *unless:*
    i. The activities are listed as "EXEMPT" from these rules; or
    ii. A Buffer Authorization Certificate is issued by the NC Division of Coastal Management (DCM); or

[1] e.g. Coastal Counties, HQW, ORW, or state-implemented Phase II NPDES
[2] e.g. Delegated Phase II NPDES, Water Supply Watershed, Nutrient-Sensitive Waters, or Universal Stormwater Management Program

iii. A Buffer Authorization Certificate or a Minor Variance is issued by a delegated or designated local government implementing a state riparian buffer program pursuant to 143-215.23.

Activities included in this General Certification that do not meet one of the thresholds listed above do not require written approval.

I. ACTIVITY SPECIFIC CONDITIONS:

1. All sewer lines shall be designed, constructed and maintained in accordance with Title 15A NCAC Chapter 02T.

2. Any utility construction corridor that is parallel to a stream or open water shall not be closer than 10 feet to the top of bank or ordinary high-water mark. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506 (b)(4) and (c)(4)]

3. Where there are temporary or permanent impacts from stream crossings, utility lines shall cross the stream channel at a near-perpendicular direction (i.e., between 75 degrees and 105 degrees to the stream bank). Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506 (b)(2) and (c)(2)]

4. Construction corridors in wetlands and across stream channels shall be minimized to the maximum extent practicable and shall not exceed 50 feet wide for gas utility lines and 40 feet wide for all other utility lines. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506 (b)(2) and (c)(2)]

   For construction corridors in wetlands and across stream channels, stumps shall be grubbed only as needed to install the utility and remaining stumps shall be cut off at grade level. The general stripping of topsoil within wetlands along the construction corridor is not permitted.

5. Permanent maintained access corridors in wetlands and across stream channels shall be restricted to the minimum width practicable and shall not exceed 30 feet wide for gas utility lines and 20 feet wide for all other utility lines except at manhole locations. 15-foot by 15-foot perpendicular vehicle turnarounds shall be allowed in access corridors but must be spaced at least 500 feet apart. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506 (b)(2) and (c)(2)]

6. For all utility lines constructed within wetlands, an anti-seep collar shall be placed at the downstream (utility line gradient) wetland boundary and every 150 feet up the gradient until the utility exits the wetland. Anti-seep collars may be constructed with class B concrete, compacted clay, PVC pipe, or metal collars. Wetland crossings that are directionally drilled, and perpendicular wetland crossings that are open cut and less than 150 feet long do not require anti-seep collars. The compacted clay shall have a specific

infiltration of 1 X 10^{-5} cm/sec or less. A section and plan view diagram is attached for the anti-seep collars. [15A NCAC 02H .0506 (b)(4) and (c)(4)]

The following specifications shall apply to class B concrete:

a. Minimum cement content, sacks per cubic yard with rounded coarse aggregate 5.0
b. Minimum cement content, sacks per cubic yard with angular coarse aggregate 5.5
c. Maximum water-cement ratio gallons per sack 6.8
d. Slump range 2" to 4"
e. Minimum strength - 28-day psi 2,500

7. The applicant shall have a specific plan for restoring wetland contours. Any excess material will be removed to a high ground disposal area. [15A NCAC 02H .0506 (b)(2) and (c)(2)]

   The mixing of topsoil and subsoils within the wetlands along utility corridors shall be minimized to the greatest extent practical. During excavation, the soils shall be placed on fabric to minimize impacts whenever possible. Topsoil excavated from utility trenches will be piled separately from subsoils and will be backfilled into the trench only after the subsoils have been placed and compacted.

8. For the North Carolina Department of Transportation, compliance with the NCDOT's individual NPDES permit NCS000250 shall serve to satisfy this condition. All other high-density utility line and associated facilities projects that trigger threshold Item (f) above shall comply with one of the following requirements: [15A NCAC 02H .0506(b)(5) and (c)(5)]

   a. Provide a completed Stormwater Management Plan (SMP) for review and approval, including all appropriate stormwater control measure (SCM) supplemental forms and associated items, that complies with the high-density development requirements of 15A NCAC 02H .1003. Stormwater management shall be provided throughout the entire project area in accordance with 15A NCAC 02H .1003. For the purposes of 15A NCAC 02H .1003(2)(a), density thresholds shall be determined in accordance with 15A NCAC 02H .1017.

   b. Provide documentation (including calculations, photos, etc.) that the project will not cause degradation of downstream surface waters. Documentation shall include a detailed analysis of the hydrological impacts from stormwater runoff when considering the volume and velocity of stormwater runoff from the project built upon area and the size and existing condition of the receiving stream(s).

   Exceptions to this condition require application to and written approval from DWR.

II. GENERAL CONDITIONS:

1. When written authorization is required, the plans and specifications for the project are incorporated into the authorization by reference and are an enforceable part of the Certification. Any modifications to the project require notification to DWR and may require an application submittal to DWR with the appropriate fee. [15A NCAC 02H .0501 and .0502]

2. No waste, spoil, solids, or fill of any kind shall occur in wetlands or waters beyond the footprint of the impacts (including temporary impacts) as authorized in the written approval from DWR; or beyond the thresholds established for use of this Certification without written authorization. [15A NCAC 02H .0501 and .0502]

   No removal of vegetation or other impacts of any kind shall occur to state regulated riparian buffers beyond the footprint of impacts approved in a Buffer Authorization or Variance or as listed as an exempt activity in the applicable riparian buffer rules. [15A NCAC 02B .0200]

3. In accordance with 15A NCAC 02H .0506(h) and Session Law 2017-10, compensatory mitigation may be required for losses of greater than 300 linear feet of perennial streams and/or greater than one (1) acre of wetlands. Impacts associated with the removal of a dam shall not require mitigation when the removal complies with the requirements of Part 3 of Article 21 in Chapter 143 of the North Carolina General Statutes. Impacts to isolated and other non-404 jurisdictional wetlands shall not be combined with 404 jurisdictional wetlands for the purpose of determining when impact thresholds trigger a mitigation requirement. For linear publicly owned and maintained transportation projects that are not determined to be part of a larger common plan of development by the US Army Corps of Engineers, compensatory mitigation may be required for losses of greater than 300 linear feet per perennial stream.

   Compensatory stream and/or wetland mitigation shall be proposed and completed in compliance with G.S. 143-214.11. For applicants proposing to conduct mitigation within a project site, a complete mitigation proposal developed in accordance with the most recent guidance issued by the US Army Corps of Engineers Wilmington District shall be submitted for review and approval with the application for impacts.

4. All activities shall be in compliance with any applicable State Regulated Riparian Buffer Rules in Chapter 2 of Title 15A.

5. When applicable, all construction activities shall be performed and maintained in full compliance with G.S. Chapter 113A Article 4 (Sediment and Pollution Control Act of 1973). Regardless of applicability of the Sediment and Pollution Control Act, all projects shall incorporate appropriate Best Management Practices for the control of sediment and erosion so that no violations of state water quality standards, statutes, or rules occur. [15A NCAC 02H .0506 (b)(3) and (c)(3) and 15A NCAC 02B .0200]

   Design, installation, operation, and maintenance of all sediment and erosion control measures shall be equal to or exceed the requirements specified in the most recent version of the *North Carolina Sediment and Erosion Control Manual*, or for linear transportation projects, the *NCDOT Sediment and Erosion Control Manual*.

   All devices shall be maintained on all construction sites, borrow sites, and waste pile (spoil) sites, including contractor-owned or leased borrow pits associated with the project. Sufficient materials required for stabilization and/or repair of erosion control measures and stormwater routing and treatment shall be on site at all times.

For borrow pit sites, the erosion and sediment control measures shall be designed, installed, operated, and maintained in accordance with the most recent version of the *North Carolina Surface Mining Manual*. Reclamation measures and implementation shall comply with the reclamation in accordance with the requirements of the Sedimentation Pollution Control Act and the Mining Act of 1971.

If the project occurs in waters or watersheds classified as Primary Nursery Areas (PNAs), SA, WS-I, WS-II, High Quality Waters (HQW), or Outstanding Resource Waters (ORW), then the sedimentation and erosion control designs shall comply with the requirements set forth in 15A NCAC 04B .0124, *Design Standards in Sensitive Watersheds*.

6. Sediment and erosion control measures shall not be placed in wetlands or waters except within the footprint of temporary or permanent impacts authorized under this Certification. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0501 and .0502]

7. Erosion control matting that incorporates plastic mesh and/or plastic twine shall not be used along streambanks or within wetlands. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02B .0201]

8. An NPDES Construction Stormwater Permit (NCG010000) is required for construction projects that disturb one (1) or more acres of land. The NCG010000 Permit allows stormwater to be discharged during land disturbing construction activities as stipulated in the conditions of the permit. If the project is covered by this permit, full compliance with permit conditions including the erosion & sedimentation control plan, inspections and maintenance, self-monitoring, record keeping and reporting requirements is required. [15A NCAC 02H .0506(b)(5) and (c)(5)]

   The North Carolina Department of Transportation (NCDOT) shall be required to be in full compliance with the conditions related to construction activities within the most recent version of their individual NPDES (NCS000250) stormwater permit. [15A NCAC 02H .0506(b)(5) and (c)(5)]

9. All work in or adjacent to streams shall be conducted so that the flowing stream does not come in contact with the disturbed area. Approved best management practices from the most current version of the *NC Sediment and Erosion Control Manual*, or the *NC DOT Construction and Maintenance Activities Manual*, such as sandbags, rock berms, cofferdams, and other diversion structures shall be used to minimize excavation in flowing water. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506(b)(3) and (c)(3)]

10. If activities must occur during periods of high biological activity (e.g. sea turtle nesting, fish spawning, or bird nesting), then biological monitoring may be required at the request of other state or federal agencies and coordinated with these activities. [15A NCAC 02H .0506 (b)(2) and 15A NCAC 04B .0125]

All moratoriums on construction activities established by the NC Wildlife Resources Commission (WRC), US Fish and Wildlife Service (USFWS), NC Division of Marine Fisheries (DMF), or National Marine Fisheries Service (NMFS) shall be implemented. Exceptions to this condition require written approval by the resource agency responsible for the given moratorium. A copy of the approval from the resource agency shall be forwarded to DWR.

Work within a designated trout watershed of North Carolina (as identified by the Wilmington District of the US Army Corps of Engineers), or identified state or federal endangered or threatened species habitat, shall be coordinated with the appropriate WRC, USFWS, NMFS, and/or DMF personnel.

11. Culverts shall be designed and installed in such a manner that the original stream profiles are not altered and allow for aquatic life movement during low flows. The dimension, pattern, and profile of the stream above and below a pipe or culvert shall not be modified by widening the stream channel or by reducing the depth of the stream in connection with the construction activity. The width, height, and gradient of a proposed culvert shall be such as to pass the average historical low flow and spring flow without adversely altering flow velocity. [15A NCAC 02H .0506(b)(2) and (c)(2)]

    Placement of culverts and other structures in streams shall be below the elevation of the streambed by one foot for all culverts with a diameter greater than 48 inches, and 20% of the culvert diameter for culverts having a diameter less than or equal to 48 inches, to allow low flow passage of water and aquatic life.

    If multiple pipes or barrels are required, they shall be designed to mimic the existing stream cross section as closely as possible including pipes or barrels at flood plain elevation and/or sills where appropriate. Widening the stream channel shall be avoided.

    When topographic constraints indicate culvert slopes of greater than 5%, culvert burial is not required, provided that all alternative options for flattening the slope have been investigated and aquatic life movement/connectivity has been provided when possible (e.g. rock ladders, cross vanes, etc.). Notification, including supporting documentation to include a location map of the culvert, culvert profile drawings, and slope calculations, shall be provided to DWR 60 calendar days prior to the installation of the culvert.

    When bedrock is present in culvert locations, culvert burial is not required provided that there is sufficient documentation of the presence of bedrock. Notification, including supporting documentation such as a location map of the culvert, geotechnical reports, photographs, etc. shall be provided to DWR a minimum of 60 calendar days prior to the installation of the culvert. If bedrock is discovered during construction, then DWR shall be notified by phone or email within 24 hours of discovery.

    If other site-specific topographic constraints preclude the ability to bury the culverts as described above and/or it can be demonstrated that burying the culvert would result in destabilization of the channel, then exceptions to this condition require application to and written approval from DWR.

Installation of culverts in wetlands shall ensure continuity of water movement and be designed to adequately accommodate high water or flood conditions. When roadways, causeways, or other fill projects are constructed across FEMA-designated floodways or wetlands, openings such as culverts or bridges shall be provided to maintain the natural hydrology of the system as well as prevent constriction of the floodway that may result in destabilization of streams or wetlands.

The establishment of native woody vegetation and other soft stream bank stabilization techniques shall be used where practicable instead of rip-rap or other bank hardening methods.

12. Bridge deck drains shall not discharge directly into the stream. Stormwater shall be directed across the bridge and pre-treated through site-appropriate means to the maximum extent practicable (e.g. grassed swales, pre-formed scour holes, vegetated buffers, etc.) before entering the stream. Exceptions to this condition require application to and written approval from DWR. [15A NCAC 02H .0506(b)(5)]

13. Application of fertilizer to establish planted/seeded vegetation within disturbed riparian areas and/or wetlands shall be conducted at agronomic rates and shall comply with all other Federal, State and Local regulations. Fertilizer application shall be accomplished in a manner that minimizes the risk of contact between the fertilizer and surface waters. [15A NCAC 02B .0200 and 15A NCAC 02B .0231]

14. If concrete is used during construction, then all necessary measures shall be taken to prevent direct contact between uncured or curing concrete and waters of the state. Water that inadvertently contacts uncured concrete shall not be discharged to waters of the state. [15A NCAC 02B .0200]

15. All proposed and approved temporary fill and culverts shall be removed and the impacted area shall be returned to natural conditions within 60 calendar days after the temporary impact is no longer necessary. The impacted areas shall be restored to original grade, including each stream's original cross sectional dimensions, planform pattern, and longitudinal bed profile. For projects that receive written approval, no temporary impacts are allowed beyond those included in the application and authorization. All temporarily impacted sites shall be restored and stabilized with native vegetation. [15A NCAC 02H .0506(b)(2) and (c)(2)]

16. All proposed and approved temporary pipes/culverts/rip-rap pads etc. in streams shall be installed as outlined in the most recent edition of the *North Carolina Sediment and Erosion Control Planning and Design Manual* or the *North Carolina Surface Mining Manual* or the *North Carolina Department of Transportation Best Management Practices for Construction and Maintenance Activities* so as not to restrict stream flow or cause dis-equilibrium during use of this Certification. [15A NCAC 02H .0506(b)(2) and (c)(2)]

17. Any rip-rap required for proper culvert placement, stream stabilization, or restoration of temporarily disturbed areas shall be restricted to the area directly impacted by the approved construction activity. All rip-rap shall be placed such that the original stream elevation and streambank contours are restored and maintained. Placement of rip-rap or other approved materials shall not result in de-stabilization of the stream bed or banks upstream or downstream of the area or in a manner that precludes aquatic life passage. [15A NCAC 02H .0506(b)(2)]

18. Any rip-rap used for stream or shoreline stabilization shall be of a size and density to prevent movement by wave, current action, or stream flows and shall consist of clean rock or masonry material free of debris or toxic pollutants. Rip-rap shall not be installed in the streambed except in specific areas required for velocity control and to ensure structural integrity of bank stabilization measures. [15A NCAC 02H .0506(b)(2)]

19. Applications for rip-rap groins proposed in accordance with 15A NCAC 07H .1401 (NC Division of Coastal Management General Permit for construction of Wooden and Rip-rap Groins in Estuarine and Public Trust Waters) shall meet all the specific conditions for design and construction specified in 15A NCAC 07H .1405.

20. All mechanized equipment operated near surface waters shall be inspected and maintained regularly to prevent contamination of stream waters from fuels, lubricants, hydraulic fluids, or other toxic materials. Construction shall be staged in order to minimize the exposure of equipment to surface waters to the maximum extent practicable. Fueling, lubrication and general equipment maintenance shall be performed in a manner to prevent, to the maximum extent practicable, contamination of surface waters by fuels and oils. [15A NCAC 02H .0506(b)(3) and (c)(3) and 15A NCAC 02B .0211 (12)]

21. Heavy equipment working in wetlands shall be placed on mats or other measures shall be taken to minimize soil disturbance. [15A NCAC 02H .0506(b)(3) and (c)(3)]

22. In accordance with 143-215.85(b), the applicant shall report any petroleum spill of 25 gallons or more; any spill regardless of amount that causes a sheen on surface waters; any petroleum spill regardless of amount occurring within 100 feet of surface waters; and any petroleum spill less than 25 gallons that cannot be cleaned up within 24 hours.

23. If an environmental document is required under the State Environmental Policy Act (SEPA), then this General Certification is not valid until a Finding of No Significant Impact (FONSI) or Record of Decision (ROD) is issued by the State Clearinghouse. If an environmental document is required under the National Environmental Policy Act (NEPA), then this General Certification is not valid until a Categorical Exclusion, the Final Environmental Assessment, or Final Environmental Impact Statement is published by the lead agency. [15A NCAC 01C .0107(a)]

24. This General Certification does not relieve the applicant of the responsibility to obtain all other required Federal, State, or Local approvals before proceeding with the project, including those required by, but not limited to, Sediment and Erosion Control, Non-Discharge, Water Supply Watershed, and Trout Buffer regulations.

25. The applicant and their authorized agents shall conduct all activities in a manner consistent with State water quality standards (including any requirements resulting from compliance with §303(d) of the Clean Water Act), and any other appropriate requirements of State and Federal Law. If DWR determines that such standards or laws are not being met, including failure to sustain a designated or achieved use, or that State or Federal law is being violated, or that further conditions are necessary to assure compliance, then DWR may revoke or modify a written authorization associated with this General Water Quality Certification. [15A NCAC 02H .0507(d)]

26. The permittee shall require its contractors and/or agents to comply with the terms and conditions of this permit in the construction and maintenance of this project, and shall provide each of its contractors and/or agents associated with the construction or maintenance of this project with a copy of this Certification. A copy of this Certification, including all conditions shall be available at the project site during the construction and maintenance of this project. [15A NCAC 02H .0507 (c) and 15A NCAC 02H .0506 (b)(2) and (c)(2)]

27. When written authorization is required for use of this Certification, upon completion of all permitted impacts included within the approval and any subsequent modifications, the applicant shall be required to return a certificate of completion (available on the DWR website: https://edocs.deq.nc.gov/Forms/Certificate-of-Completion). [15A NCAC 02H .0502(f)]

28. Additional site-specific conditions, including monitoring and/or modeling requirements, may be added to the written approval letter for projects proposed under this Water Quality Certification in order to ensure compliance with all applicable water quality and effluent standards. [15A NCAC 02H .0507(c)]

29. If the property or project is sold or transferred, the new permittee shall be given a copy of this Certification (and written authorization if applicable) and is responsible for complying with all conditions. [15A NCAC 02H .0501 and .0502]

III. GENERAL CERTIFICATION ADMINISTRATION:

1. In accordance with North Carolina General Statute 143-215.3D(e), written approval for a 401 Water Quality General Certification must include the appropriate fee. An applicant for a CAMA permit under Article 7 of Chapter 113A of the General Statutes for which a Water Quality Certification is required shall only make one payment to satisfy both agencies; the fee shall be as established by the Secretary in accordance with 143-215.3D(e)(7).

2. This Certification neither grants nor affirms any property right, license, or privilege in any waters, or any right of use in any waters. This Certification does not authorize any person to interfere with the riparian rights, littoral rights, or water use rights of any other person and this Certification does not create any prescriptive right or any right of priority regarding any usage of water. This Certification shall not be interposed as a defense in any action respecting the determination of riparian or littoral rights or other rights to water use. No consumptive user is deemed by virtue of this Certification to possess any prescriptive or other right of priority with respect to any other consumptive user regardless of the quantity of the withdrawal or the date on which the withdrawal was initiated or expanded.

3. This Certification grants permission to the Director, an authorized representative of the Director, or DWR staff, upon the presentation of proper credentials, to enter the property during normal business hours. [15A NCAC 02H .0502(e)]

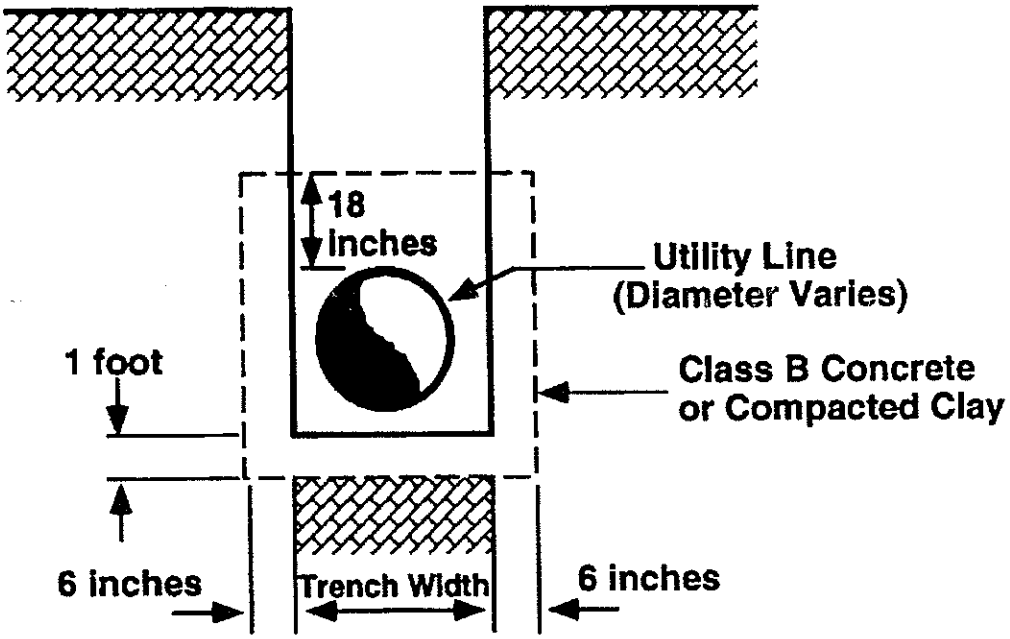
4. This General Certification shall expire on the same day as the expiration date of the corresponding Nationwide Permit and/or Regional General Permit. The conditions in effect on the date of issuance of Certification for a specific project shall remain in effect for the life of the project, regardless of the expiration date of this Certification. This General Certification is rescinded when the US Army Corps of Engineers reauthorizes any of the corresponding Nationwide Permits and/or Regional General Permits or when deemed appropriate by the Director of the Division of Water Resources.

5. Non-compliance with or violation of the conditions herein set forth by a specific project may result in revocation of this General Certification for the project and may also result in criminal and/or civil penalties.

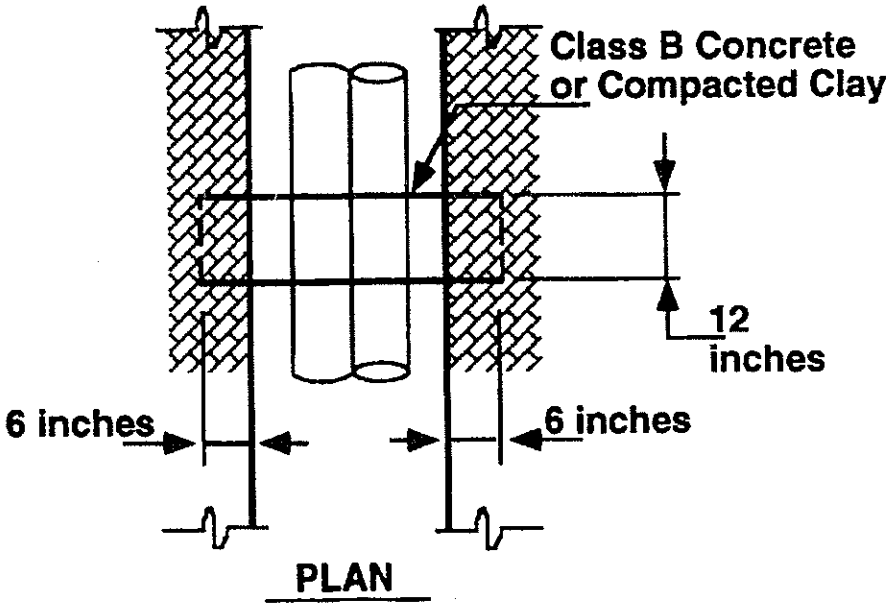
6. The Director of the North Carolina Division of Water Resources may require submission of a formal application for Individual Certification for any project in this category of activity if it is deemed in the public's best interest or determined that the project is likely to have a significant adverse effect upon water quality, including state or federally listed endangered or threatened aquatic species, or degrade the waters so that existing uses of the water or downstream waters are precluded.

History Note: Water Quality Certification (WQC) Number 4133 issued December 1, 2017 replaces WQC 4086 issued March 3, 2017; WQC 3884 issued March 19, 2012; WQC Number 3819 issued March 19, 2010; WQC Number 3699 issued November 1, 2007; WQC Number 3625 issued March 19, 2007; WQC Number 3374 issued March 18, 2002; WQC Number 3288 issued June 1, 2000; WQC Number 3101 issued February 11, 1997; WQC Number 3022 issued September 6, 1995, WQC Number 2664 issued January 21, 1992.

ANTI -SEEP COLLAR



SECTION



PLAN

Appendix I
Duke Energy Guideline

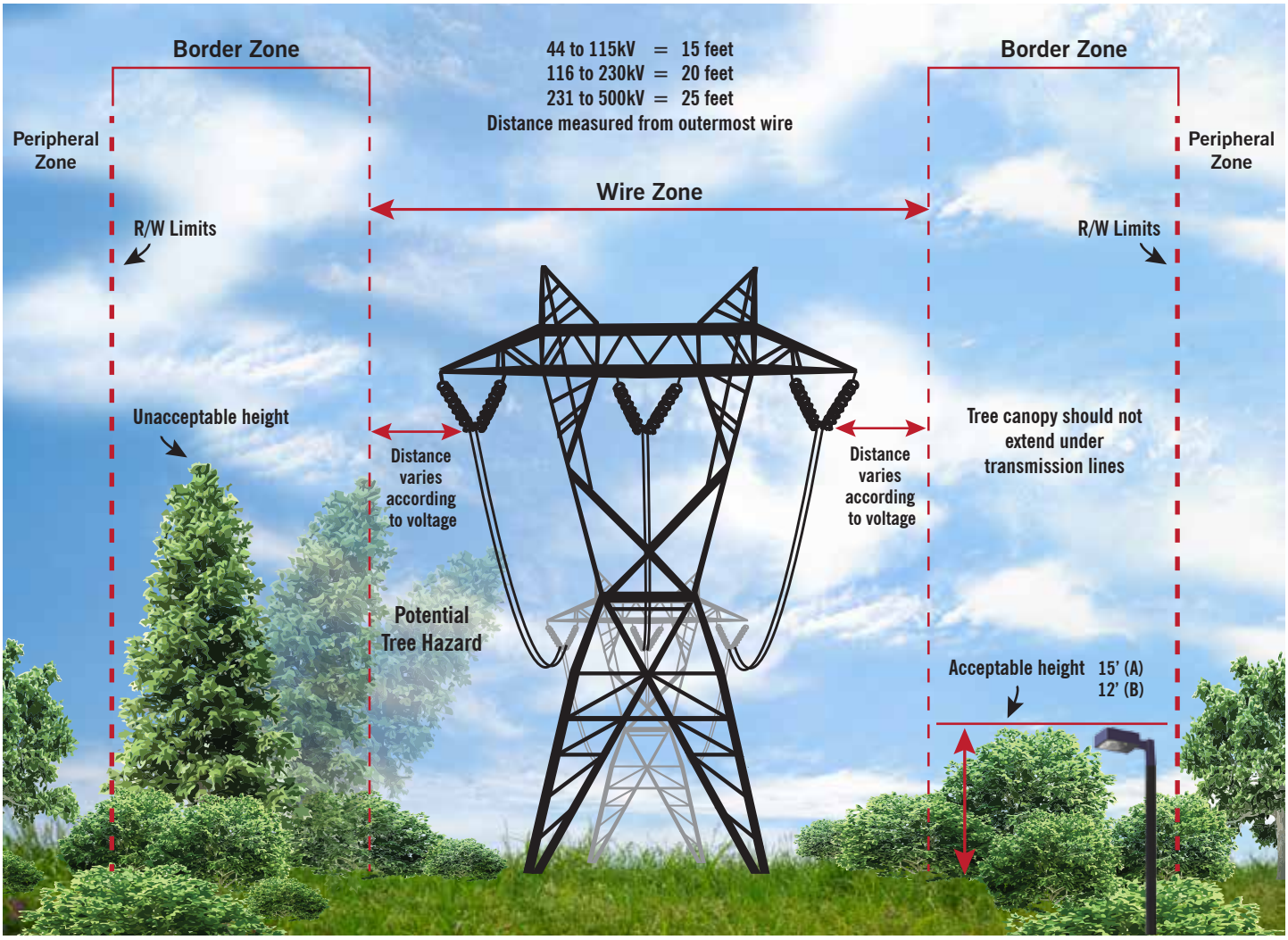
DUKE ENERGY ELECTRIC TRANSMISSION RIGHT-OF-WAY GUIDELINES/RESTRICTIONS
VALID FOR NORTH CAROLINA AND SOUTH CAROLINA
(Revised 11/20/2014)

This list of right-of-way restrictions has been developed to answer the most frequently asked questions about property owner use of Duke Energy's electric transmission rights of way. This list does not cover all restrictions or all possible situations. You should contact the Asset Protection right-of-way specialist if you have additional concerns about the rights of way. This list of restrictions is subject to change at any time and without notice. Duke Energy reserves all rights conveyed to it by the right-of-way agreement applicable to the subject property. All activity within the rights of way shall be reviewed by an Asset Protection right-of-way specialist to obtain prior written approval. Engineering plans may be required. Compliance with the Duke Energy Right-of-Way Guidelines/Restrictions or approval of any plans by Duke Energy does not mean that the requirements of any local, county, state or federal government or other applicable agency with governing authority have been satisfied.

1. **Structures, buildings, manufactured/mobile homes, satellite systems, swimming pools (any associated equipment and decking), graves, billboards, dumpsters, signs, wells, deer stands, retaining walls, septic systems or tanks (whether above or below ground), debris of any type, flammable material, building material, wrecked or disabled vehicles and all other objects (whether above or below ground) which in Duke Energy's opinion interfere with the electric transmission right of way are not allowed within the right-of-way limits. Transformers, telephone/cable pedestals (and associated equipment) and fire hydrants are not allowed. Manholes, water valves, water meters, backflow preventers and irrigation heads are not permitted. Attachments to Duke Energy structures are prohibited.**
2. **Fences and gates shall not exceed 10 feet in height and shall be installed greater than 25 feet from poles, towers and guy anchors. Fences shall not parallel the centerline within the rights of way but may cross from one side to the other at any angle not less than 30 degrees with the centerline. If a fence crosses the right of way, a gate (16 feet wide at each crossing) shall be installed by the property owner, per Duke Energy's specifications. The property owner is required to install a Duke Energy lock on the gate to ensure access. Duke Energy will supply a lock.**
3. **Grading (cuts or fill) shall be no closer than 25 feet from poles, towers, guys and anchors (except for parking areas; see paragraph 7) and the slope shall not exceed 4:1. Grading or filling near Duke Energy facilities which will prevent free equipment access or create ground-to-conductor clearance violations will not be permitted. Storage or stockpiling of dirt or any other material is prohibited. Sedimentation control, including re-vegetation, is required per state regulations.**
4. **Streets, roads, driveways, sewer/water lines, other utility lines or any underground facilities shall not parallel the centerline within the right of way but may cross, from one side to the other, at any angle not less than 30 degrees with the centerline. No portion of such facility or corresponding easement shall be located within 25 feet of Duke Energy's facilities. Roundabouts, cul-de-sacs and intersections (such as roads, driveways and alleyways) are not permitted.**
5. **Any drainage feature that allows water to pond, causes erosion, directs stormwater toward the right of way or limits access to or around Duke Energy facilities is prohibited.**
6. **Contact Duke Energy prior to the construction of lakes, ponds, retention or detention facilities, etc.**
7. **Parking may be permitted within the right of way, provided that:**
   a. **Prior to grading, concrete barriers shall be installed at a minimum of 9 feet from the Duke Energy facilities. During construction, grading shall be no closer than 10 feet to any Duke Energy facility.**
   b. **After grading/paving activity is complete, a Duke Energy-approved barrier sufficient to withstand a 15-mph vehicular impact shall be erected 9 feet from any Duke Energy facility.**
   c. **Any access areas, entrances or exits shall cross (from one side to the other) the right of way at any angle not less than 30 degrees with the centerline and shall not pass within 25 feet of any structure. Parking lot entrances/exits cannot create an intersection within the right of way.**
   d. **Lighting within the right-of-way limits must be approved by Duke Energy before installing. Due to engineering design standards, lighting <u>is not</u> allowed in the "Wire Zone." Where lighting is approved ("Border Zone"), the total height may not exceed 15 feet in Area A and 12 feet in Area B. See map on back of this page for Areas. Contact your Asset Protection right-of-way specialist as the "Wire Zone" varies for the different voltage lines.**
8. **Duke Energy will not object to certain vegetation plantings as long as:**
   a. **They do not interfere with the access to or the safe, reliable operation and maintenance of Duke Energy facilities.**
   b. **With prior written approval, Duke Energy does not object to low-growing shrubs and grasses within the "Wire Zone." Tree species <u>are not</u> allowed within the "Wire Zone." Trees that are approved in the "Border Zone" may not exceed, at maturity, 15 feet in Area A and 12 feet in Area B. See map on back of page for areas. Contact the Asset Protection right-of-way specialist for "Wire Zone"/"Border Zone" definitions.**
   c. **For compliant mature height species, refer to <u>plants.ces.ncsu.edu/</u> for reference.**
   d. **Engineering drawings must indicate the <u>outermost</u> conductor.**
   e. **Vegetation that is not in compliance is subject to removal without notice.**
   f. **Duke Energy may exercise the right to cut "danger trees" outside the right-of-way limits as required to properly maintain and operate the transmission line.**

We hope this is useful information. If you have additional questions or plan any activity not mentioned above, please contact the Asset Protection right-of-way specialist for your area (see map).

Transmission Right-of-way Zones - Carolinas



Wire Zone: Extends beyond the outermost conductor on both sides. (See diagram above.)

Permitted within the Wire Zone: Low-growing plants, shrubs and grasses.
Not permitted within the Wire Zone: Tree species of any kind.

Border Zone: Extends from the edge of the Wire Zone to the outside edge of the Right of Way.

Permitted within the Border Zone: Lighting structures and plantings within the Right of Way that do not exceed a vertical height of 15 feet in Area A and 12 feet in Area B. (See Asset Protection Map for location of geographic areas) For compliant mature height species, refer to **plants/ces.ncsu.edu/**.

Not permitted within the Border Zone: Any object that exceeds vertical height restrictions. These restrictions are based on flat ground elevations. If the ground elevations differ, no object at any time may exceed the outermost conductor's ground elevation.

Peripheral Zone: Outside the Right of Way and adjacent to Border Zones.

Permitted within the Peripheral Zone: Trees may be planted in the Peripheral Zone. Duke Energy recommends customers exercise caution selecting and planning trees in this zone.
Not permitted in the Peripheral Zone: Trees with canopies are subject to routine trimming and possible removal.

In all zones:

When an outage risk is identified, Duke Energy will attempt to notify the affected customer. However, the company may need to take immediate action if trees cannot be pruned to appropriate levels. This may include trees and shrubs that are within 20 feet of the power line at the maximum peak load or during weather conditions that create line sag and sway.

Written approvals by Duke Energy are required for all plans.

We hope this is useful information. If you have additional questions on line voltages or plan any activity not mentioned above, please contact the Asset Protection Specialist for your area. (See Map)

*Right of Way is intended to reference the easement rights granted to Duke Energy. Actual zone size may vary based upon the particular Right of Way.

Duke Energy North Carolina and South Carolina Transmission Asset Protection Zones

Area A and Area B have different right-of-way restrictions related to tree and light heights. Please refer to the attached Right-of-Way Restrictions Guide for more information.

Asset Protection Right-of-Way Specialist Zones

- Zone 1 – Craig Garrett 828.258.5018
- Zone 2 – Steven Pryor 864.948.5610
- Zone 3 – Stephen Lord 704.812.2316
- Zone 4 – Ervin Summers 336.634.4633
- Zone 5 – Robbie James 910.944.5363
- Zone 6 – Robbie James 910.944.5363
- Zone 7 – Bruce Pait 919.329.5928
- Zone 8 – Bill Wilder 910.772.4903

Legend – updated 5/13/16

DUKE ENERGY®

Appendix J
Subsurface Utility Engineering Test Hole Reports

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 1

Tip # _____ Proposed _____ Date 8-7-18

Project Description _____

Owner _____ Type _____ Size & Material _____

Condition _____ Paving Thickness _____ Found 12 3/4 OD DI

BM#1 _____ Location _____

BM#2 _____ Location _____

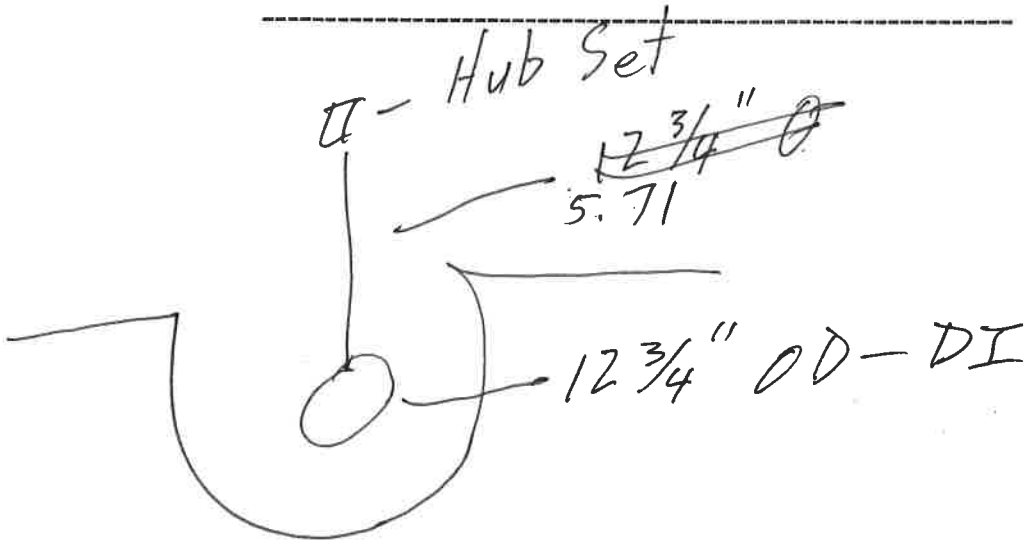
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 5.71 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Lock 1 Rd.

- _____ (RR)

_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 2
Tip # _____ Proposed _____ Date 8-7-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 2½" OD White PVC

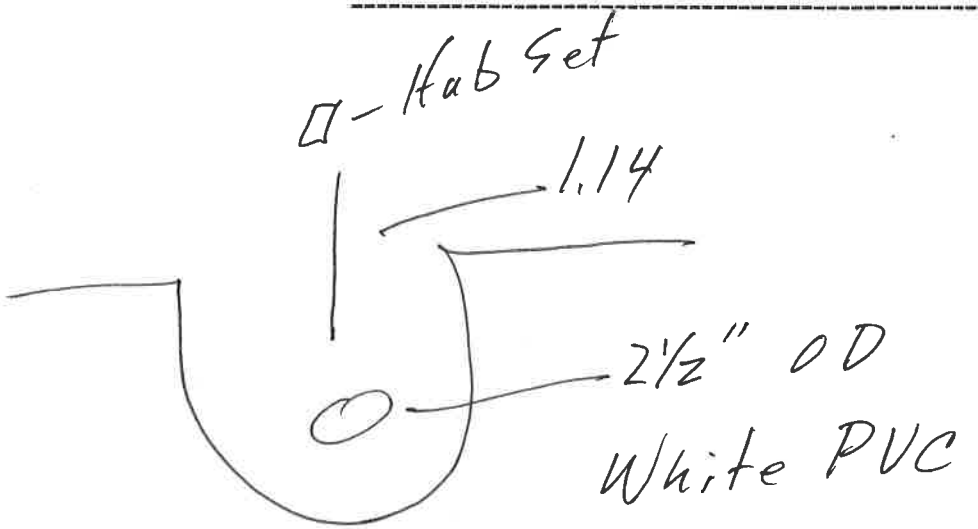
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK (Hub) Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 1.14 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Locks 1 Rd
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 3
Tip # _____ Proposed _____ Date 8-7-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 2½" OD White PVC

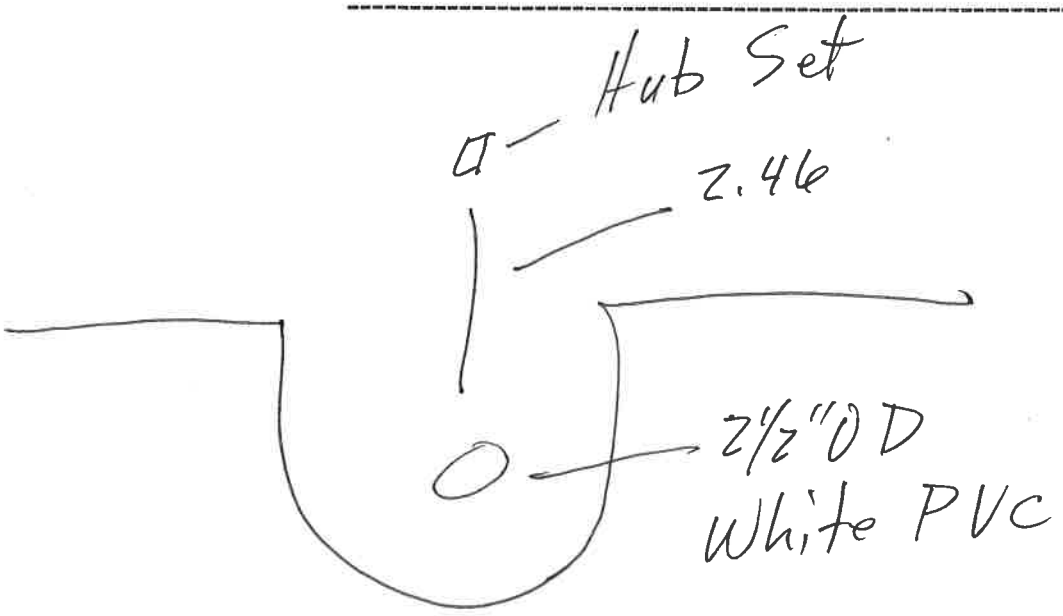
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-2.46 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Lock's 1 Rd.
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 4
Tip # _____ Proposed _____ Date _____
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 6½" OD Blue PVC

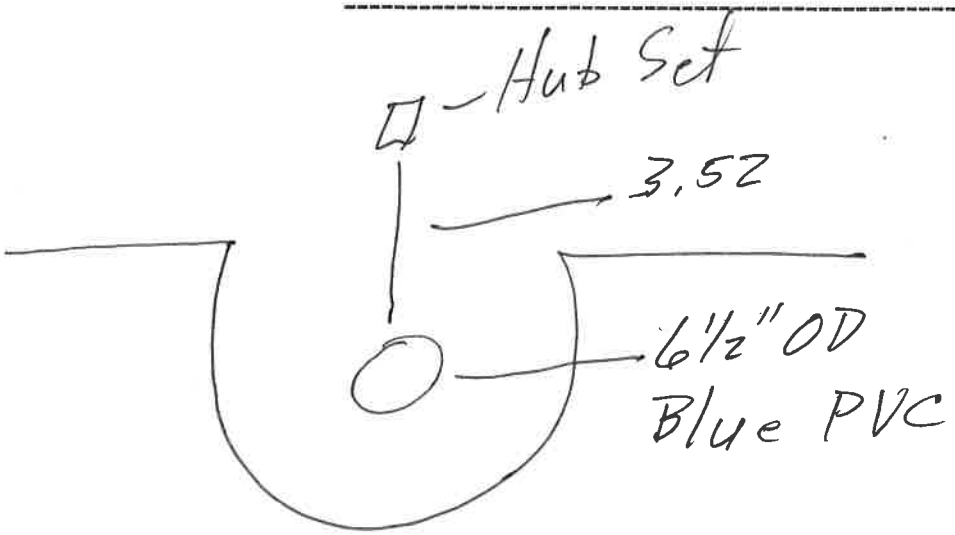
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-3.52 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



Hole as close as we could get it.
Due to ruts from loggers. Hwy 11

HI check _____ Location _____
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM&CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 5

Tip # _____ Proposed _____ Date 6-9-18

Project Description _____

Owner _____ Type _____ Size & Material _____

Condition _____ Paving Thickness _____ Found _____

BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI _____	HI _____	HI _____	HI _____
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = _____	_____ Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK Hub Chis "x"

Top #1	Top #2	Top #3
SM _____	SM _____	SM _____
- _____ (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.

---

4 Hub Set

Cleared to 10'.

Nothing

Comments on back

HI check _____ Location Clearwell Rd.

- _____ (RR)

_____ Elev

Crew members James & Zach

Could not locate with ~~Shor~~ Sure-Lock or GPR.
Come off valve. Hit water at 4'. Probed to 10'.
Spent 5.5 Hours on 8-8-18. Went back on 8-9-18
and probed beside valve. Hit gravel at 13'.
Could not get thru gravel.

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 6

Tip # _____ Proposed _____ Date 8-8-18

Project Description _____

Owner _____ Type _____ Size & Material _____

Condition _____ Paving Thickness _____ Found 37" OD - DI Pipe

BM#1 _____ Location _____

BM#2 _____ Location _____

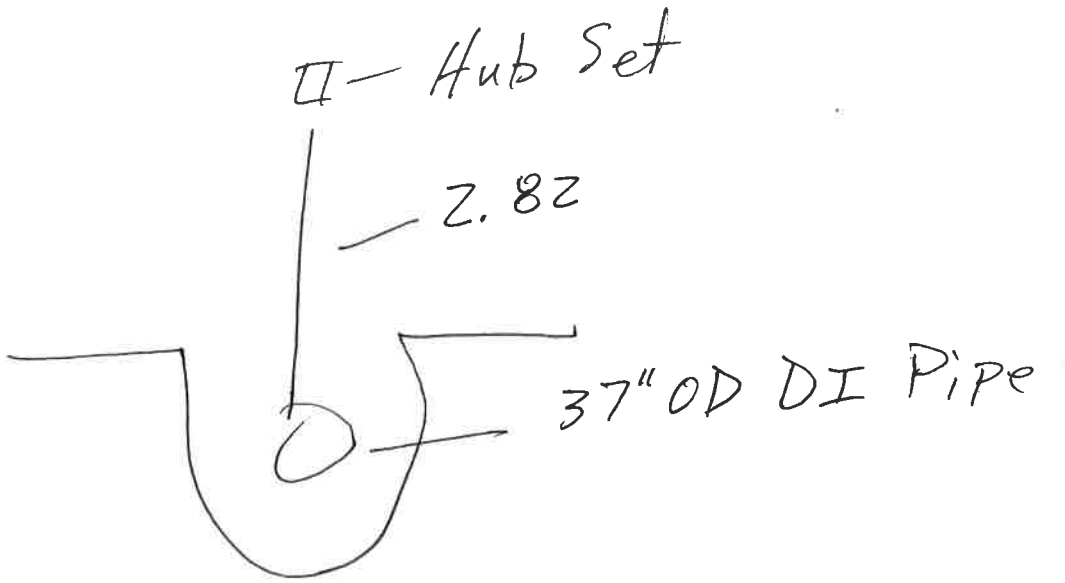
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 2.82 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Clearwell Rd.

- _____ (RR)

_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 7
Tip # _____ Proposed _____ Date 8-8-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 16½" OD Coated Steel

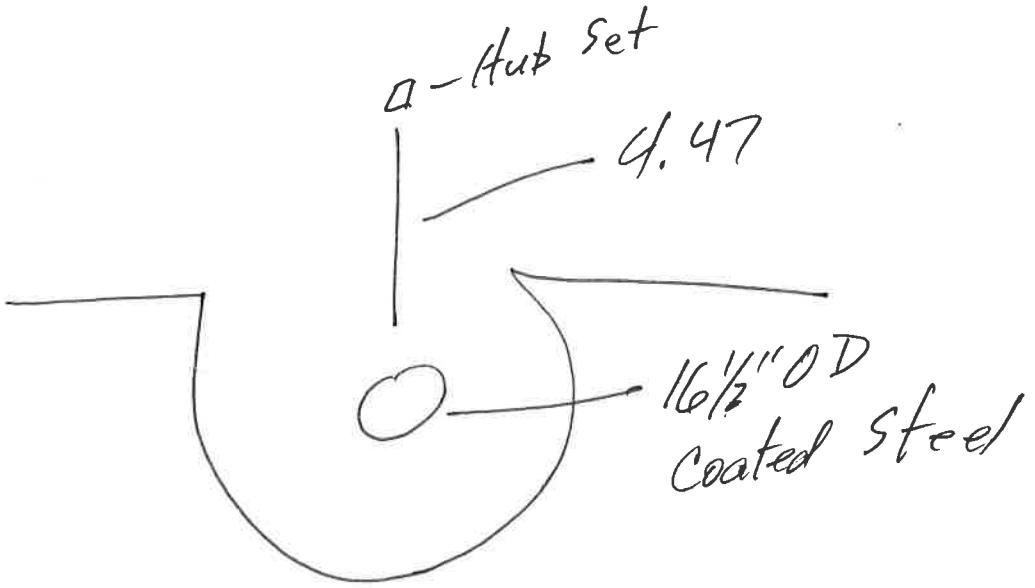
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-4.47 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Mt. Missery Rd.
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 8
Tip # _____ Proposed _____ Date 8-8-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 16½" OD Coated Steel

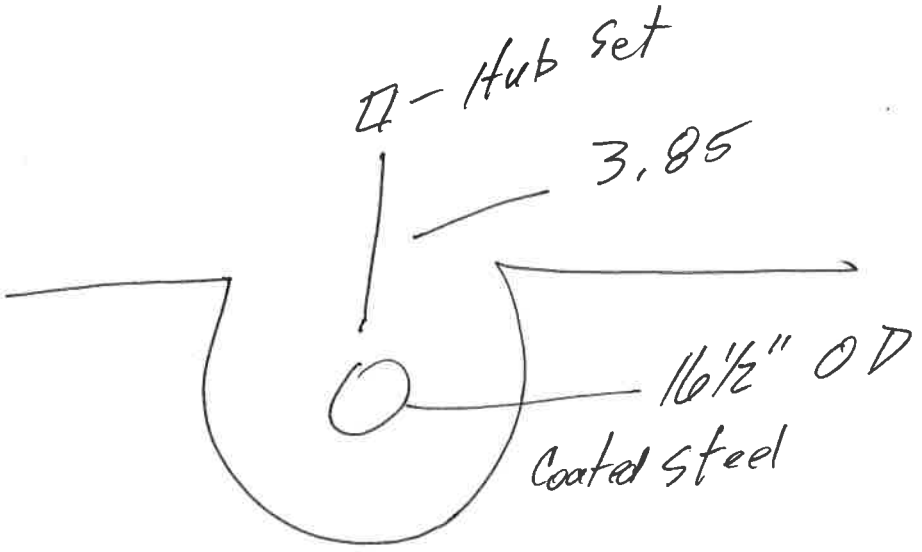
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-3.85 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Mt. Misery Rd.
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 9
Tip # _____ Proposed _____ Date 8-8-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 16½" OD Coated Steel

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 2.91 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.

---

4 - Hub Set
2.91
16½" OD
Coated Steel

HI check _____ Location Mt. Misery Rd
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 10
Tip # _____ Proposed _____ Date 8-8-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 16½" OD Coated Steel

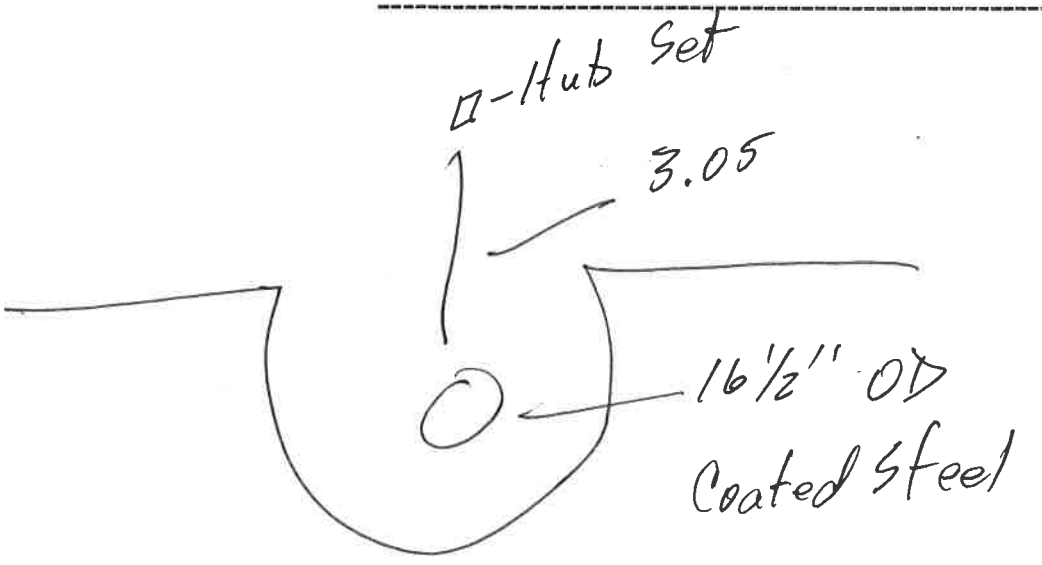
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 3.05 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Mt. Missery Rd.
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

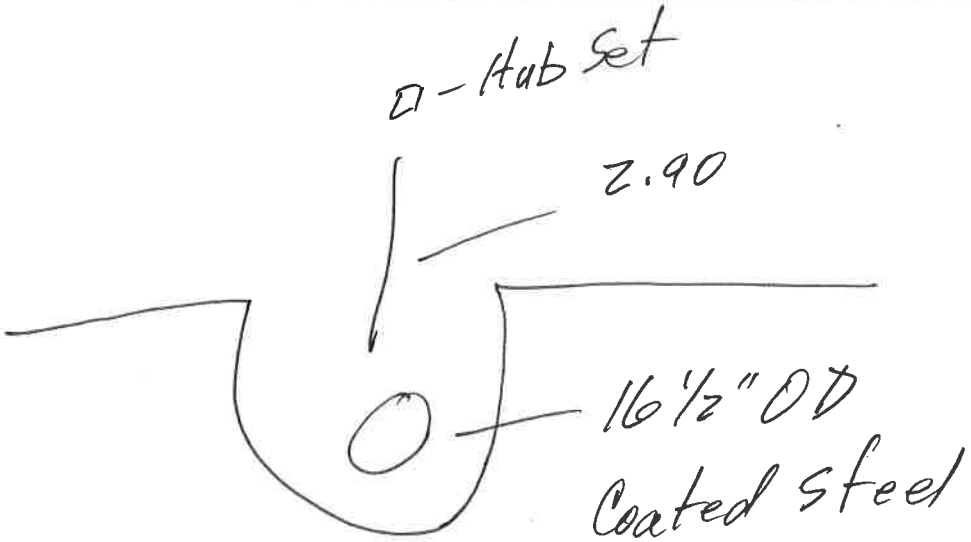
Client CFPUA Project # 05367-0038 TH# 11
Tip # _____ Proposed _____ Date 8-8-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 16½" OD Coated Steel

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	- 2.90 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Mt. Misery Rd.
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 12
Tip # _____ Proposed _____ Date 8-8-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 48" PCCP

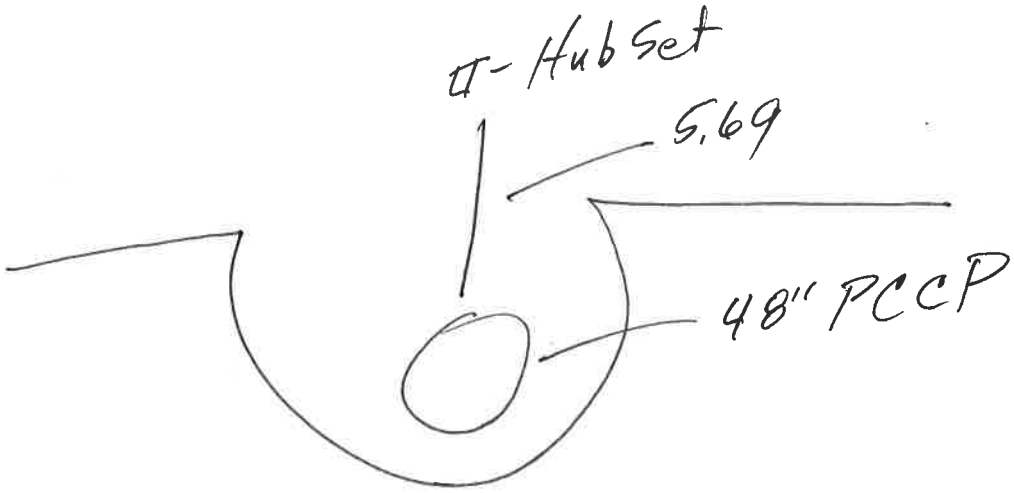
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 5.69 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Mt. Misery Rd.
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 13
Tip # _____ Proposed _____ Date 8-8-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 1¼" Steel Gas Line

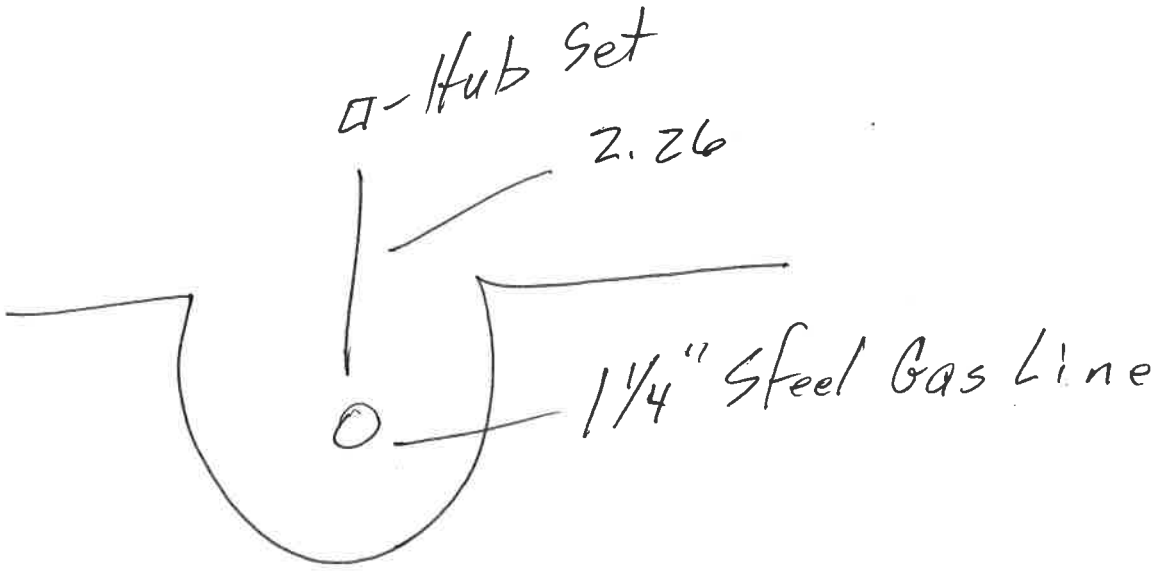
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	-2.26 (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- _____ (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Mt. Misery Rd.
- _____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 14
Tip # _____ Proposed _____ Date 8-7-18
Project Description _____
Owner _____ Type _____ Size & Material _____
Condition _____ Paving Thickness _____ Found 42" PCCP Waterline

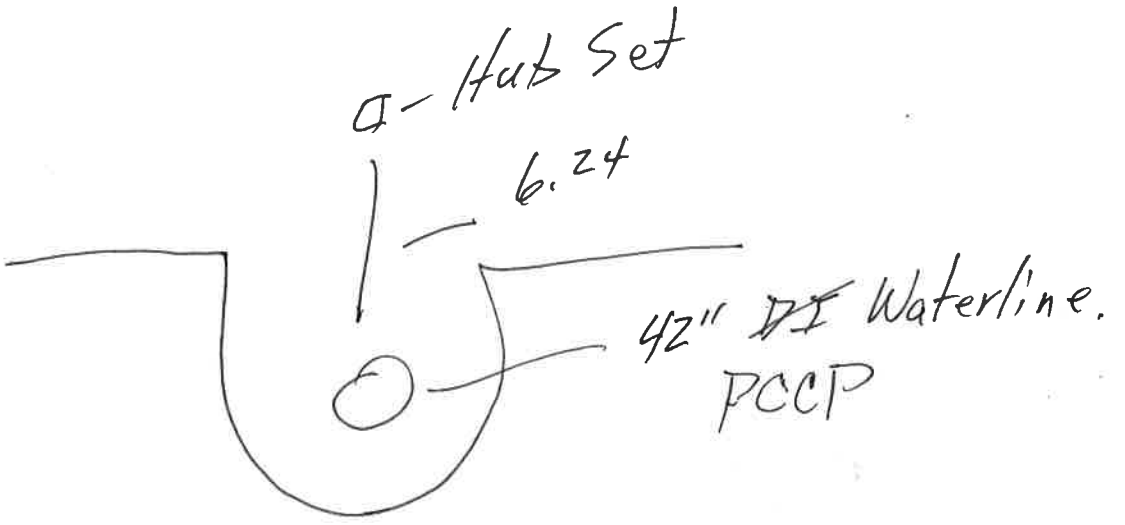
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-6.24 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Surge Tank
-_____ (RR)
_____ Elev

Crew members James & Zach

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 15
Tip # _____ Proposed _____ Date 8/15/18
Project Description _____
Owner _____ Type _____ Size & Material 42" PCCP
Condition _____ Paving Thickness – Found RW - Raw Water

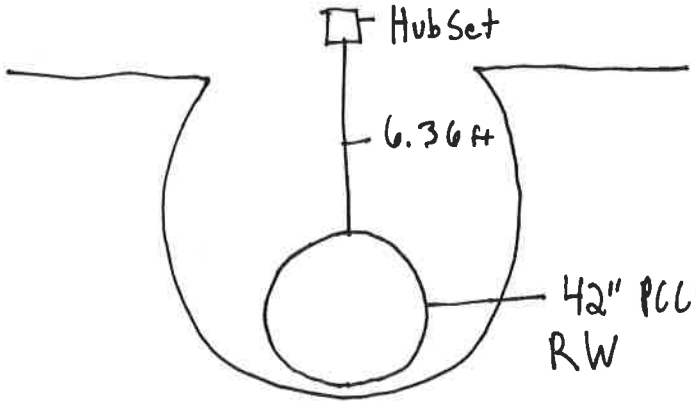
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK (Hub) Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 6.36' (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



- measurement on top of 90° Elbow

HI check 6.36 Location Lock 1 Pump Station
- _____ (RR)
_____ Elev
Crew members YU, JW, ZG

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# 16
Tip # _____ Proposed _____ Date 8/16/18
Project Description _____
Owner _____ Type _____ Size & Material 42" PCCP
Condition _____ Paving Thickness – Found RW - Raw Water

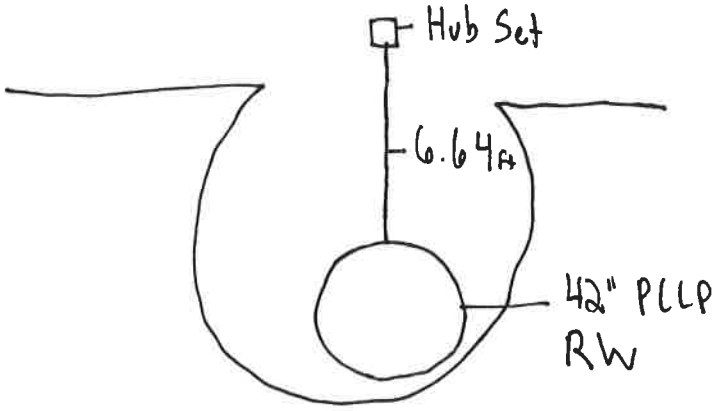
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK (Hub) Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 6.64' (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check 6.64 Location Lock 1 Pump station
- _____ (RR)
_____ Elev
Crew members YV, JW, ZG

McKIM & CREED
1730 Varsity Drive, Suite 500
Raleigh, NC 27606
Phone: 919.233.8091 Fax: 919.233.8031

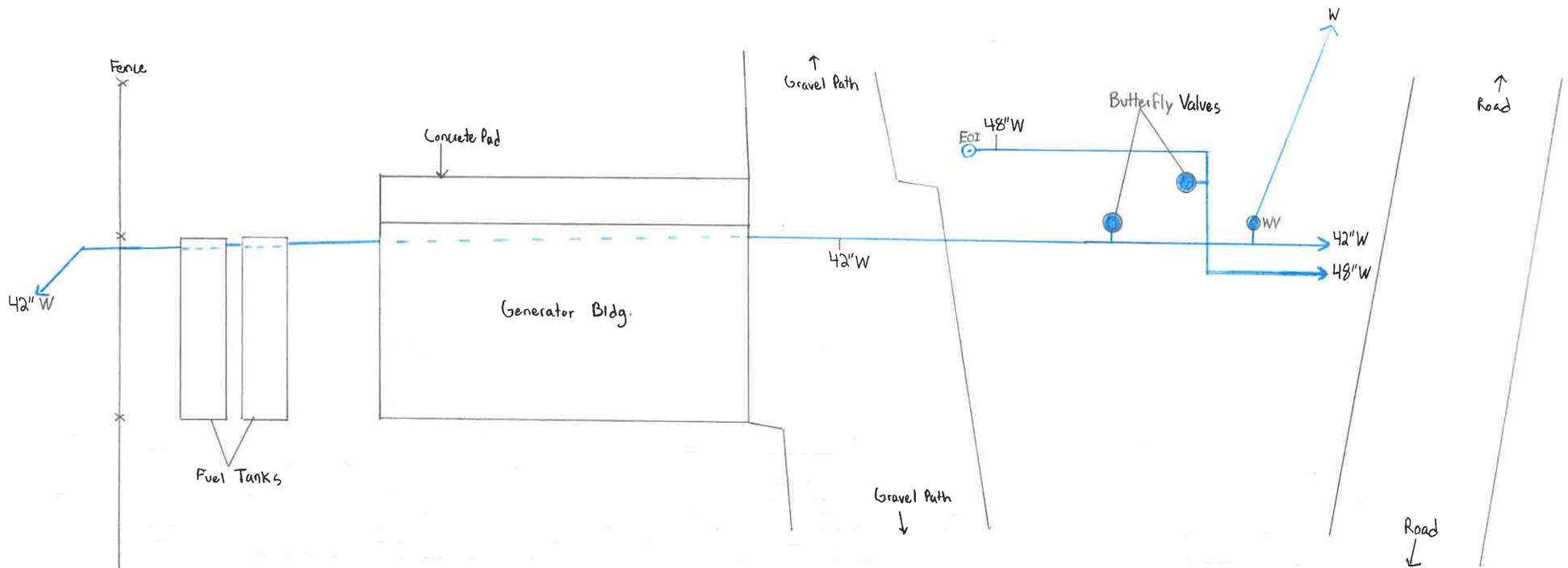
FIELD SKETCH

PROJECT NUMBER: 05367-0038
PROJECT TITLE: Raw Water
CLIENT: CFPUA

DESIGNATED: James Warren
SKETCHED: Zach Gillentine
SURVEYED: -

DIRECTION: N
SHEET: 1/1

DATE: 08/16/18
DATE: -
DATE: -



Legend

Pipe sizes per Record
EOI- End of Information
W- Water
WV- Water Valve

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# SUE 30-1
Tip # _____ Proposed _____ Date 6-12-18
Project Description _____
Owner _____ Type _____ Size & Material 30" STEEL
Condition _____ Paving Thickness _____ Found 30" STEEL

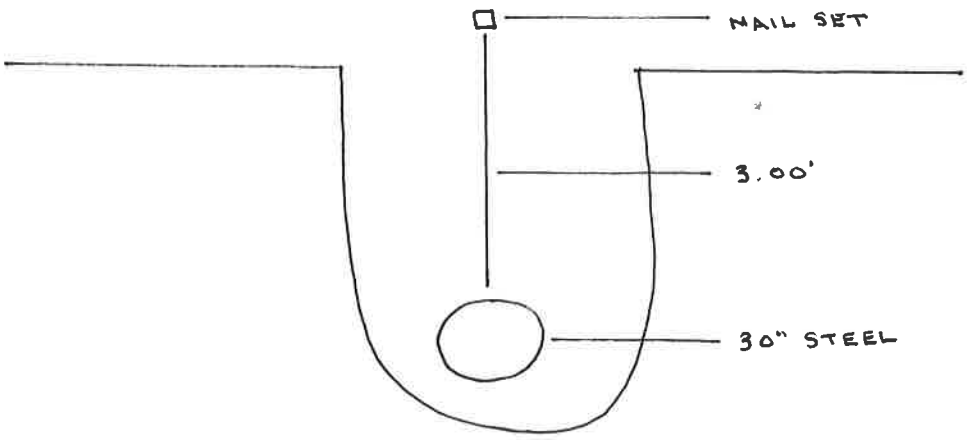
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI _____	HI _____	HI _____	HI _____
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = _____	_____ Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark NAIL
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM _____	SM _____	SM _____
- 3.00 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location _____
- _____ (RR)
_____ Elev

Crew members J.W., M.T., A.P.

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# SUE 30-2
Tip # _____ Proposed _____ Date 6-11-18
Project Description _____
Owner _____ Type _____ Size & Material 30" STEEL
Condition _____ Paving Thickness _____ Found 30" STEEL

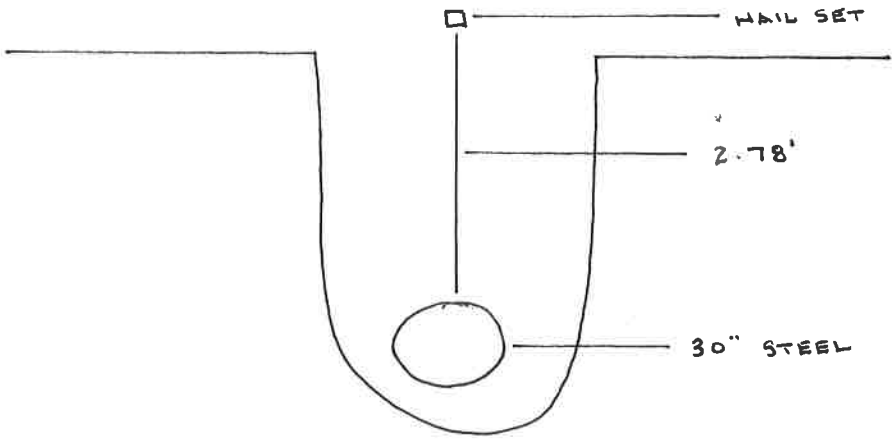
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI _____	HI _____	HI _____	HI _____
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = _____	_____ Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark NAIL
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM _____	SM _____	SM _____
- 2.78 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location _____
- _____ (RR)
_____ Elev

Crew members J.W., M.T., A.P.

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# SUE 30-3
Tip # _____ Proposed _____ Date 6-11-18
Project Description _____
Owner _____ Type _____ Size & Material 30" STEEL
Condition _____ Paving Thickness _____ Found 30" STEEL

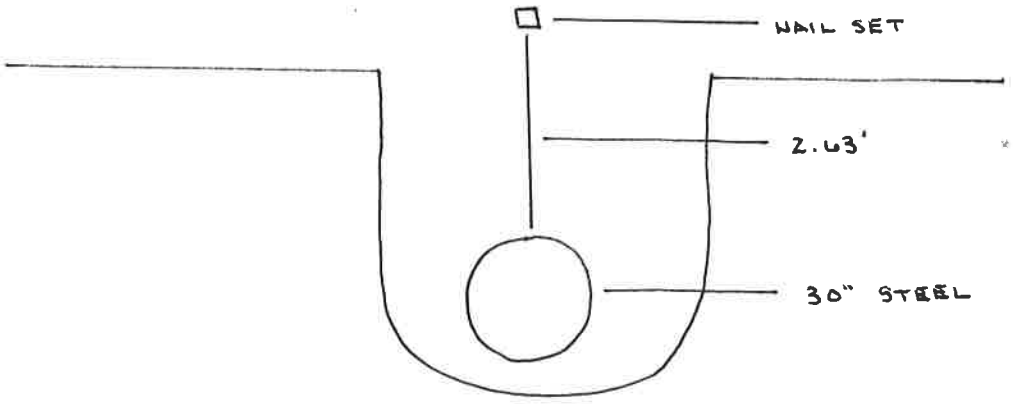
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI _____	HI _____	HI _____	HI _____
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = _____	_____ Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark NAIL
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM _____	SM _____	SM _____
- 2.63 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location _____
- _____ (RR)
_____ Elev

Crew members J.W., M.T., A.P.

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# SUE 30-4
Tip # _____ Proposed _____ Date 6-11-18
Project Description _____
Owner _____ Type _____ Size & Material 30" STEEL
Condition _____ Paving Thickness _____ Found 30" STEEL

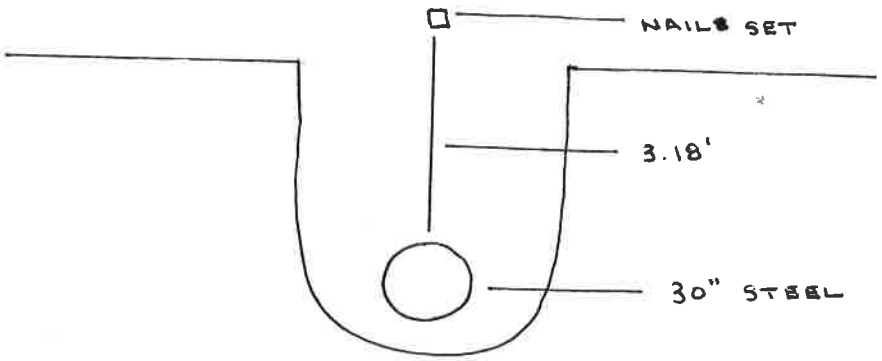
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI _____	HI _____	HI _____	HI _____
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = _____	_____ Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark NAIL
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM _____	SM _____	SM _____
- 3.18 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location _____
- _____ (RR)
_____ Elev

Crew members J.W., M.T., A.P.

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# SUE 30-5
Tip # _____ Proposed _____ Date 6-12-18
Project Description _____
Owner _____ Type _____ Size & Material 30" STEEL
Condition _____ Paving Thickness _____ Found 30" STEEL

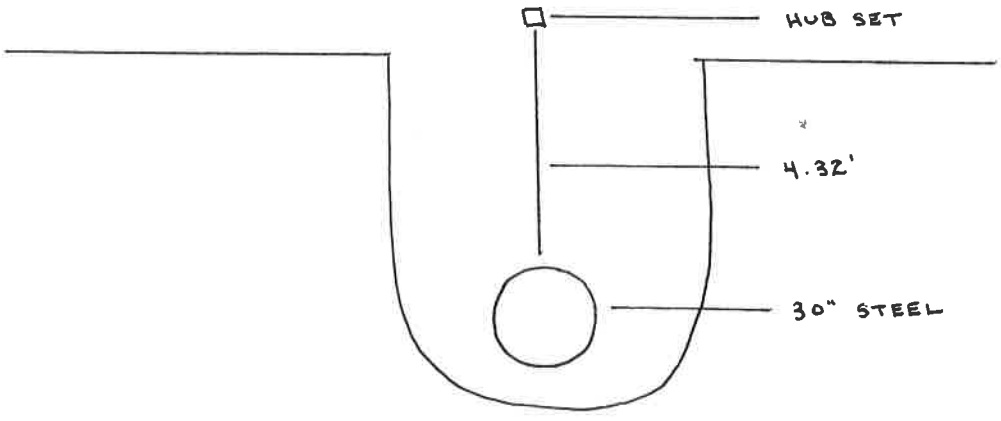
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI _____	HI _____	HI _____	HI _____
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = _____	_____ Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark ~~NAIL~~ _____
PK (Hub) Chis "x"

Top #1	Top #2	Top #3
SM _____	SM _____	SM _____
- 4.32 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location _____
- _____ (RR)
_____ Elev

Crew members J.W., M.T., A.P.

McKIM & CREED

Testhole Data Report

Client CFPUA Project # 05367-0038 TH# SUE 48-1
Tip # _____ Proposed _____ Date 6-12-18
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found 48" PCCP

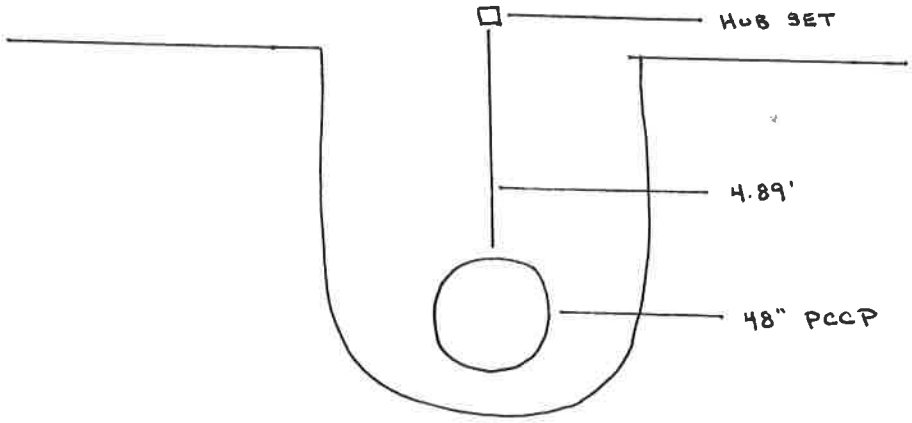
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI _____	HI _____	HI _____	HI _____
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = _____	_____ Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK (Hub) Chis "x"

Top #1	Top #2	Top #3
SM _____	SM _____	SM _____
- 4.89 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location _____
- _____ (RR)
_____ Elev

Crew members J.W., M.T., A.P.

McKIM&CREED

☐ MEMO
☐ TELEPHONE
☐ FIELD REPORT
☐ CONFERENCE

DATE: 8-17-2017 TIME:

AUTHOR: JON collins

PROJECT: CLIENT:

SUBJECT: LCFPUA Test holes PROJ. NO.

1 ✓ 7.55	14 ✓ 2.45	27 ✓ 4.01
2 ✓ 4.9	15 ✓ 2.47	28 ✓ 4.37
3 ✓ 6.53	16 ✓ 4.0	29 ✓ 4.67
4 ✓ 5.24	17 ✓ 4.75	30 ✓ 4.63
5 ✓ 5.25	18 ✓ 7.59	9A ✓ 2.0
6 ✓ 4.76	19 ✓ 4.51	See sketch on TH Report
7 ✓ 3.67	20 ✓ 5.55	11A ✓ 5.47
8 ✓ 5.42	21 ✓ 4.97	see sketch on TH Report for locations
9 ✓ 5.60	22 ✓ 5.67	Intl Paper contact: Kim Fail 910-512-0608
10 X No Access	23 ✓ 3.11	
11 ✓ 2.52	24 ✓ 7.13	Main Gate/security: 910-362-4602
12 ✓ 4.93	25 ✓ 6.03	
13 ✓ 3.50	26 ✓ 4.20	

ACTION

COPY:

McKIM & CREED

Testhole Data Report

Client _____ Project # 030790012 TH# 1

Tip # _____ Proposed _____ Date 8-15-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____

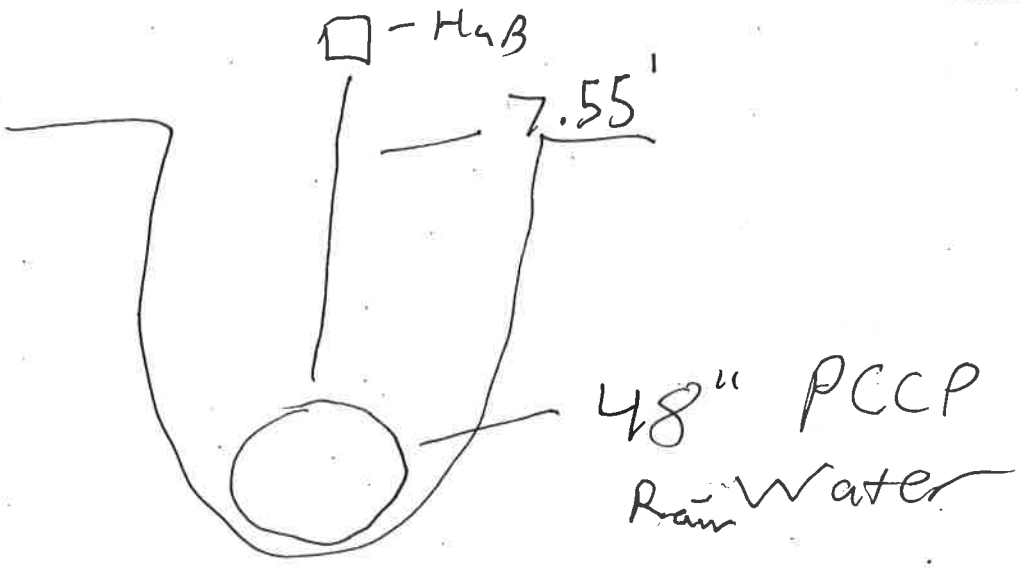
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK / Hub / Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-7.55 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Locks 1 RD, Brunswick County

-_____ (RR)

_____ Elev

Crew members JCNS

McKIM & CREED

Testhole Data Report

Client _____ Project # 030790012 TH# 2
Tip # _____ Proposed _____ Date 8-15-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

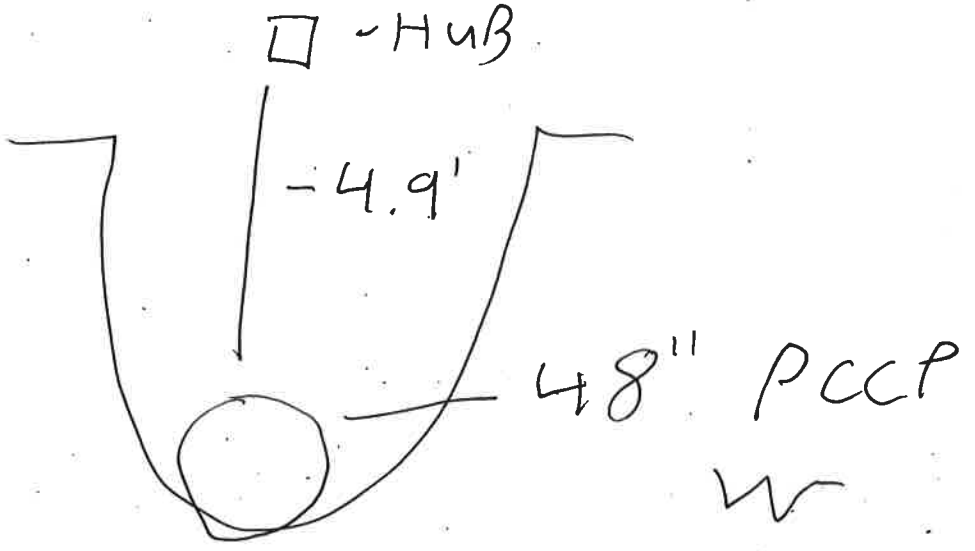
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-4.9 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.
- _____ (RR)
_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 030790012 TH# 3

Tip # _____ Proposed _____ Date 8-15-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____

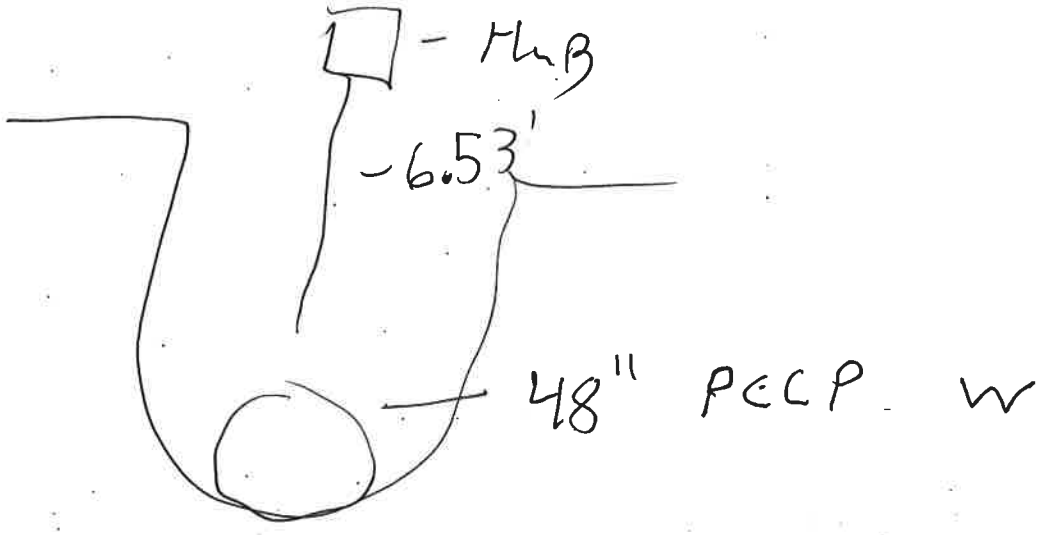
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-6.53' (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

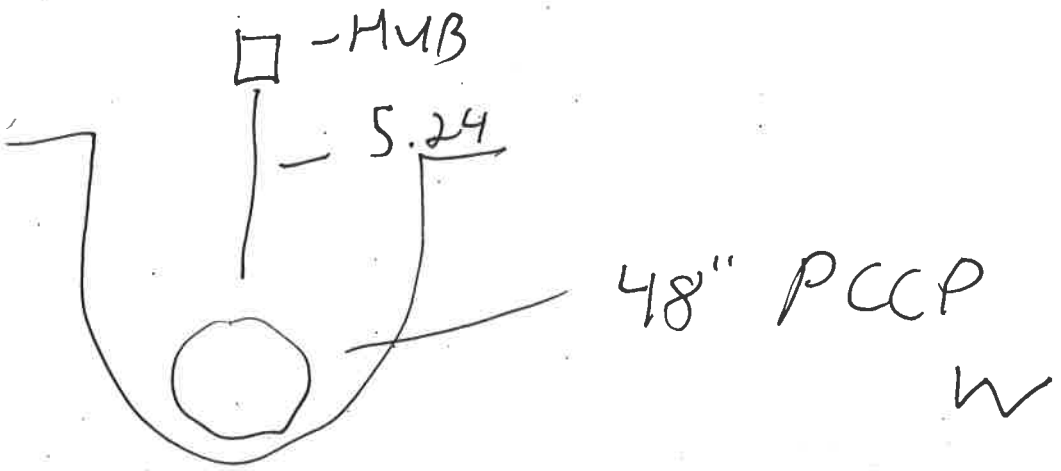
Client _____ Project # 03079 0012 TH# 4
Tip # _____ Proposed _____ Date 8-16-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK (Hub) Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-5.24 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location JCNS Brunswick Co.
- _____ (RR)
_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 5

Tip # _____ Proposed _____ Date 8-16-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____

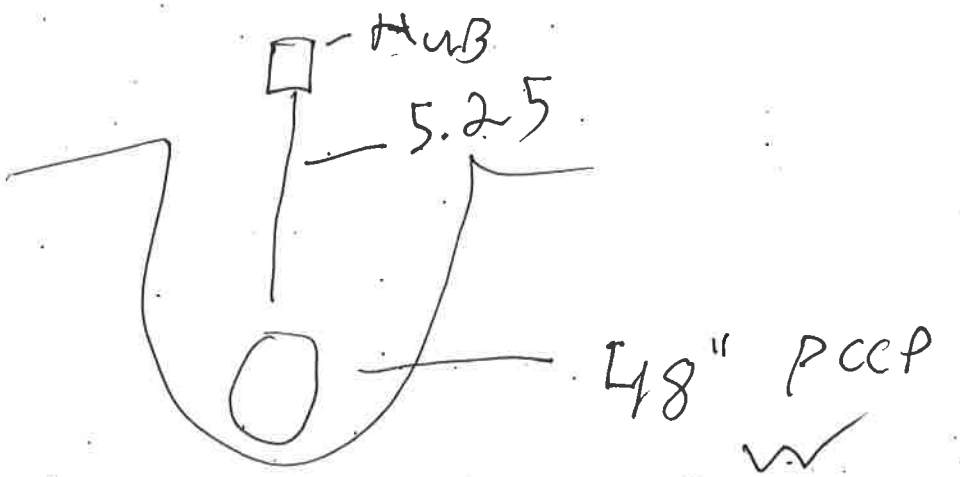
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-5.25 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew members JE NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 6

Tip # _____ Proposed _____ Date 8-15-2015

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

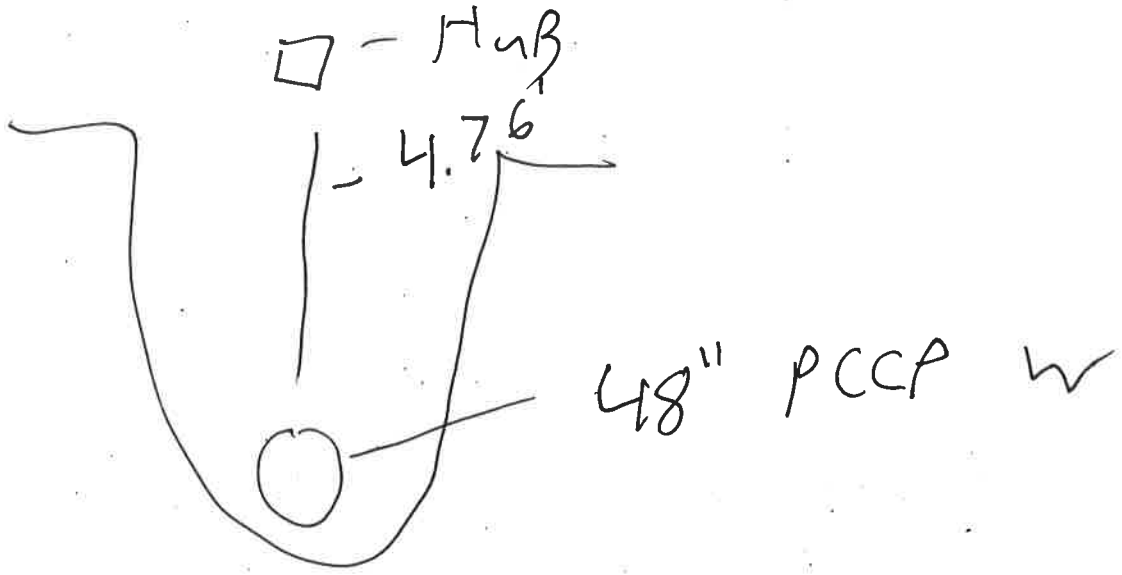
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark	Top #1	Top #2	Top #3
_____	SM [redacted]	SM [redacted]	SM [redacted]
PK (Hub) Chis "x"	-4.76 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 7

Tip # _____ Proposed _____ Date 8-16-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____

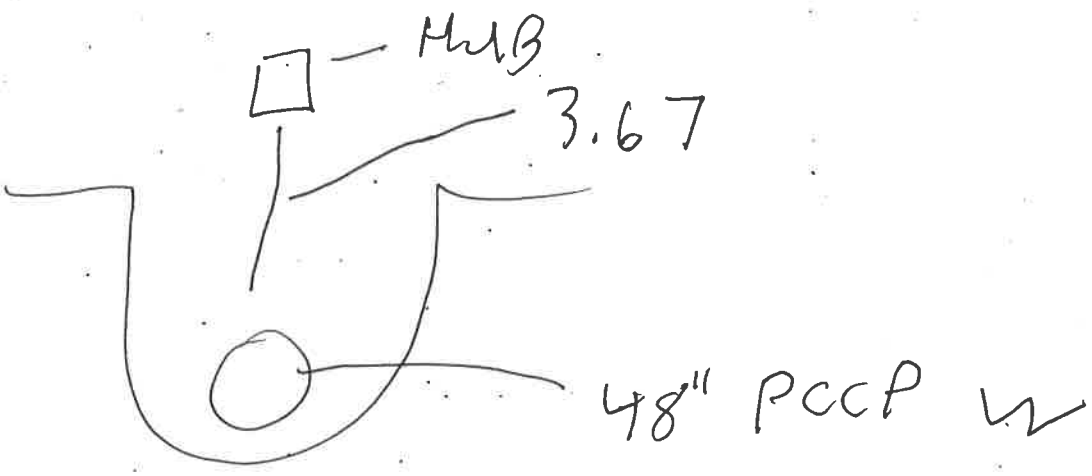
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK Hub Chis "X"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 3.67 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location _____

- _____ (RR)

_____ Elev

Crew members _____

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 8

Tip # _____ Proposed _____ Date 8-17-207

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

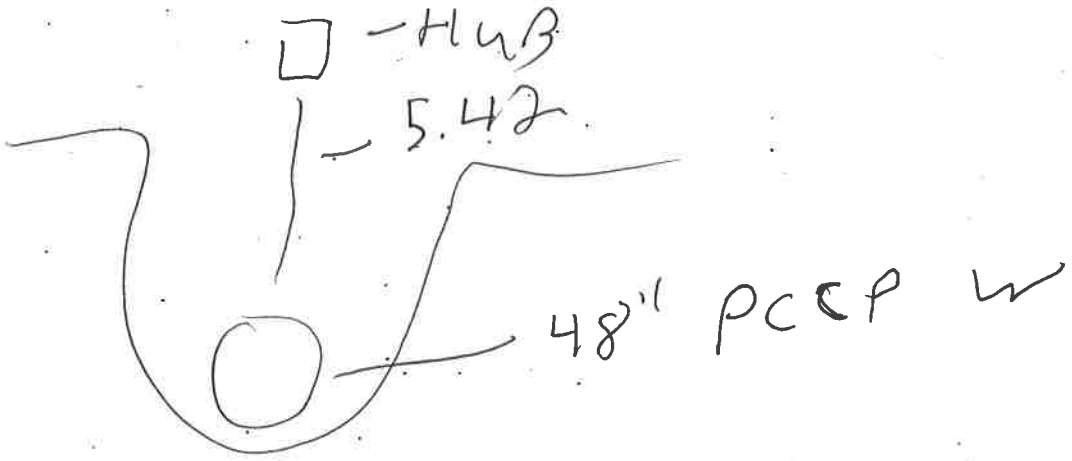
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	- 5.42 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO.

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 9

Tip # _____ Proposed _____ Date 8-17-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____

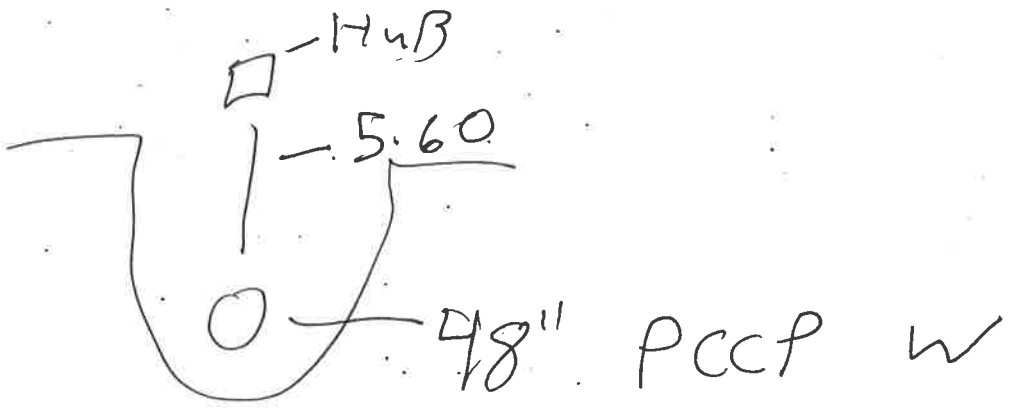
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK (Hub) Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-5.60 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO.

- _____ (RR)

_____ Elev

Crew mernbers JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 9A
Tip # _____ Proposed _____ Date 8-17-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

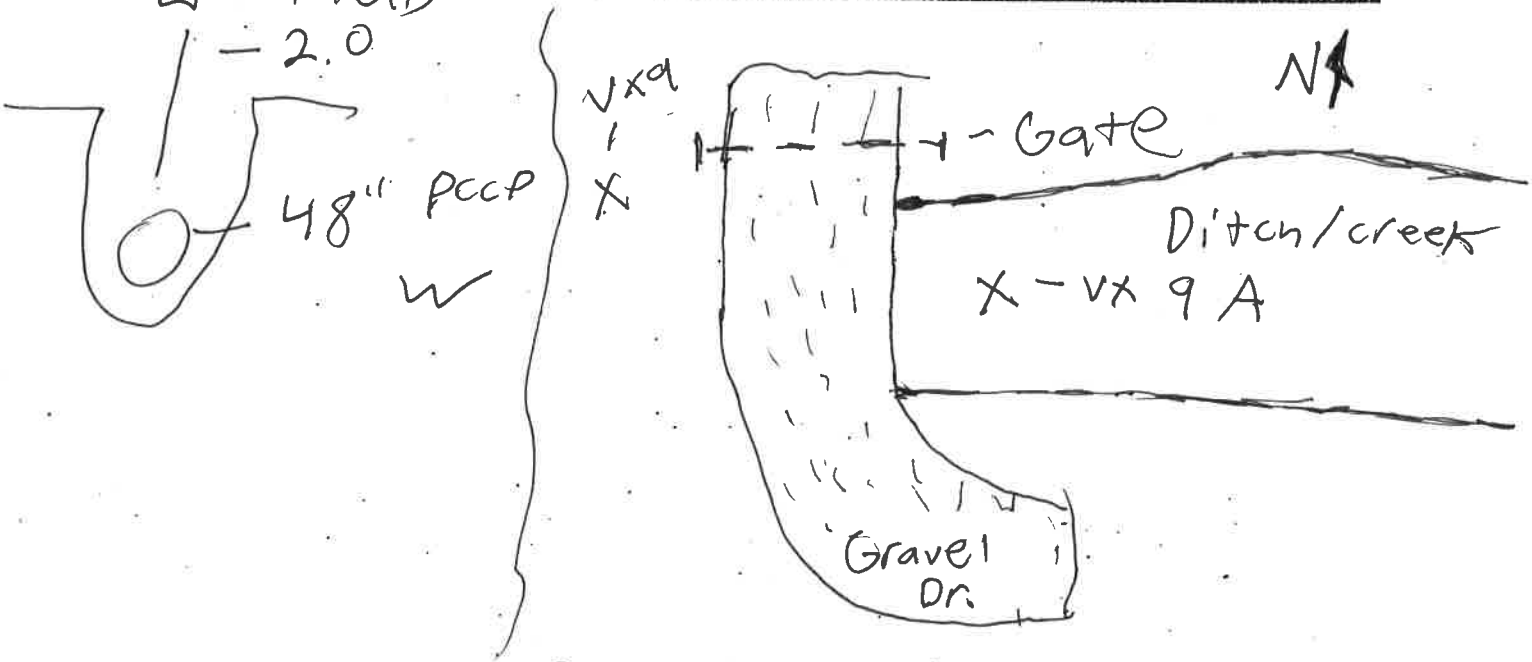
~~BM#1~~ Location IN Bottom of Big ditch

~~BM#2~~ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-2.0 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.
- _____ (RR)
_____ Elev Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 10

Tip # _____ Proposed _____ Date 8-17-2017

Project Description _____

Owner _____ Type _____ Size & Material _____

Condition _____ Paving Thickness _____ Found _____

BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	- _____ (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.

NO Access.

Surrounded by Thick/Heavy Swamp.

HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

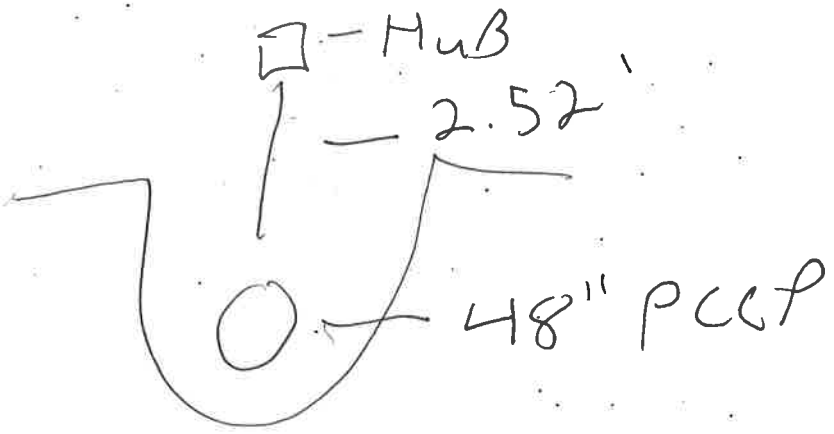
Client _____ Project # 0307900102 TH# 11
Tip # _____ Proposed _____ Date 8-17-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK (Hub) Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-2.52 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.
- _____ (RR)
_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

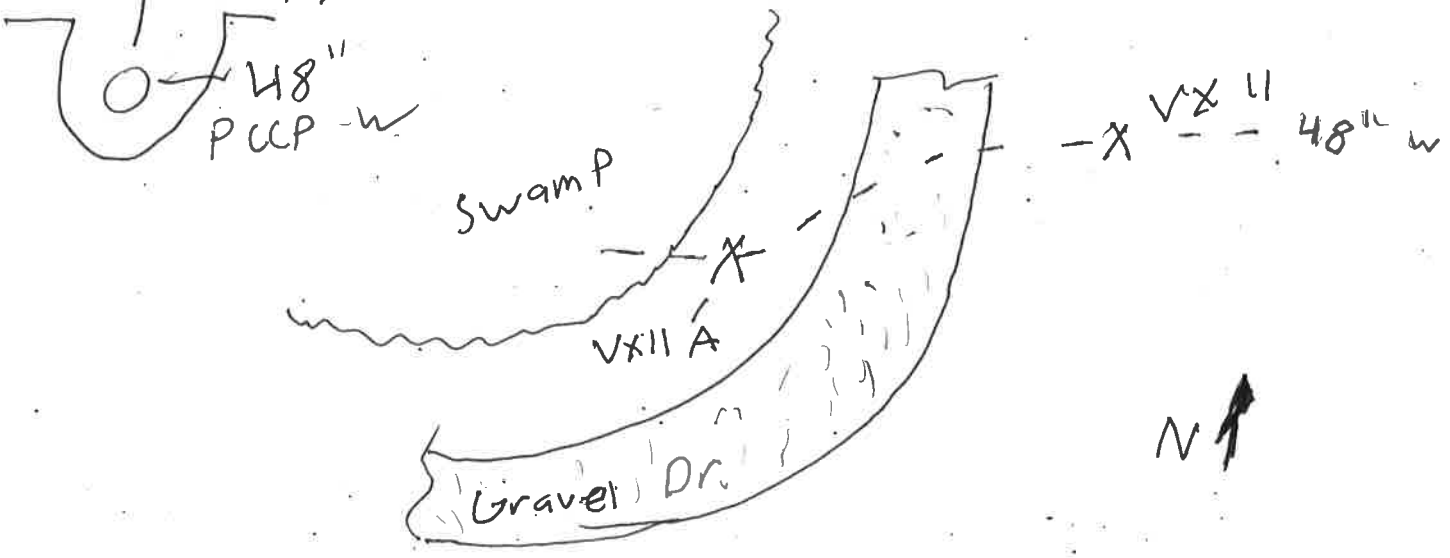
Client _____ Project # 03079 00 12 TH# 11A
Tip # _____ Proposed _____ Date 8-17-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found N/A

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "X"	SM [redacted]	SM [redacted]	SM [redacted]
	-5.47' (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location _____
- _____ (RR)
_____ Elev

Crew members _____

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 12

Tip # _____ Proposed _____ Date 8-16-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

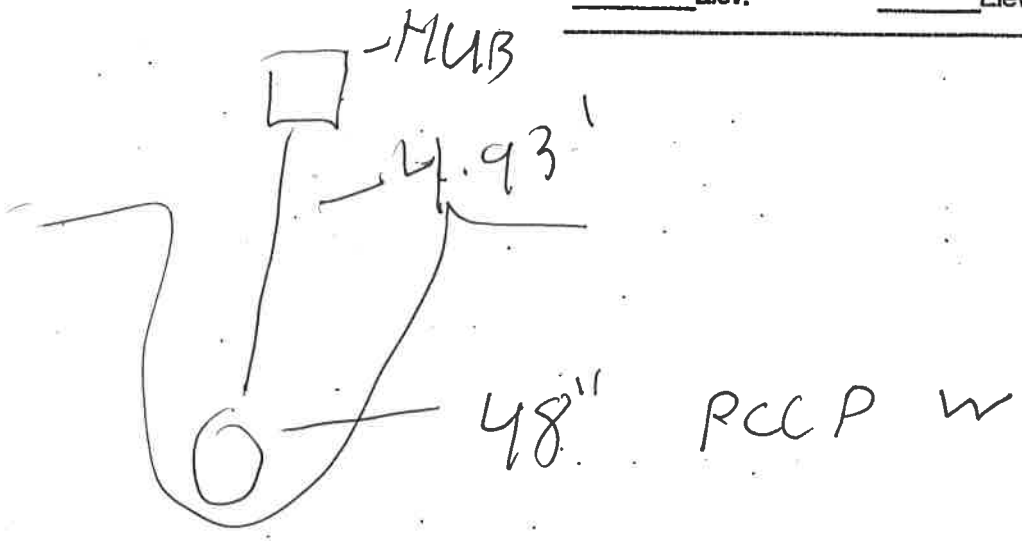
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK / Hub / Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-4.93 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew mernbers JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0017 TH# 13

Tip # _____ Proposed _____ Date 8-17-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

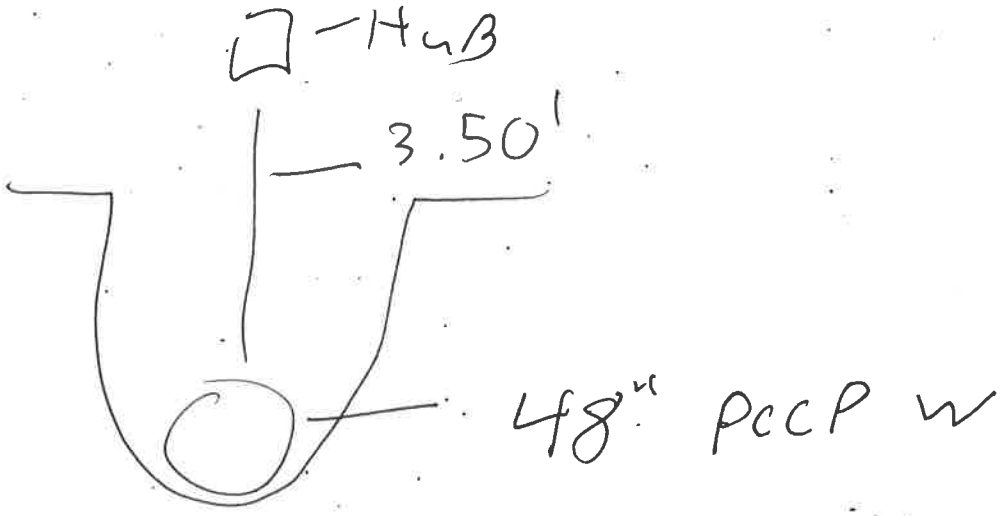
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-3.50 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO.

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

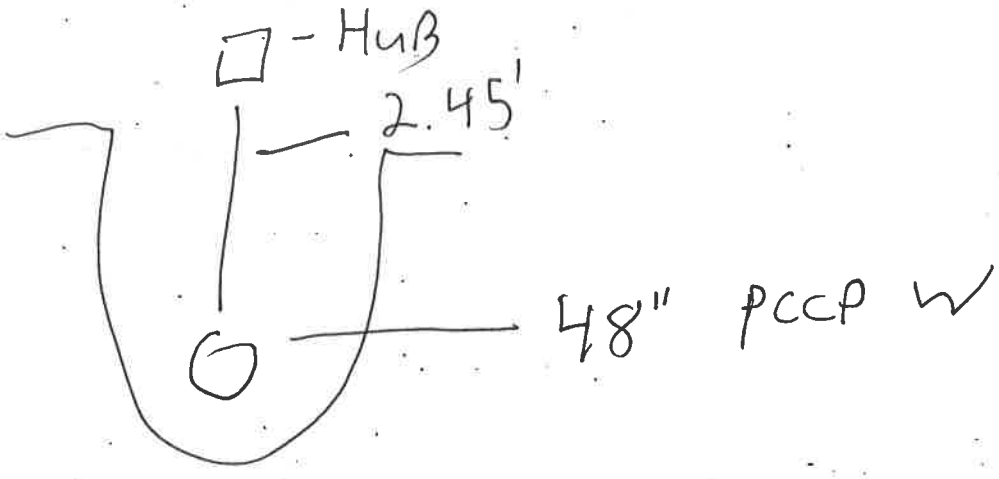
Client _____ Project # 03079 0012 TH# 14
Tip # _____ Proposed _____ Date 8-16-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	- 2.45 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co
- _____ (RR)
_____ Elev

Crew members JC VS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 15

Tip # _____ Proposed _____ Date 8-16-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" RCCP

Condition _____ Paving Thickness _____ Found W

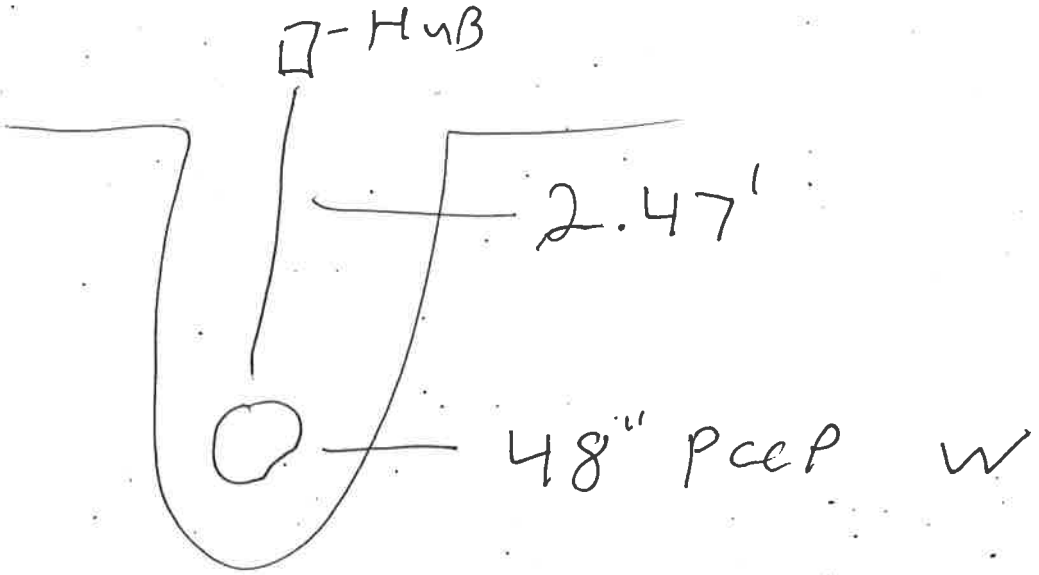
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-2.47 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

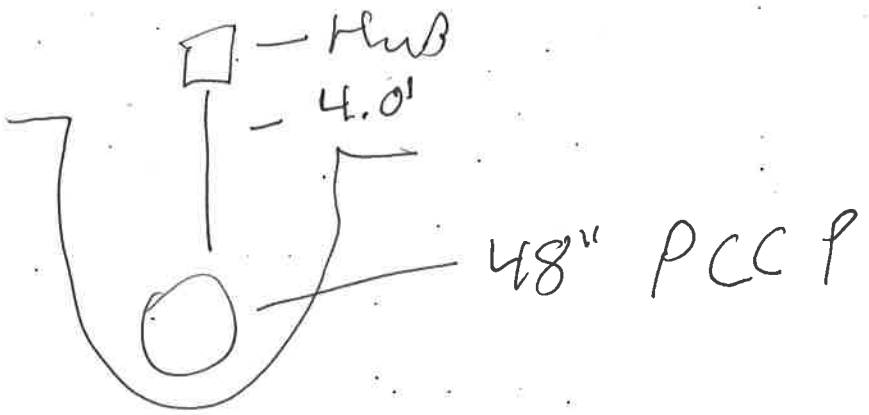
Client _____ Project # 03079 0012 TH# 16
Tip # _____ Proposed _____ Date 8-16-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK (Hub) Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-4.0 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.
- _____ (RR)
_____ Elev

Crew members JE NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 030290012 TH# 17

Tip # _____ Proposed _____ Date 8-16-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

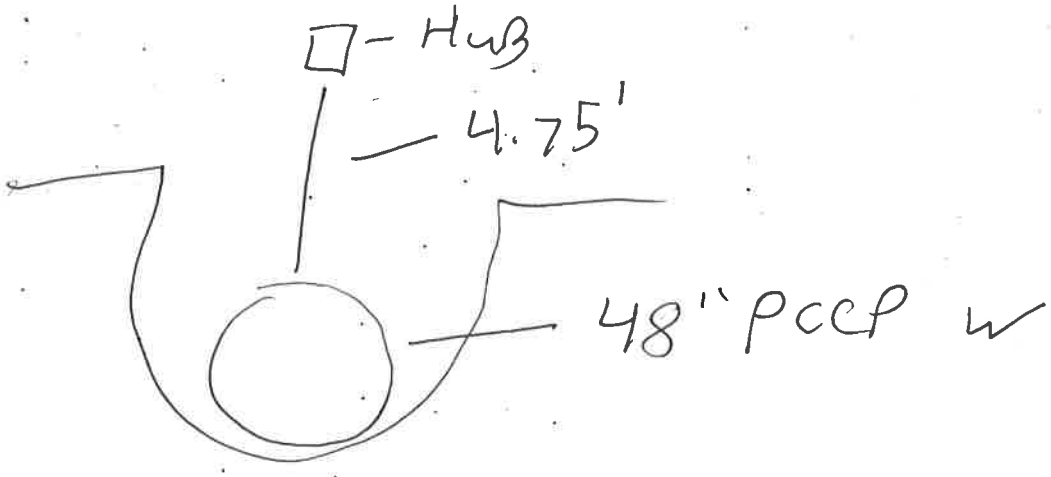
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "X"	SM [redacted]	SM [redacted]	SM [redacted]
	-4.75 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 0307900 12 TH# 18

Tip # _____ Proposed _____ Date 8-17-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" RCCP

Condition _____ Paving Thickness _____ Found W

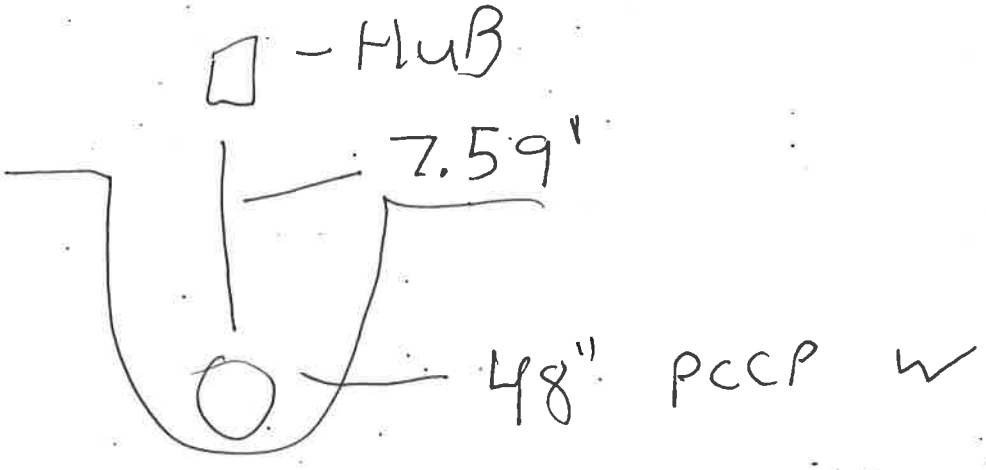
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK / (Hub) / Chis "X"	SM [redacted]	SM [redacted]	SM [redacted]
	- 7.59 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 19

Tip # _____ Proposed _____ Date 8-16-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

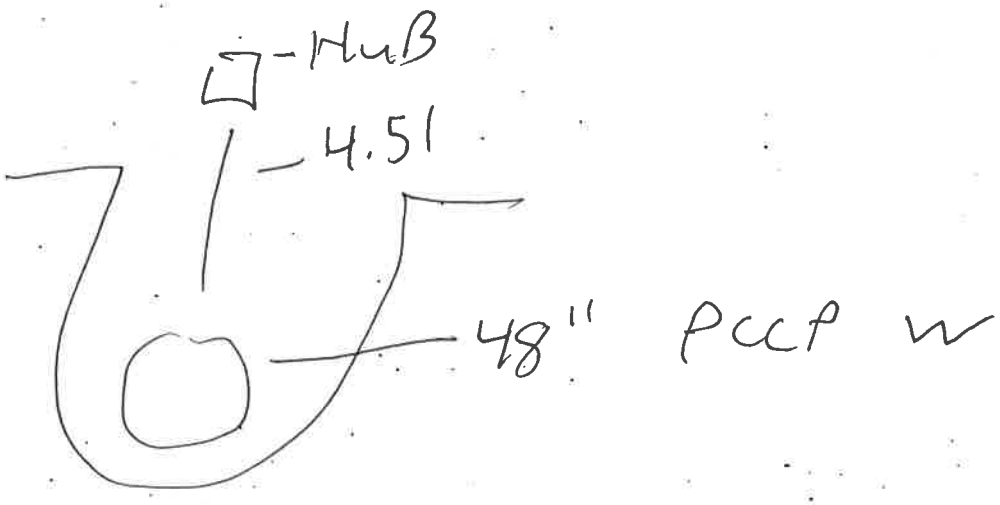
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-4.51 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO.

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 0307900012 TH# 20
Tip # _____ Proposed _____ Date 8-16-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

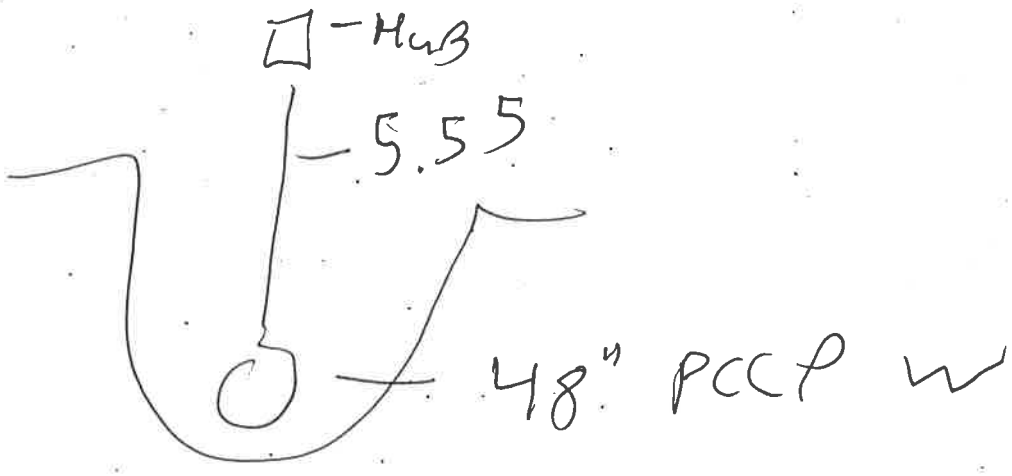
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK Hub Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-5.55 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO.
- _____ (RR)
_____ Elev Crew members JC NS

McKIM & CREED

Testhole Data Report

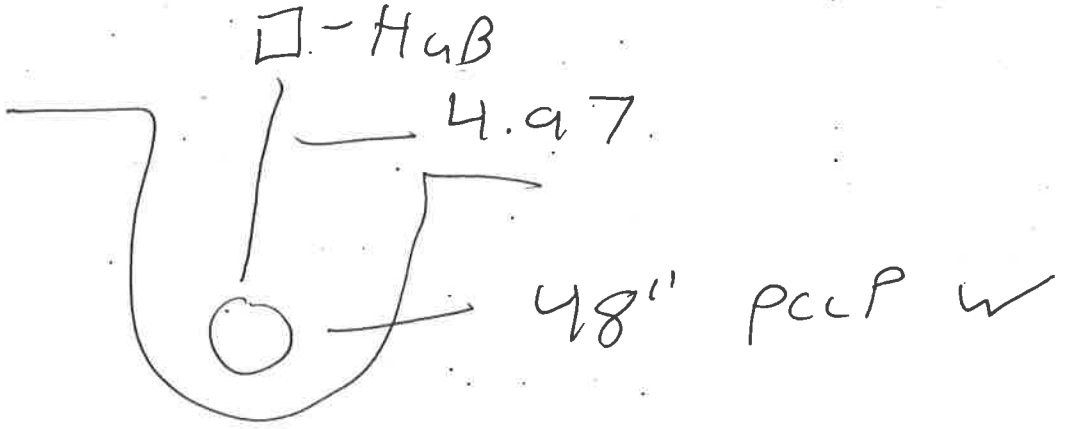
Client _____ Project # 03079 0012 TH# 21.
Tip # _____ Proposed _____ Date 8-17-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK (Hub) Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	- 4.97 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO.
- _____ (RR)
_____ Elev

Crew members JL NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 030790012 TH# 22
Tip # _____ Proposed _____ Date 8-16-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W/

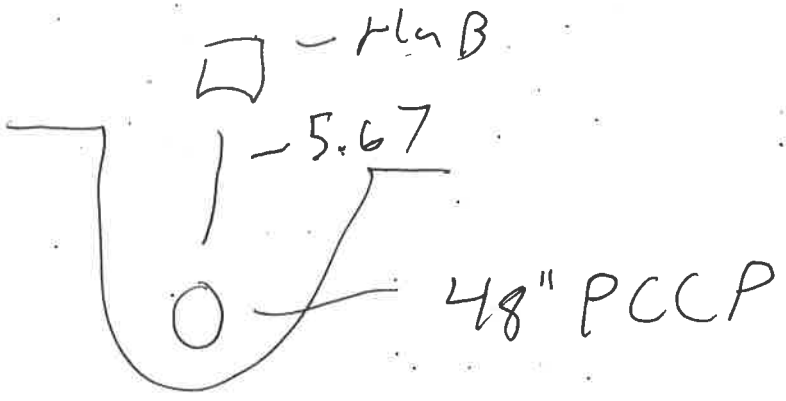
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK (Hub) Chis "X"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-5.67 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO.
- _____ (RR)
_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 0307900 12 TH# 23

Tip # _____ Proposed _____ Date 8-16-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

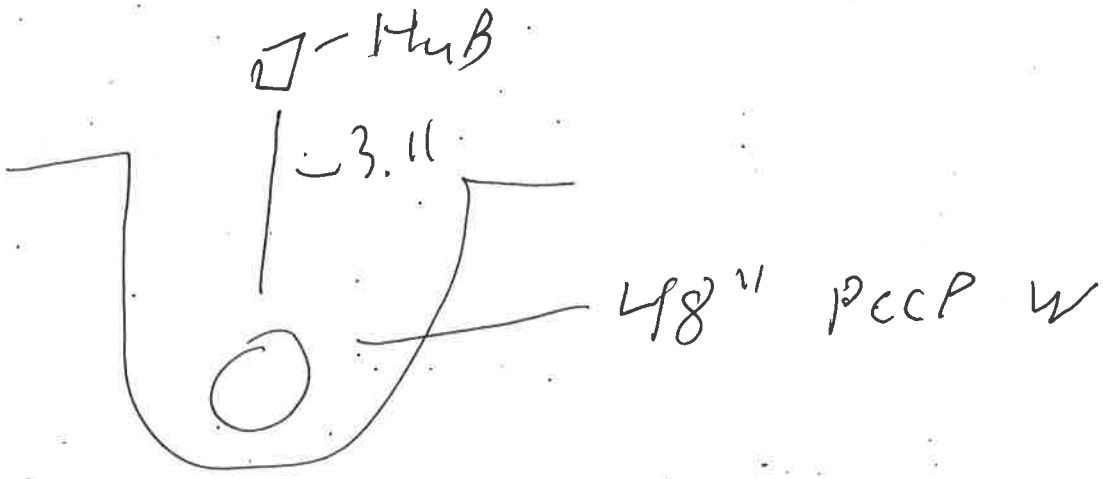
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	- 3.11 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew members JL NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079002 TH# 24
Tip # _____ Proposed _____ Date 8-17-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" RCCP
Condition _____ Paving Thickness _____ Found N

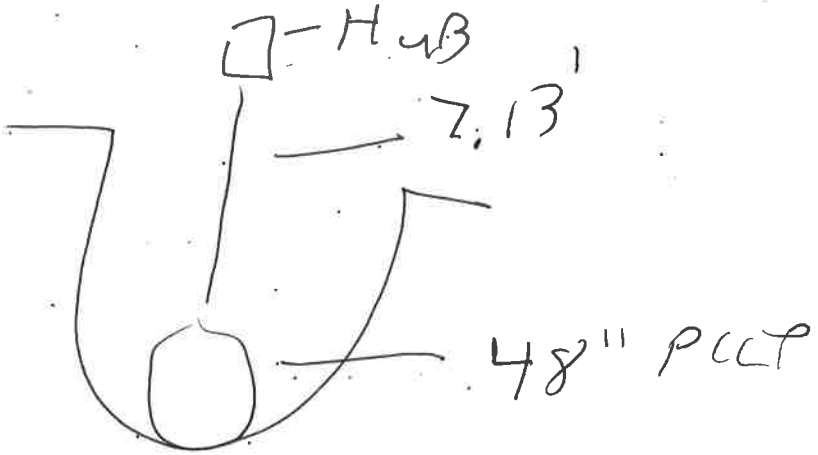
BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____
PK (Hub) Chis "X"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
- 7.13 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick CO.
- _____ (RR)
_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0012 TH# 25

Tip # _____ Proposed _____ Date 8-17-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found ~

BM#1 _____ Location _____

BM#2 _____ Location _____

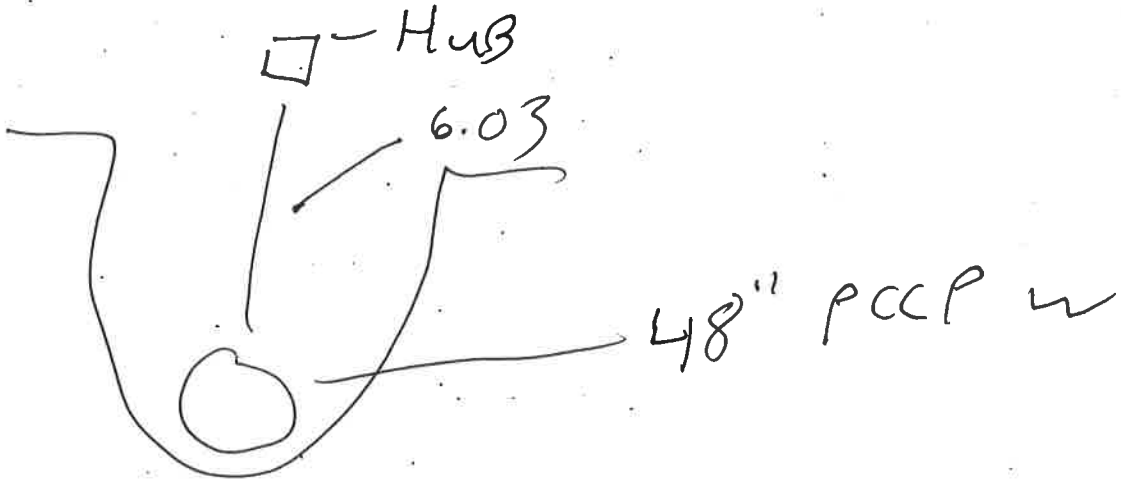
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____

PK (Hub) Chis "x"

Top #1	Top #2	Top #3
SM [redacted]	SM [redacted]	SM [redacted]
-6.03 (actual)	- _____ (actual)	- _____ (actual)
_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew members JC NS

McKIM&CREED

Testhole Data Report

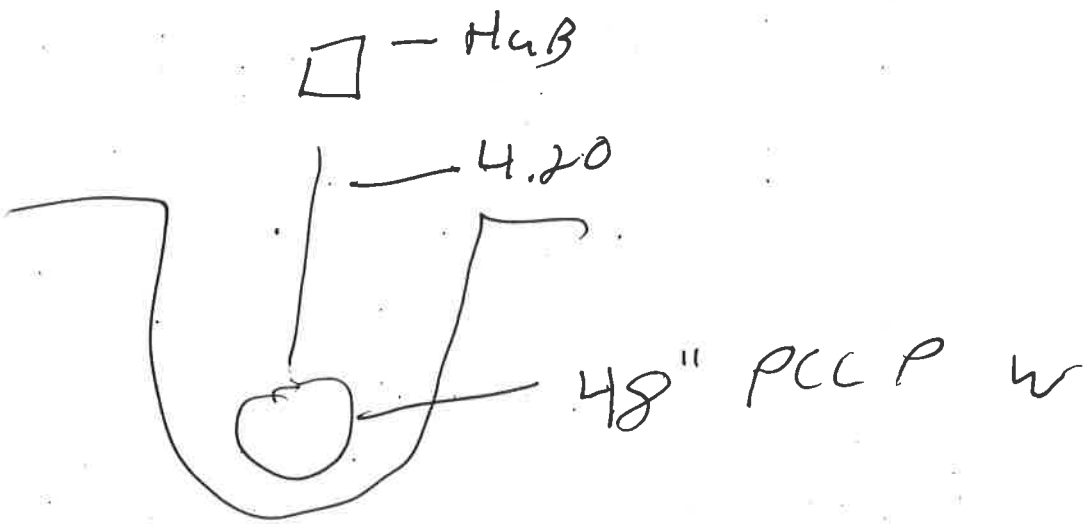
Client _____ Project # 03079 0012 TH# 26,
Tip # _____ Proposed _____ Date 8-17-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" RCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	- 4.20 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co
- _____ (RR)
_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

Client _____ Project # 03079 0002 TH# 27

Tip # _____ Proposed _____ Date 8-16-2017

Project Description _____

Owner _____ Type _____ Size & Material 48" PCCP

Condition _____ Paving Thickness _____ Found W

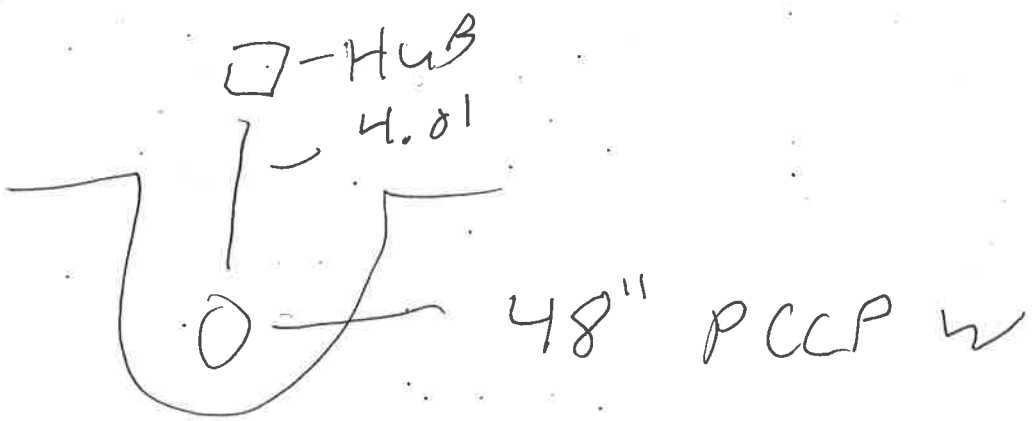
BM#1 _____ Location _____

BM#2 _____ Location _____

Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-4.01 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.

- _____ (RR)

_____ Elev

Crew mernbers JE NS

McKIM & CREED

Testhole Data Report

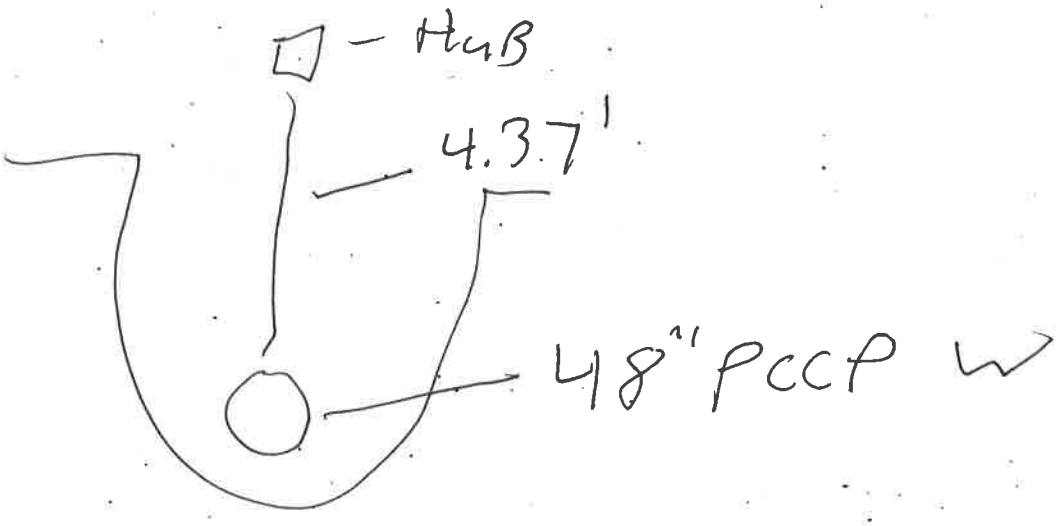
Client _____ Project # 1030 79 0012 TH# 28
Tip # _____ Proposed _____ Date 8-17-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-4.37 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.
- _____ (RR)
_____ Elev

Crew mernbers JC NS

McKIM & CREED

Testhole Data Report

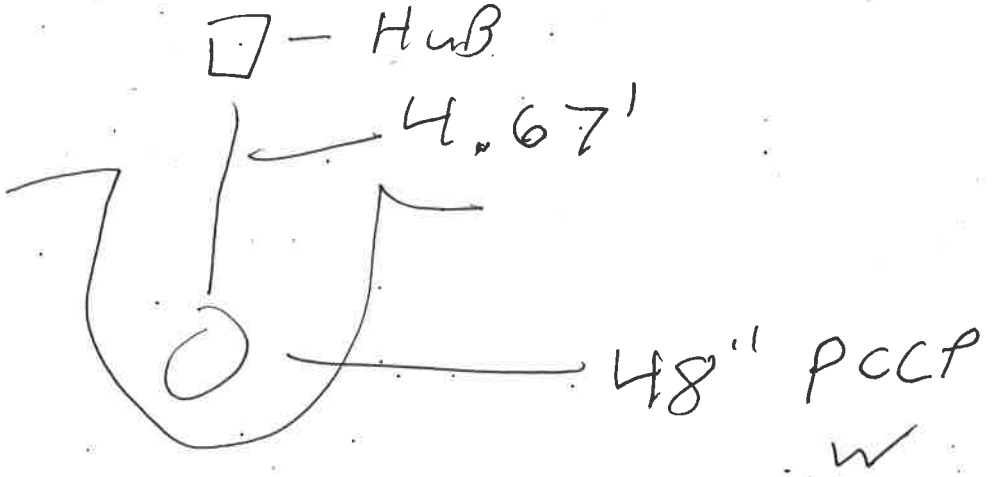
Client _____ Project # 03079 0012 TH# 29
Tip # _____ Proposed _____ Date 8-16-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "X"	SM [redacted]	SM [redacted]	SM [redacted]
	- 4.67 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.
- _____ (RR)
_____ Elev

Crew members JC NS

McKIM & CREED

Testhole Data Report

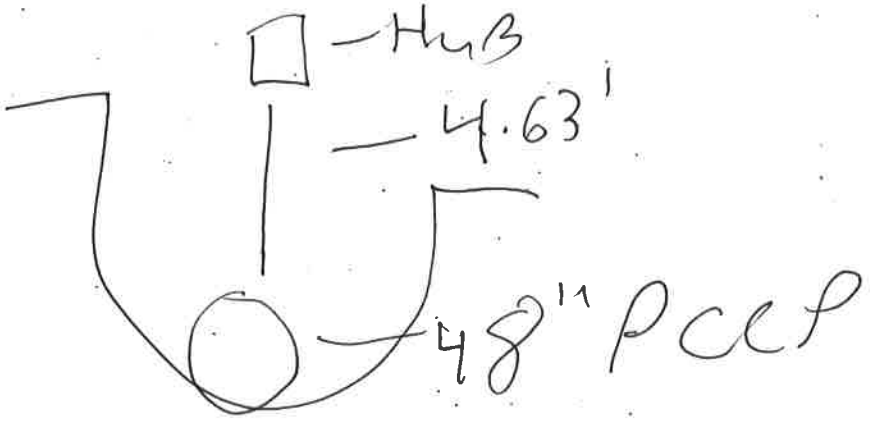
Client _____ Project # 030790012 TH# 30
Tip # _____ Proposed _____ Date 8-16-2017
Project Description _____
Owner _____ Type _____ Size & Material 48" PCCP
Condition _____ Paving Thickness _____ Found W

BM#1 _____ Location _____

BM#2 _____ Location _____
Check by _____

Instrument	Survey Mark	Top #1	Top #2	Top #3
BM _____	HI [redacted]	HI [redacted]	HI [redacted]	HI [redacted]
+ _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)	- _____ (RR)
HI = [redacted]	[redacted] Elev.	_____ Elev.	_____ Elev.	_____ Elev.

Survey Mark _____	Top #1	Top #2	Top #3
PK Hub Chis "x"	SM [redacted]	SM [redacted]	SM [redacted]
	-4.63 (actual)	- _____ (actual)	- _____ (actual)
	_____ Elev.	_____ Elev.	_____ Elev.



HI check _____ Location Brunswick Co.
- _____ (RR)
_____ Elev
Crew members JC NS