



ADDENDUM NO. 1

METROPOLITAN SEWERAGE DISTRICT MSD ITT PUMP STATION REPLACEMENT

MSD PROJECT NO.: 2020061

MCKIM & CREED PROJECT NO.: 09596-0001

BIDS DUE: TUESDAY, JULY 21, 2026, AT 2:00 PM (EST)

ADDENDUM ISSUE DATE: JULY 9, 2026

TO: ALL PLAN HOLDERS OF RECORD

PLEASE NOTE THE FOLLOWING CLARIFICATIONS, CHANGES, AND/OR ADDITIONS TO THE ABOVE REFERENCED PROJECT:

1. SCOPE

Addendum No. 1 is issued to revise the specifications and construction drawings, to provide the mandatory pre-bid conference meeting agenda and sign-in sheet, to provide the executed Board of Trustees of the Endowment Fund of North Carolina State University Right of Entry, and to answer the following questions:

2. SPECIFICATIONS

1. SECTION 01026 – MEASUREMENT AND PAYMENT

Replace Section 01026 MEASUREMENT AND PAYMENT with the revised Section 01026 MEASUREMENT AND PAYMENT attached to this Addendum No. 1.

2. SECTION 02213 – ROCK AND BOULDER EXCAVATION

Replace Section 02213 ROCK AND BOULDER EXCAVATION with the revised Section 02213 ROCK AND BOULDER EXCAVATION attached to this Addendum No. 1.

3. SECTION 02221 – EXCAVATION, BEDDING AND BACKFILL FOR PIPE AND STRUCTURES

Replace Section 02221 EXCAVATION, BEDDING AND BACKFILL FOR PIPE AND STRUCTURES with the revised Section 02221 EXCAVATION, BEDDING AND BACKFILL FOR PIPE AND STRUCTURES attached to this Addendum No. 1.

4. SECTION 02722 – SANITARY SEWERS

Permax-CTF (by Permite Corporation) has been added to the list of approved ductile iron pipe ceramic-filled amine-cured epoxy products. Replace Section 02722 SANITARY SEWERS with the revised Section 02722 SANITARY SEWERS attached to this Addendum No. 1.

5. SECTION 02723 – FORCE MAINS

Permax-CTF (by Permite Corporation) has been added to the list of approved ductile iron pipe ceramic-filled amine-cured epoxy products. Replace Section 02723 FORCE MAINS with the revised Section 02723 FORCE MAINS attached to this Addendum No. 1.

6. SECTION 17120 – INSTRUMENTATION AND CONTROL, DEVICES AND EQUIPMENT

Replace Section 17120 INSTRUMENTATION AND CONTROL, DEVICES AND EQUIPMENT with the revised Section 17120 INSTRUMENTATION AND CONTROL, DEVICES AND EQUIPMENT attached to this Addendum No. 1.

7. SECTION 17120A – INSTRUMENT SCHEDULE

Replace Section 17120A INSTRUMENT SCHEDULE with the revised Section 17120A INSTRUMENT SCHEDULE attached to this Addendum No. 1.

8. SECTION 17130A – CONTROL SYSTEM INPUT/OUTPUT SCHEDULE

Replace Section 17130A CONTROL SYSTEM INPUT/OUTPUT SCHEDULE with the revised Section 17130A CONTROL SYSTEM INPUT/OUTPUT SCHEDULE attached to this Addendum No. 1.

9. SECTION IX – BID SCHEDULE

Replace section IX Bid Schedule with the revised Section IX Bid Schedule attached to this Addendum No. 1.

3. CONSTRUCTION DRAWINGS

1. Replace drawing CU04.1 with the revised drawing CU04.1 attached to this Addendum No. 1.
2. Replace drawing CU05.1 with the revised drawing CU05.1 attached to this Addendum No. 1.
3. Replace drawing CS01.1 with the revised drawing CS01.1 attached to this Addendum No. 1.
4. Replace drawing CS02.1 with the revised drawing CS02.1 attached to this Addendum No. 1.
5. Replace drawing CS02.2 with the revised drawing CS02.2 attached to this Addendum No. 1.
6. Replace drawing C03.1 with the revised drawing C03.1 attached to this Addendum No. 1.
7. Replace drawing C03.2 with the revised drawing C03.2 attached to this Addendum No. 1.
8. Replace drawing CE01.1 with the revised drawing CE01.1 attached to this Addendum No. 1.
9. Replace drawing CE01.2 with the revised drawing CE01.2 attached to this Addendum No. 1.
10. Replace drawing M01.2 with the revised drawing M01.2 attached to this Addendum No. 1.
11. Replace drawing E01.0 with the revised drawing E01.0 attached to this Addendum No. 1.
12. Replace drawing E02.0 with the revised drawing E02.0 attached to this Addendum No. 1.
13. Replace drawing E03.1 with the revised drawing E03.1 attached to this Addendum No. 1.
14. Replace drawing E10.0 with the revised drawing E10.0 attached to this Addendum No. 1.
15. Replace drawing E10.1 with the revised drawing E10.1 attached to this Addendum No. 1.
16. Replace drawing I01.0 with the revised drawing I01.0 attached to this Addendum No. 1.

4. PRE-BID CONFERENCE MEETING AGENDA AND SIGN-IN SHEET

1. Pre-bid conference meeting agenda and sign-in sheet have been attached to this Addendum No. 1.

5. RIGHT OF ENTRY

1. Replace draft Board of Trustees of the Endowment Fund of North Carolina State University Right of Entry with the executed Board of Trustees of the Endowment Fund of North Carolina State University Right of Entry attached to this Addendum No. 1.

6. QUESTIONS

1. QUESTION: Will heavy duty, pressure rated lay-flat hose be allowed for bypass piping?

RESPONSE: Due to the sensitive nature of the surrounding area and the potential environmental impacts associated with sewage release, pressure-rated lay-flat hose will not be permitted for bypass piping. The Contractor shall provide rigid piping or other leak-resistant piping systems acceptable to MSD.

QUESTION: Would it be acceptable to install an auto dialer in lieu of 24/7 manned bypass pumping operation? If not, would you consider it if an additional redundant pump above and beyond the one required was piped in and wired into the floats?

RESPONSE: No. Due to the proximity of the bypass pumping operation to the French Broad River and McDowell Creek and the potential environmental impacts associated with a bypass failure, MSD will require continuous 24-hour manned operation of the bypass system. The use of an auto dialer and/or additional redundant pumps will not be accepted as a substitute for the required manned operation.

- 2. QUESTION: Will you allow alternate pricing of a jack and bore of 30" steel casing in lieu of HDD 24" HDPE under the river?**

RESPONSE: No. The straight-line nature of the jack and bore will require significantly deeper pipeline installation and larger bore pits on both sides of the river. Additionally jack and bore would trigger a re-evaluation of Section 10 permitting and may require additional easements. Therefore, alternate pricing for a 30-inch steel casing installed by jack and bore in lieu of the specified HDD installation will not be accepted.

- 3. QUESTION: According to the drawings, the Owner is supplying the generator. Will the generator come with an ATS, MTS, and docking station, or does the EC need to provide ATS, MTS, and docking station?**

RESPONSE: The generator will be owner supplied, but due to the need to ensure that the existing station remains in operation until the new station is tested and ready, the transfer switches and associated equipment (docking station) will need to be supplied and installed by the Contractor prior to the new station being tested and accepted and the old station being decommissioned.

- 4. QUESTION: The drawings on page E01.0 show 2 SPD's with dashed lines around them. Can you provide some details for those?**

RESPONSE: See details on sheet I03.1.

- 5. QUESTION: Can an item be added for trench rock for all the pipe that has to be dug in? And wetwell area excavations?**

RESPONSE: Yes. A new Trench Rock Excavation pay item has been added to the revised Bid Schedule included with Addendum No. 1 for rock excavation encountered during installation of gravity sewer, force main, storm drainage, manholes, ARV manholes, and appurtenant utility structures.

No separate pay item will be added for rock excavation associated with the lift station/wetwell. Any rock excavation encountered within the lift station/wetwell excavation or other structure excavations shall be included in the applicable lump-sum structure bid item.

Additionally, a separate Undercut and Replace Unsuitable Material pay item has been added to the revised Bid Schedule included with Addendum No. 1. for Engineer-directed undercut below planned excavation grade, including utility trenches and utility structure excavations.

- 6. QUESTION: Directional bore. Can a rock bore item be added for this just in case?**

RESPONSE: A new Rock Bore for Horizontal Directional Drill pay item has been added to the revised Bid Schedule attached to this Addendum No. 1.

- 7. QUESTION: Will CAD drawings be provided prior to the bid opening date?**

RESPONSE: Although the possibility of providing CAD files was discussed during the pre-bid meeting, MSD has determined that the CAD (DWG) files will not be distributed during the bidding period. Bidders should prepare

their bids using the contract documents issued for bidding, including the PDF plan set and any revisions issued by addendum.

CAD files may be made available to the successful Contractor following contract award, if required for construction and subject to the applicable terms governing their use.

8. QUESTION: Are there any special requirements for discharging water after testing?

RESPONSE: Hydrostatic test water from new utility piping may be discharged in accordance with NCDEQ requirements for utility distribution system hydrotesting. All other construction-related water shall be discharged and managed in accordance with the Contract Documents and applicable permits. Withdrawal of testing water from the French Broad River in excess of 100,000 gallons per day shall be registered with the NC Division of Water Resources.

9. QUESTION: Are there any Davis-Bacon requirements?

RESPONSE: No. Davis-Bacon requirements do not apply.

10. QUESTION: Will the Contractor have access to Old Fanning Bridge?

RESPONSE: Yes. See Article 5.1 of Section V: Special Conditions of the bid documents. Per discussion with Troy S. Wilson, NCDOT District Engineer, no encroachment is needed to perform the work under and around Old Fanning Bridge. Contractor shall notify the office of Troy S. Wilson 72 hours in advance of crews starting work.

7. ACKNOWLEDGEMENT OF BIDDER

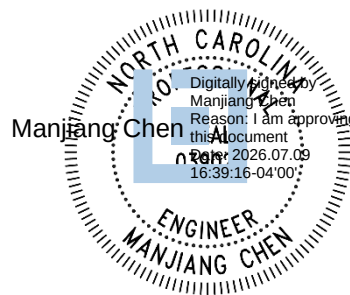
Please acknowledge receipt of this addendum by inserting the appropriate addendum number and date in Section X – Proposal (see page X-2).

The Metropolitan Sewerage District of Buncombe County appreciates your input in this project. Hopefully, these revisions and clarifications will improve this project. We look forward to receiving your bid on July 21, 2026.

The foregoing changes are hereby incorporated into the Contract, Documents, and Drawings for the Metropolitan Sewerage District of Buncombe County ITT Pump Station Replacement project.

Regards,
McKim & Creed, Inc.

Manjiang Chen, Ph.D., PE
Senior Project Manager



SECTION 01026 – MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. This section covers methods of measurement and payment for items of Work under this Contract.
- B. The total Bid amount shall cover all Work required by the Contract Documents. All costs in connection with the proper and successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction equipment and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the lump sum prices bid. All Work not specifically set forth as a pay item in the Bidding Schedule shall be considered a subsidiary obligation of Contractor, and all costs in connection therewith shall be included in the prices bid.

1.2 DEFINITIONS

- A. Unit price is an amount proposed by Bidders, stated on the Bidding Schedule, as a price per unit of measurement for materials and/or services added to or deducted from the Contract Sum by appropriate modification, if the estimated quantities of Work required by the Contract Documents are increased or decreased.
- B. Lump sum is an amount proposed by bidders, stated on the Bidding Schedule, as a price to include all materials, labor, etc. for work furnished and installed, complete and operational.

1.3 PERMITS AND TAXES

- A. Refer to General Conditions paragraph 7.09 - Permits for payment of construction and license permits. The Contractor shall include costs of all construction permits and licenses in the bid.
- B. Refer to General Conditions paragraph 7.10 - Taxes for payment of taxes. The Contractor shall include costs of state and local sales taxes in the Bid.

1.4 RETAINAGE

- A. Refer to the Agreement.

1.5 EXCAVATION AND TRENCHING

- A. Except where otherwise specified, the lump sum price bid for each item of Work which involves excavation or trenching shall include all costs for such Work. No direct payment shall be made for excavation or trenching. There shall be no separate payment for excavation and stabilization below grade, or special backfill for such excavation, unless specifically stated in the Measurement and Payment sections.

- B. Except as specifically provided under Bid Item 13, Trench Rock Excavation, and Bid Item 6g, Rock Bore for Horizontal Directional Drill, there shall be no separate payment for rock excavation. Rock excavation associated with structures, including the lift station, valve vaults, flow meter vaults, retaining walls, and site improvements, shall be considered subsidiary to the applicable pay item.
- C. All excavation work required for structures, not otherwise paid for as trenching, shall be considered to be a subsidiary obligation of Contractor; and the cost of such excavation shall be included in the prices bid for the structures.

1.6 MEASUREMENT AND PAYMENT

- A. Bid Item 1: Mobilization
 - 1. All work covered by this section will be paid for at the contract lump sum price for "Mobilization." The lump sum bid price shall not exceed 3% of the total project bid.
 - 2. Partial Payments for the item of "Mobilization" will be made with the first and second partial pay estimates paid on the contract and will be made at the rate of 50% of the lump sum price for "Mobilization" on each of these partial pay estimates.
- B. Bid Item 2: 10' Diameter Pre-Cast Submersible Lift Station w/ Grinder (Expandable to Triplex Lift Station)
 - 1. Payment of the lump sum price for the Lift Station shall include, but not be limited to, full compensation for all labor, materials, tools, equipment and incidentals necessary for construction of the lift station complete, as shown inside the proposed pump station boundaries and as specified in the contract documents.
 - 2. Payment for the Lift Station shall include all excavation, dewatering, shoring, stabilization, partially weathered rock (PWR), rock excavation, auger-refusal materials, boulders, and other subsurface conditions encountered within the lift station excavation limits. No separate payment shall be made for rock excavation associated with the lift station excavation.
 - 3. The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.
- C. Bid Item 3: Demolition and Abandonment of Existing Pump Station
 - 1. Payment of the lump sum price for abandonment of the existing pump station shall include, but not be limited to, full compensation for all labor, materials, tools, equipment and incidentals necessary for limited demolition and abandonment of the existing pump station inside the pump station boundary as established by the existing fence including removal of tops of

existing structures and filling of structures more than 3-ft below grade with stone, removal of generators, control panels, and pumps and conveyance to the Owner, and abandonment in place of associated gravity and force mains, as shown on the Drawings and as specified.

2. The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.

D. Bid Item 4: Manholes

1. Bid Item 4a: Demolish and Remove Existing 4' Diameter Gravity Sewer Manhole
 - a) Payment of the unit price for demolition and removal of 4' diameter precast concrete manholes not containing valves or other mechanical equipment shall include all work necessary to completely remove the precast concrete manhole as well as to cut and cap the existing downstream 12" gravity sewer main including but not be limited to excavation, compaction, backfill, shoring, dewatering, and disposal as required, in accordance with the contract documents.
 - b) Payment shall be per manhole demolished.
2. Bid Item 4b: Demolish and Remove Existing 5' Diameter Gravity Sewer Manhole
 - a) Payment of the unit price for demolition and removal of 5' diameter precast concrete manholes not containing valves or other mechanical equipment shall include all work necessary to completely remove the precast concrete manhole as well as to cut and cap the existing downstream 24" gravity sewer main including but not be limited to excavation, compaction, backfill, shoring, dewatering, and disposal as required, in accordance with the contract documents.
 - b) Payment shall be per manhole removed.
3. Bid Item 4c: Abandon Existing 5' Diameter Gravity Sewer Manhole
 - a) Payment of the unit price for abandonment of 5' diameter precast concrete manholes not containing valves or other mechanical equipment shall include all work necessary to completely remove the top 3' of the existing precast concrete manhole and fill the remaining volume with non-compressible material as well as to cut and cap the existing downstream 24" gravity sewer main including but not be limited to excavation, compaction, backfill, shoring, dewatering, and disposal as required, in accordance with the contract documents.

- b) Payment shall be per manhole abandoned.
- 4. Bid Item 4d: Abandon Existing 4' Diameter Air Release Valve Manhole
 - a) Payment of the unit price for demolition and removal of 4' diameter precast concrete manholes containing air release valves shall include all work necessary to completely remove the top 3' of the precast concrete manhole and fill the remaining volume with non-compressible material as well as to cut and cap the existing 6" PVC force main entering and exiting the manhole, including but not be limited to excavation, compaction, backfill, shoring, dewatering, and disposal as required, in accordance with the contract documents.
 - b) Payment shall be per manhole abandoned.
- 5. Bid Item 4e: Modify Existing Sewer Manhole
 - a) Payment of the unit price for modification of existing sewer manhole (MSD MH 49-481327) shall include, but not be limited to, plugging of existing 24" pipes, installation of new 8" pipe, grout filling and finishing of pipe, and all other necessary materials, work, and equipment required to complete modification to the existing sewer manhole.
 - b) Payment shall be per manhole modified.
- 6. Bid Item 4f: Modify Receiving MH 49-23725
 - a) Payment of the unit price for modification of receiving MH 49-23725 shall include, but not be limited to, core drilling for force main, installation of 24" HDPE force main and flexible manhole sleeve or entrance joint, low shrink hydraulic grout filling, finishing of pipe, installation of proposed bench, installation of concrete backstop, coating of manhole interior, and all other necessary materials, work, and equipment required to complete modification to the existing sewer manhole.
 - b) Payment shall be per manhole modified.
- 7. Bid Item 4g: Install 4' Diameter Gravity Sewer Manhole
 - a) Payment of the unit price for 4' diameter precast concrete manholes not containing valves or other mechanical equipment shall include excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
 - b) Payment shall be per manhole installed.
- 8. Bid Item 4h: Install 4' Diameter Gravity Sewer Manhole with Vent Stack

- a) Payment of the unit price for 4' diameter precast concrete manholes with vent stack not containing valves or other mechanical equipment shall include excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
 - b) Payment shall be per manhole installed.
- 9. Bid Item 4i: Install 5' Diameter Gravity Sewer Manhole
 - a) Payment of the unit price for 5' diameter precast concrete manholes not containing valves or other mechanical equipment shall include excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
 - b) Payment shall be per manhole installed.
- 10. Bid Item 4j: Install 5' Diameter Manhole with Air Release Valve on 16" HDPE Force Main
 - a) Payment shall be made for installation of two (2) 2" combination air release valves on 16" HDPE force main complete with valve, 5' diameter vented manhole, corporation stop and tapping saddle, and all excavation, compaction, backfill, shoring, dewatering, and testing and inspection as required, in accordance with the contract documents.
 - b) Payment shall be per air release valve installed.

E. Bid Item 5: Gravity Sewer Mains

- 1. Bid Item 5a: Demolish and Remove Existing 24" DIP Gravity Sewer
 - a) Payment of the unit price for demolition and removal of 24" DIP gravity sewer main shall include all work necessary to completely remove the existing gravity sewer piping including but not be limited to excavation, compaction, backfill, shoring, dewatering, and disposal as required, in accordance with the contract documents.
 - b) Payment shall be per linear foot of gravity sewer pipe removed. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline
- 2. Bid Item 5b: Abandon Existing 24" PVC Gravity Sewer in Place
 - a) Payment of the lump sum price for abandonment of existing 24" PVC gravity sewer in place shall include, but not be limited to all labor and materials necessary for the abandonment of the existing 24" PVC gravity sewer outside its discharge manhole including excavation, backfill, cutting, capping, and abandonment of existing

24" PVC gravity sewer in place, as shown on the Drawings and as specified in the contract documents.

- b) The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.

3. Bid Item 5c: Abandon Existing 12" PVC Gravity Sewer in Place

- a) Payment of the lump sum price for abandonment of existing 12" PVC gravity sewer in place shall include, but not be limited to all labor and materials necessary for the abandonment of the existing 12" PVC gravity sewer outside its discharge manhole including excavation, backfill, cutting, capping, and abandonment of existing 12" PVC gravity sewer in place, as shown on the Drawings and as specified in the contract documents.
- b) The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.

4. Bid Item 5d: Install 8" PVC Gravity Sewer

- a) Payment of the unit price for 8" PVC gravity sewer installation shall include, but not be limited to, excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
- b) Measurement shall be per linear foot of sewer installed. Pipe length shall be measured by actual linear feet in place measured along the

5. Bid Item 5e: Install 12" PVC Gravity Sewer

- a) Payment of the unit price for 12" PVC gravity sewer installation shall include, but not be limited to, excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
- b) Measurement shall be per linear foot of sewer installed. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline.

6. Bid Item 5f: Install 24" PVC C900 Gravity Sewer

- a) Payment of the unit price for 24" PVC C900 Gravity Sewer shall include, but not be limited to, excavation, compaction, backfill,

shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.

- b) Measurement shall be per linear foot of sewer installed. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline.

7. Bid Item 5g: Install 30" DIP Gravity Sewer with Ceramic Epoxy Liner

- a) Payment of the unit price for 30" DIP Gravity Sewer with Ceramic Epoxy Liner shall include, but not be limited to, excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
- b) Measurement shall be per linear foot of sewer installed. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline.

F. Bid Item 6: Force Mains

1. Bid Item 6a: Abandon Existing 6" DIP Force Main on Bridge

- a) Payment of the lump sum price for abandonment of existing 6" DIP force main shall include, but not be limited to all labor and materials necessary for the abandonment of the 360 LF of existing 6" DIP force main suspended from the bridge on Old Fanning Bridge Road including cutting, capping, and abandonment of existing 6" PVC force main on both ends of the bridge, as shown on the Drawings and as specified in the contract documents.
- b) The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.

2. Bid Item 6b: Abandon Existing 6" PVC Force Main at ARV Manholes and Existing Receiving Manhole

- a) Payment of the lump sum price for abandonment of existing 6" PVC Force Main at ARV Manholes and Existing Receiving Manhole shall include, but not be limited to all labor and materials necessary for the abandonment of the existing 6" PVC force main outside of the ARV manholes and the existing force main receiving manhole including excavation, backfill, cutting, capping, and abandonment of existing 6" PVC force main, as shown on the Drawings and as specified in the contract documents.
- b) The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the

percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.

3. Bid Item 6c: Install 16" HDPE Force Main by Open Cut
 - a) Payment shall be made for installation of 16" DR9 HDPE force main with fittings and appurtenances including end connections, stream crossing, excavation, compaction, backfill, pipe bedding, shoring, dewatering, and testing and inspection as required, in accordance with the contract documents.
 - b) Payment shall be per linear foot of force main installed by open cut. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline.
4. Bid Item 6d: Install 24" HDPE Force Main by Open Cut
 - a) Payment shall be made for installation of 24" DR9 HDPE force main with fittings and appurtenances including reducer, end connection, excavation, compaction, backfill, pipe bedding, shoring, dewatering, and testing and inspection as required, in accordance with the contract documents.
 - b) Payment shall be per linear foot of force main installed by open cut. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline.
5. Bid Item 6e: Install 24" HDPE Casing w/ 16" HDPE Carrier Pipe Force Main by Horizontal Directional Drill
 - a) Payment shall be made for installation of 24" DR9 HDPE casing installed by horizontal directional drill complete with 16" DR9 HDPE carrier pipe. Payment shall include, but not be limited to, excavation, compaction, backfill, shoring, dewatering, insertion of carrier pipe, and testing and inspection as required, in accordance with the contract documents.
 - b) Payment shall be per linear foot of force main installed by horizontal directional drill. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline.
6. Bid Item 6f: Install Force Main Bypass Connection
 - a) Payment of the lump sum price for the force main bypass connection shall include all site clearing, grubbing, grading, removal of excess excavated materials from the site and disposal at approved locations, excavation, compaction, and all other necessary materials, work, and equipment required to complete installation in accordance with the contract documents.

- b) The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.

7. Bid Item 6g: Rock Bore for Horizontal Directional Drill

- a) Rock Bore shall include competent rock, partially weathered rock (PWR), and auger-refusal materials encountered during HDD operations that require specialized rock boring methods.
- b) Payment shall be made at the contract unit price per linear foot of Rock Bore. Payment shall include all labor, equipment, tooling, drilling fluids, reaming, steering, casing installation, carrier pipe installation, disposal, and incidentals necessary to complete the work.

G. Bid Item 7: Site Development

- 1. Payment of the lump sum price for pump station site development shall include all site clearing, grubbing, grading, removal of excess excavated materials from the site and disposal at approved locations, excavation, compaction, and all other necessary materials, work, and equipment required to complete sitework and other general construction items accordance with the contract documents.
- 2. The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.

H. Bid Item 8: Access Road

- 1. Payment of the lump sum price for access road construction shall include all site clearing, grubbing, grading, excavation, compaction, and all other necessary materials, work, and equipment required to complete construction of the access road.
- 2. The Contractor shall be paid based on percentage completion in accordance with the approved schedule of values, based on the percentage of labor and materials incorporated into the work for each payment item and upon and Owner and Engineer's verification.

I. Bid Item 9: Retaining Wall

- 1. Payment of the unit price for retaining wall shall include all clearing, grubbing, grading, excavation, compaction, tiebacks, rear wall drainage and all other necessary materials, work, and equipment required to complete construction of the retaining wall.

2. Payment shall be per linear foot of retaining wall installed at the locations shown on the contract drawings. Wall length shall be measured by actual linear feet in place measured along the top of wall.
- J. Bid Item 10: Storm Water Installation
1. Bid Item 10a: 18" Concrete Headwall
 - a) Payment of the unit price for concrete headwall shall include, but not be limited to, wingwalls, apron, rebar, excavation, compaction, testing and all other necessary materials, work, and equipment required to complete installation of the headwall.
 - b) Payment shall be per headwall installed.
 2. Bid Item 10b: 24" Concrete Headwall
 - a) Payment of the unit price for concrete headwall shall include, but not be limited to, wingwalls, apron, rebar, excavation, compaction, testing and all other necessary materials, work, and equipment required to complete installation of the headwall.
 - b) Payment shall be per headwall installed.
 3. Bid Item 10c: 18" RC Pipe
 - a) Payment of the unit price for 18" reinforced concrete pipe installation shall include, but not be limited to, excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
 - b) Measurement shall be per linear foot of reinforced concrete pipe installed. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline.
 4. Bid Item 10d: 24" RC Pipe
 - a) Payment of the unit price for 24" reinforced concrete pipe installation shall include, but not be limited to, excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
 - b) Measurement shall be per linear foot of reinforced concrete pipe installed. Pipe length shall be measured by actual linear feet in place measured along the pipe centerline.
 5. Bid Item 10e: Concrete Spillway

- a) Payment of the unit price for concrete spillway construction shall include all concrete, rebar, joints, finishing and all other necessary materials, work, and equipment required to complete installation of the spillway.
 - b) Payment shall be per concrete spillway installed.
- 6. Bid Item 10f: 4' Diameter Storm Water Manhole
 - a) Payment of the unit price for 4' diameter precast concrete storm water manholes shall include excavation, compaction, backfill, shoring, dewatering, surface repairs, testing, and inspection as required, in accordance with the contract documents.
 - b) Payment shall be per manhole installed.
- 7. Bid Item 10g: Modify Existing Storm Water Manhole
 - a) Payment of the unit price for modification of existing storm water manhole shall include, but not be limited to, removal of existing pipe, installation of new pipe, grout filling and finishing of pipe, raising ring and cover to proposed elevation and all other necessary materials, work, and equipment required to complete modification to the existing manhole.
 - b) Payment shall be per manhole modified.
- K. Bid Item 11: Electrical Improvements
 - 1. Payment of the lump sum price for electrical improvements shall include all labor, materials, and equipment as necessary to construct the electrical work, as specified by the contract documents. The price shall include, but not be limited to:
 - a) Location, removal, and relocation of existing wiring, conduits, poles, and equipment as specified and shown on the drawings.
 - b) Furnishing and installing temporary power and control wiring, conduits, poles, and equipment as required to maintain operation of any and all existing facilities whose power supply may be affected by construction activities.
 - c) Electrical distribution panels, control panel installations, transformers, wires, conduits, poles, junction boxes, handholes, raceways, duct banks, disconnects, and lighting.
 - d) Installation and testing of grounding system.
 - e) Installation and testing of lightning protection system.
 - f) Testing and acceptance.

- g) All other necessary materials, work, and equipment required to complete electrical installation in accordance with the contract documents, but not included as part of another bid item.

L. Bid Item 12: Erosion Control

- 1. Payment of the lump sum price for erosion control shall include all materials, work, and equipment necessary to furnish, install, and maintain erosion control measures required for the lawful completion of the construction, including but not be limited to silt fencing, stone outlets, inlet protection, rip rap aprons, establishing ground cover, and removal of erosion control measures at the completion of construction, as specified and shown on the drawings.

M. Bid Item 13: Trench Rock Excavation

- 1. Payment shall be made for rock excavation encountered during installation of force mains, gravity sewers, storm drainage facilities, manholes, air release valve manholes, and appurtenant utility structures.
- 2. Rock excavation shall include competent rock, partially weathered rock (PWR), auger-refusal material, and boulders requiring ripping, hoe-ramming, drilling, blasting, or other specialized removal methods.
- 3. Measurement shall be made in cubic yards of rock excavation within the authorized excavation in place within the authorized excavation limits. Quantities shall be determined by cross-sections, average-end-area calculations, or other methods approved by the Engineer.
- 4. No payment shall be made for over-excavation beyond the authorized limits.
- 5. Payment shall include excavation, drilling, blasting (where permitted), hoe-ramming, removal, hauling, disposal, and all labor, equipment, tools, and incidentals required to complete the work.
- 6. No separate payment shall be made for over-excavation, dewatering, shoring, stabilization, bedding, backfill, or restoration.

N. Bid Item 14: Undercut and Replace Unsuitable Material with Select Backfill

- 1. Measurement shall be made in cubic yards of unsuitable material excavated and removed below the planned excavation bottom as directed and approved by the Engineer.
- 2. Unsuitable material shall include excessively wet, soft, unstable, pumping, organic, or otherwise unsuitable soils which cannot adequately support the proposed construction.

3. Payment shall be made for unsuitable material excavated and removed below the planned bottom of excavation when directed or approved by the Engineer.
4. Payment shall include excavation, removal, disposal, furnishing approved replacement material, placement, compaction, and all incidentals required to complete the work.
5. No separate payment shall be made for replacement of unsuitable material resulting from inadequate dewatering, over-excavation, or Contractor means and methods.

O. Bid Item 15: Instrumentation & Control Integration Allowance

1. Allowance for Instrumentation & Control Integration by CITI, Inc. for all labor, materials, and equipment as necessary for instrumentation & control integration, as specified by the contract documents. Contractor is responsible for the payment of this item. Any unspent portion of the allowance at the completion of the project will be credited back to the Owner. If the actual instrumentation & control integration cost exceeds the allowance, the Contractor shall provide documentation to support the additional cost, and the Owner will compensate the Contractor for the difference.

P. Bid Item 16: Henderson County Electrical Trade Permit Fee Allowance

1. Allowance for Henderson County Electrical Trade permit fee required for the execution of the ITT Pump Station Replacement project, as specified in the contract documents. Allowance shall cover all costs associated with obtaining necessary electrical trade permit to perform the work outlined in the Contract. Contractor is responsible for the payment of this fee and for ensuring that required permit is obtained prior to the commencement of relevant work activities. Actual cost of the permit fee will be based on the actual fee assessed by the permitting authority. Any unspent portion of the allowance at the completion of the project will be credited back to the Owner. If the actual permit fee exceeds the allowance, the Contractor shall provide documentation to support the additional cost, and the Owner will compensate the Contractor for the difference.

1.7 ITEMS NOT PAID FOR:

- A. **No payment will be made for any item not specifically listed in the Bidding Schedule.** All ancillary items required for a complete, functioning, treatment system installation will be the responsibility of the Contractor to include in the cost of line items listed on the Bidding Schedule. Specific items which will NOT be paid for include, but are not limited to the following:
1. **Except for Bid Item 13, Trench Rock Excavation, and Bid Time 6g, Rock Bore for Horizontal Direction Drill, all excavation shall be considered unclassified.** Neither the Owner nor the Engineer assumes responsibility for subsurface conditions, including unyielding material, ground water, and existing utilities not indicated or show on the Drawings.

2. All Clearing, Grubbing, Grading, and Excavation shall be included in the cost of line items listed on the Bidding Schedule and no separate payment shall be made. This shall include storing of topsoil and disposal of debris. No additional payment will be made for any clearing or excavation outside areas indicated on plan sheets which may be required for installation of piping, structures, or equipment.
3. No additional payment for backfill or trench stabilization stone shall be made except where specifically noted above. Contractor shall be required to furnish acceptable bedding, fill, and stabilization materials as part of the total cost of work and no separate payment for these items will be made.
4. Repairing damaged utilities will be at the Contractor's expense and no compensation therefore will be allowed.
5. Repairing of damaged facility roads will be at the Contractor's expense and no compensation therefore will be allowed.
6. Shoring, bracing, sheeting, etc., installed where required for trench stabilization and protection of adjacent roads, utilities, and structures shall be included in the Base Bid and no separate payment will be made thereof.
7. No payment will be made for restocking fees incurred by the Contractor due to excess materials. Contractor is advised to include anticipated restocking fees for excess materials, including those due to unforeseen site conditions, in the total cost of work.

END OF SECTION 01026

SECTION 02213 – ROCK AND BOULDER EXCAVATION

PART 1 – GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and perform excavation and disposal of rock and boulders.
- B. Blasting will be permitted only when specifically authorized in writing by the Engineer and all preparation requirements have been fulfilled.
- C. Contractor shall secure all local, county, and state permits and licenses prior to commencing any blasting operations. Copies of approved permits and licenses shall be submitted to Engineer.
- D. Contractor shall be responsible for damages resulting from blasting operations to the extent caused by Contractor's negligence.

1.2 RELATED WORK

- A. Earth excavation and trenching is included in Section 02221.

1.3 DEFINITIONS

- A. Rock excavation shall mean the removal of rock which, as determined by the Engineer based on the criteria specified herein, requires its removal drilling and blasting, wedging, sledging, or barring, and which cannot be removed by the following equipment:
 - 1. Trenches – Tracked excavator with a bucket curling force of at least 18,300 pounds.
 - 2. Boulders or masses of rock exceeding ½ cubic yards in volume which, as determined by the Engineer based on the criteria specified herein, require blasting for removal.
- B. Rock which can be excavated at a reasonable rate with trench excavation equipment shall be considered as earth.
- C. Boulders up to ½ cubic yard in volume which can be removed without resorting to blasting shall be considered as earth.
- D. Loose rock, concrete, or other materials that can be removed by means other than drilling and blasting, but which for any reason the Contractor chooses to remove by drilling and blasting shall be considered as earth.
- E. Partially Weathered Rock (PWR): The geotechnical report defines Partially Weathered Rock (PWR) for subsurface characterization and design purposes. Such classification shall not, by itself, determine eligibility for payment as rock excavation. PWR that can be excavated using conventional earth excavation equipment meeting the requirements of this specification shall be considered earth

excavation. PWR requiring drilling, blasting, hydraulic hammering, or other approved rock-removal methods shall be classified as rock excavation and measured for payment under the applicable rock excavation bid item.

1.4 BLASTING SURVEY

- A. Pre-blasting and post-blasting surveys shall be conducted by Contractor and reported for all major structures within the influence range of any blasting operations or within a minimum of **300** feet, whichever is greater from any blast site. The surveys shall consist of a visual inspection and recording by notes and photographs of structures, to include specifically cracks or other structural damage previously sustained. Pre-blast surveys shall be performed by a third party entity other than the blasting agent, and qualified to perform such surveys. The preconstruction survey will not damage equipment or facilities.
- A. The pre-blast survey shall consist of digital color photographs of all observable exterior and interior surfaces. The photographs shall be compiled in an electronic digital format acceptable to the Engineer and indexed, describing the location of each photograph to facilitate easy comparison of a given structures condition. Existing defects in structures shall be photographed and appropriately documented. The Contractor shall furnish a copy of the survey results, including photographs, to the Engineer, prior to beginning blasting operations.

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Materials used for replacement, stabilization, or backfill associated with rock excavation shall conform to Section 02221 unless otherwise specified.
- B. Structural fill shall be as specified in Section 02221.
- C. Stone, aggregate, or granular materials used in connection with rock excavation shall conform to the NCDOT Standard Specifications for Roads and Structures, latest edition.

PART 3 – EXECUTION

3.1 ROCK QUANTITIES

- A. Measurement and payment for rock excavation shall be in accordance with Section 01026, Bid Item 13 – Trench Rock Excavation.
- B. Rock excavation quantities shall be measured in cubic yards within the authorized excavation limits. Quantities shall be determined by cross-sections, average-end-area calculations, or other methods approved by the Engineer.
- C. No payment shall be made for over-excavation beyond the authorized limits.
- D. Payment shall include all labor, equipment, drilling, blasting, hoe-ramming, removal, hauling, disposal, and incidentals necessary to complete the work.

- E. Quantities and payment shall be subject to verification by the Engineer.

3.2 MEASUREMENT OF ROCK BORE FOR HORIZONTAL DIRECTIONAL DRILL

- A. Rock Bore for Horizontal Directional Drill shall be measured in linear feet along the installed drill alignment through material meeting the Contract definition of rock.
- B. The limits of payable Rock Bore shall be determined by the Engineer based on a combination of:
 - 1. Contractor drilling logs,
 - 2. Geotechnical information,
 - 3. Actual drilling conditions,
 - 4. Tooling required to advance the bore, and
 - 5. Other field observations deemed appropriate by the Engineer.
- C. Rock Bore shall include drilling through competent bedrock and partially weathered rock requiring rock-drilling tooling, including roller cone bits, downhole hammer systems, or other Engineer-approved rock tooling.
- D. No separate payment will be made for isolated cobbles, gravel, or soils that do not require rock-drilling methods.
- E. Mixed-face drilling shall be measured as Rock Bore only for those portions of the bore requiring specialized rock-drilling methods, as determined by the Engineer.
- F. Payment shall include all labor, equipment, tooling changes, drilling fluid modifications, steering, removal of cuttings, disposal, and incidentals necessary to complete the Rock Bore.

3.3 BLASTING

- A. Prior to commencing any blasting operations, the Contractor shall notify the Engineer and the official from the list below (if applicable) and obtain blasting permits as required. The Contractor must furnish certification of insurance specifically covering any and all obligations assumed pursuant to the use of explosives.

BLASTING PERMITS:

City of Asheville	FIRE MARSHAL (828-259-5636)
Biltmore Forest	PUBLIC WORKS DIRECTOR (828-274-3919)
Black Mtn. & Montreat	FIRE DEPT. (828-669-8074)
Town of Weaverville	FIRE MARSHAL (828-645-3500)

Buncombe County	FIRE MARSHAL (828-250-6620)
Town of Woodfin	TOWN MANAGER (828-253-4887)
Town of Mills River	FIRE AND RESCUE (828-891-7959)
Town of Fletcher	FIRE DEPT. (828-684-0864)
Henderson County	FIRE MARSHAL (828-698-6161)

- B. Obtain all required permits from authorities having jurisdiction prior to blasting operations.
- C. Contractor shall not blast within any rights-of-way maintained by a public agency without approval from the controlling agency and only in accordance with their respective requirements.
- D. All blasting operations shall be conducted by qualified persons in full compliance with all laws, regulations, local ordinances, and with all possible care to avoid injury to persons and property. At least 24 hours in advance, notice shall be given in writing to all tenants and residents within 2,000 feet of the work before blasting.
- E. Care shall be taken to avoid damage to utilities or other structures above and below ground. Notify authorized representatives of all utilities which might be affected by blasting operations at least 24 hours before any blasting is performed. Unless otherwise permitted, no blasting will be allowed prior to 8:00 AM or after 4:00 PM, local time.
- A. In general, blasting for removal of rock along the pipe centerline shall be done prior to any trench excavation. Where the initial blasting fails to fracture rock so that trench excavation can be performed, additional spot drilling and blasting may be authorized. In such cases, all affected areas shall be covered by suitable blasting mats to limit the spread of rock/soil.
- F. Storage, handling, and use of explosives shall comply with all applicable regulations and approved safety procedures.
- G. If rock below the intended blasting grade is shattered by blasting, caused by holes drilled too deep, or too heavy charges of explosives or any other circumstance due to blasting; and if, in the opinion of the Engineer, the shattered rock is unfit for subgrade, the rock shall be removed and the excavation refilled with structural fill at no additional cost to the Owner.

3.2 BLASTING MONITORING

- A. Seismographs shall be set at adjacent structures and other areas designated by the Engineer for monitoring blasting. Blast monitoring shall be conducted by persons trained in the use of seismographs, records shall be analyzed, and results reported by persons familiar with analyzing and reporting the frequency content of a seismograph record. Vibration limits shall not exceed those determined during the pre-blasting survey or applicable regulatory limits, whichever is more stringent.

In no case shall peak particle velocity exceed 1.0 inch per second and/or a frequency of 20 Hz unless otherwise approved.

- B. All blasting operations conducted within the anticipated zone of influence, but not less than 300 feet of existing structures shall be monitored. In areas where several structures are located adjacent to blasting, a sufficient number of seismic units equipped to provide a printed readout shall be deployed to allow for comprehensive documentation of blasting operations. The resultant seismic data shall be provided to the blasters to allow for blast design changes based on the location of the next blast and the resultant vibration levels for the previous shot. A copy of all resultant seismic data shall be provided to the Engineer, immediately after the shot.
- C. The pre-blast survey, vibration and over pressure monitoring shall be conducted by a professional seismic consultant, who is licensed and certified for this work.
- D. No separate payment will be made for the pre-blast survey, vibration and over pressure monitoring, the post-blast survey, nor any other work related to the blasting or excavation of rock. Costs shall be included in Bid Item 13-Tench Rock Excavation and Bid Time 6g – Rock Bore, as applicable.

3.3 DISPOSAL AND REUSE OF ROCK

- A. Disposal shall comply with all applicable federal, state, and local regulations.
- B. Provide documentation of disposal upon request by the Engineer.
- C. Excavated rock and boulder material exceeding six inches in the largest cross-sectional dimensions shall not be used for backfilling unless otherwise approved. Rock of six inches and smaller dimensions may be used in the fill material, except that rock shall have a maximum cross-sectional dimension of 1-1/2 inches within 12 inches of a pipeline, and 3-1/2 inches within 12 inches of a road subgrade or a structure. All rock used in backfill shall be mixed with granular backfill materials to achieve the required density.
- D. All rock not used for backfilling shall be removed from the site and disposed of by the Contractor at no additional cost to the Owner. No disposal on Owner property or rights-of-way shall be permitted.
- E. The Contractor shall advise the Engineer in writing of the disposal location and submit a copy of the agreement with the disposal site property owner.
- F. Rock used in backfill shall be free from organic matter, muck, or marl.

END OF SECTION 02213

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SECTION 02221 – EXCAVATION, BEDDING AND BACKFILL FOR PIPE AND STRUCTURES

PART 1 – GENERAL

1.1 SCOPE

- A. The work specified in this Section includes requirements for excavation for trenching and support of sending and receiving pits, and temporary excavations. The Contractor shall design, furnish, install, and maintain a system of supports, including all bracing and associated items, to retain excavations in a safe manner and to control ground movements. Upon completion of the required construction the system of supports shall be completely removed unless written approval is received from the Engineer, and the excavation and staging area sites restored as discussed herein.
- B. The Contractor shall furnish all labor, materials, equipment and incidentals to perform all excavation work to include: necessary clearing; grubbing; preparation of the site; site grading; fencing and signing; construction staging areas; design and construction of excavation support systems; sheeting, shoring, and protection work; design and construction of thrust blocks; disposal of debris and excavated material, excavation dewatering; surface water control, and ground water control; backfilling; preparation of sub-grades; and site restoration.
- C. Earth excavation shall be included in the Base Bid unless otherwise identified. Rock excavation shall be measured and paid for in accordance with Section 02213 – Rock and Boulder Excavation.
- D. Clearing and grubbing not directly associated with excavation work are specified in Section 02110. Demolition of existing structures and equipment is specified in Section 02065
- E. All excavations and support systems shall conform to applicable OSHA excavation, trenching, and shoring standards which are contained in the U.S. Code of Federal Regulations 29 (C.F.R.) 1926.650-1926.653. In the event of a conflict, comply with the more restrictive applicable requirements.
- F. Excavation support at trenchless crossings shall not impede the flow of traffic along the road or railroad being crossed.
- G. The Contractor shall be responsible for sizing the excavations and shafts. The size of the shafts shall, however, be adequate for construction of any structures indicated on the Drawings and to provide adequate space to meet the Contractor's work requirements for his/her selected methods of construction. Shaft excavations larger than those shown on the Drawings will be subject to the approval of the Engineer and the Owner, and any modifications to the approved traffic control measures shall be obtained and carried out at no additional cost to the Owner.
- H. The Contractor shall examine the site and review available subsurface borings and undertake his own subsurface investigations prior to submitting his bid,

taking into consideration all conditions that may affect his work. The Owner and Engineer make no representation as to the subsurface characteristics at locations other than at boring locations shown and at the time the subsurface investigation was made. This provision shall not eliminate or modify the Contractor's rights under the Differing Site Conditions provisions of the Contract Documents.

- I. Prior to construction, the Contractor shall be responsible for taking sufficient measurements, horizontal and vertical, to ensure that all existing facilities, which includes but is not limited to pavement, curbs gutters and drainage facilities are restored to their original lines and grades.
- J. Wherever a compaction percent is referred to herein it shall mean at least that percent of maximum density determined in accordance with the test method specified herein (ASTM D698 or AASHTO T-180, as applicable).
- K. All of the work herein, except where supplemental unit prices are specifically provided under Bid Item 13, Trench Rock Excavation, and Bid Item 14, Undercut and Replace Unsuitable Material with Select Backfill, shall be included in the unit and lump sum pricing of the work.

1.2 SUBMITTALS

- A. Shop drawings and submittals for this section shall be for informational review.
- B. Shop Drawings for support of temporary excavations and trenches: Submit shop drawings detailing pipe, gaskets, fittings, bedding material, restoration material, equipment, and construction methods to be used for excavation support operations as specified herein and as shown on the Contract Drawings.
- C. Shop Drawings for sending and receiving pits: The excavation support systems for sending and receiving pits shown on the contract drawings are the minimum design considered acceptable for this project. The Contractor shall construct the systems as shown on the contract drawings or design and construct an alternate system in accordance with the requirements herein.
 - 1. Submit shop drawings detailing material types, equipment, and construction methods to be used for construction of the excavation support systems as shown on the contract drawings. Shop drawings shall also detail all member connections and tunnel portal openings.
 - 2. Submit design calculations and shop drawings detailing material types, equipment, and construction methods to be used for construction of an alternate excavation support system. Shop drawings shall also detail all member connections and tunnel portal openings.
 - 3. Submit thrust block design calculations and shop drawings for all sending pits.

1.3 DEFINITION

- A. Unsuitable materials include soils that are soft, unstable, organic, or otherwise incapable of supporting the Work as determined by the Engineer.
- B. Class IV and Class V materials shall not be used for bedding, haunching, or initial backfill under any circumstances.

1.4 EXCAVATION STABILIZATION

A. General

1. All excavations shall be stabilized to protect the safety of workers in the excavations from earth slides and cave-ins, and to protect the integrity of the pipe or structure being constructed.
2. Groundwater control is necessary for creating stable foundations for pipes and structures, and for stabilizing excavation slopes.
3. The contract work may include deep gravity sewer main, force main, and structure excavations, high groundwater tables, and excavation adjacent to and below streams.
4. The type of excavation stabilization systems to be used shall be selected by the Contractor, based upon geotechnical characteristics, excavation depth, groundwater elevation, proximity of existing structures, area available for excavation storage, use of excavation area, etc.
5. All backfill shall be placed and compacted as specified herein.
6. Excavated material shall not be stored outside the designated permanent and temporary rights-of-way or on private properties.
7. Dewatering: Maintain groundwater a minimum of 3 feet below the bottom of excavation or as required by the geotechnical report, whichever is more restrictive.

B. Excavation, Sheet piling, and Bracing

1. Furnish, install, maintain, and remove such sheet piling and bracing systems as may be required to support the sides of excavations, to prevent any movement which could in any way diminish the width of the excavation below that necessary for proper construction; and to protect adjacent structures from undermining, settling, or other damage.
2. For trench sheet piling for pipes, no sheet piling closer than one pipe diameter or two feet (whichever is greater) from the outside edge of the pipe shall be withdrawn if driven below mid-diameter of any pipe; and no sheet piling shall be cut off at a level lower than the top of any pipe unless otherwise approved by the Engineer. Any sheet piling beyond these limits which is withdrawn shall be done in a manner in which the sheet piling slides smoothly out of position without any disturbance of adjacent bedding. The remaining hole shall immediately be filled by hand with sand. If,

during the progress of the work, the Engineer decides that selected sheeting should be left in place, he may direct the Contractor in writing and compensation shall be as provided in the Contract Documents. Engineer decisions regarding sheeting and bracing shall be based on project safety and protection requirements.

3. All sheeting and bracing not left in place shall be carefully removed in such a manner as not to endanger workers, the construction, other structures, utilities, piping, or property. For structures, all sheeting and bracing shall be removed after completion of the substructure. All voids left or caused by withdrawal of sheeting shall be immediately backfilled with sand and compacted.
4. The right of the Engineer to order sheeting and bracing to be left in place shall not be construed as creating any obligation on his part to issue such orders; and his failure to exercise his right to do so shall not relieve the Contractor from liability for damages to persons or property occurring from or on the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient sheeting and bracing to prevent any caving or moving of the ground.
5. The Contractor shall construct the cofferdams and sheeting outside the neat lines of the foundation unless indicated otherwise to the extent he deems it desirable for his method of operation. Sheeting shall be plumb and securely braced in position. Sheeting, bracing, and cofferdams shall be adequate to withstand all pressures to which they will be subjected. Pumping, bracing, and other work within the cofferdam shall be done in a manner to avoid disturbing any construction of the new work. Any movement or bulging which may occur shall be corrected by the Contractor so as to provide the necessary clearances and dimensions for the new work.
6. Drawings of the cofferdams, sheeting and bracing, and design computations shall be submitted to the Engineer for information; and construction shall not be started until such drawings are received. The drawings and computations shall be prepared and sealed by a Professional Engineer registered in North Carolina; and shall be in sufficient detail to disclose the method of operation for each of the various stages of construction, if required, for the completion of the new work substructures.
7. Sheeting and bracing requirements are further defined in OSHA Standards, Subpart P, Part 1926 of the Code of Federal Regulations.

C. Moveable Earth Retaining Devices

1. The Contractor may, at his option, use moveable earth retaining devices (trench boxes) to stabilize excavations for pipes where these devices can be effectively used. Moveable earth retaining devices shall not be considered as a substitute for sheeting systems specifically called out on the drawings.

2. Trench box interior widths shall be at least four feet wider than the outside diameter of the gravity sewer main pipe and force main to permit space for exterior jointing and compaction of pipe bedding. The lower edges of trench boxes shall not be deeper than the mid-diameter of the pipe.
3. Trench boxes that are not commercial product provided by a firm regularly engaged in the production of such equipment shall be designed by a Professional Engineer Registered in North Carolina. Design drawings and computations for non-commercial trench boxes shall be submitted to the Engineer for information prior to construction.

1.5 EXCAVATION DEWATERING

- A. Structures, casings, and pipes may be constructed below the natural groundwater table and adjacent streams. The Contractor shall construct and place all pipes, concrete structures, structural fill, and crushed stone bedding in-the-dry. The Contractor shall maintain the subsurface water level a minimum of three (3) feet below subgrade at all times unless otherwise specified in the geotechnical report. For purposes of this Contract, "in-the-dry" is defined as no free water inside the excavation. Dewatering operations shall comply with applicable permits and erosion and sedimentation control requirements.
- B. The Contractor shall, at all times during construction, provide and maintain proper equipment and facilities to lower the groundwater table below the excavation, to remove promptly and dispose of properly all ground and rain water entering excavations, and to keep such excavations dry so as to obtain a satisfactory undisturbed sub-grade foundation condition until the fill, structure, or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural elevations. All excavations shall be diked and ditched so as not to permit the entry of any surface drainage water.
- C. Pipes, casings, and structures shall not be installed in water or submerged within 24 hours after being placed. Water shall not flow over new concrete within four (4) days after placement. Pipes not meeting this requirement shall not be paid for, and shall be removed and reinstalled when the excavation is dry and stabilized as directed by the Engineer.
- D. In no event shall water rise to cause unbalanced pressure on structures until the concrete or mortar has set at least 24 hours. The Contractor shall prevent flotation of pipes by promptly placing and compacting backfill to project specifications.
- E. Dewatering shall at all times be conducted in such a manner as to preserve the natural undisturbed bearing capacity of the sub-grade soils at the proposed bottom of the excavation.
- F. The Contractor shall furnish all materials and equipment and perform all work required to install and maintain the drainage systems he proposes for handling groundwater and surface water encountered during construction of structures, pipes, and compacted fills.

- G. The Contractor shall provide for the disposal of the water removed from the excavation in such a manner as shall not cause erosion, siltation, or turbidity increases in any water course; injury to public health; degradation or damage to private or public property or to any portion of the work completed or in progress, or to roads and streets; or cause any impediment to the reasonable use of the site by others.
- H. The Contractor shall be responsible for correcting any disturbance to natural bearing soils or damage to structures caused by an inadequate dewatering system or by interruption of the continuous operation of the system as specified.

1.6 RELATED SECTIONS

- A. Section V – Special Conditions – Special Provision Detail Sheets for property owner fill requirements (reproduced below for reference).
 - 1. Per Wild River Corp (Parcel 9642-29-9794) Special Provisions Detail Sheet:
 - a) “MSD Contractor must inform OTCO if any fill dirt will be used so that they can review the source and approve its use. MSD Contractor to go through Adam.wallace@sierranevada.com.”

PART 2 – PRODUCTS

2.1 MATERIALS

- A. General:
 - 1. Compaction Standards:
 - a. Structural areas and roadways: 95% Modified Proctor (AASHTO T-180)
 - b. General trench backfill: 95% Standard Proctor (ASTM D698)
 - c. Top 6 inches under pavement: 100% Modified Proctor

In case of conflict, the more stringent compaction requirement shall govern.

- 2. Materials for use as imported fill and backfill shall be as described below. For each material, the Contractor shall notify the Engineer of the source of the material and, if requested, shall submit laboratory analyses or other certification of the material.
- 3. All timber, structural steel, and steel sheet piling used for the supporting systems, whether new or used, shall be sound and free from defects that may impair their strength.
- 4. Concrete shall conform to ASTM C33 and ASTM C150 unless otherwise approved.

5. Structural steel shall conform to ASTM A36 or ASTM A252 unless approved otherwise. If steel is used, no members with permanent deformations are to be provided.
 6. All timber shall be structural grade with a minimum allowable flexural strength of 1100 psi.
 7. Steel sheet piling shall conform to ASTM A328 or ASTM A572 unless approved otherwise.
 8. Use soils free of organic matter, refuse, rocks and lumps greater than six inches in diameter, and other deleterious matter.
- B. Embedment Materials: For the purpose of this specification, soils to be used as embedment materials are grouped into five classes according to soil properties and characteristics. Where a conflict exists between ASTM D698 and AASHTO T-180, the more restrictive requirement shall govern unless otherwise directed by the Engineer.
1. Class I – Crushed stone bedding shall consist of well graded angular stone material meeting the requirements of ASTM D448 size No. 67.
 2. Class II – Coarse sands and gravels with maximum practical size of 44 mm (1-1/2 inch), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class.
 3. Class III – Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Soil Types GM, GC, SM, and SC are included in this class.
 4. Class IV – Silt, silty clays, and clays, including inorganic clays and silts of medium to high plasticity and liquid limits. Soil Types MH, ML, CH, and CL are included in this class. These materials are not recommended for bedding, haunching, or initial backfill.
 5. Class V – This class includes the organic soils, OL, OH, and PT, as well as soils containing frozen earth, debris, rocks larger than 40 mm (1-1/2 inches) in diameter, and other foreign materials. These materials are not recommended for bedding, haunching, or initial backfill.
- C. Topsoil: Natural, friable soil free of subsoil, stumps, rocks larger than 2 inches in diameter, weeds, and other material detrimental to plant growth.
- D. Fill Beneath Pavement: Fill material used beneath pavement and for road shoulders shall be Class II or III.
- E. General Fill: General fill material not otherwise specified shall be Class II or III.
- F. Select Backfill: Select Backfill shall consist of Class I, Class II, or approved Class III material meeting the requirements of this Section and approved by the

Engineer for replacement of unsuitable soils. Select Backfill furnished under Bid Item 14 shall be used only where directed by the Engineer.

2.2 STONE AND BRICK

A. Granular Bedding Material:

1. All bedding material shall be angular, clean washed crushed stone graded in accordance with Size #67 in ASTM D-448 for "Standard Sizes of Coarse Aggregate" (NCDOT Standard Size #67).
2. Bedding material will be used only as instructed in the Specifications and/or as specifically directed by the Engineer.

B. Stone Stabilization Material:

1. All stone stabilization material shall be angular, clean washed crushed stone graded in accordance with standard sizes #467 in ASTM D-448 (NCDOT Standard Size #467M).
2. Stabilization material will be used only as instructed in the specifications and/or as specifically directed by the Engineer.

C. Silt Check Dam Material:

1. Shall be coarse angular, clean washed crushed stone, gravel, or rock, well graded, and ranging in sized from 2-inch through 6-inch, (NCDOT stone for erosion control Class A).

D. Rip Rap:

1. All rip rap shall consist of clean field stone or rough unhewn quarry stone, resistant to the action of air and water, varying in weight from 25 to 250 pounds with 60% weighing a minimum of 100 pounds each and no more than 5% weighing less than 50 pounds each, (see details for specific rip rap to be placed). Rip Rap will be placed from a minimum of 4.0 feet below the toe of the bank to top of the bank in areas determined by field conditions. Rip rap thickness shall be 1 ½ times the diameter of the largest stones used, or 2.0 feet, whichever is greater.

E. Brick:

1. Brick shall be clay or shale brick meeting the requirements of ASTM C-62 for Grade SW, except as otherwise provided below.
2. Brick shall be of uniform standard commercial size, with straight and parallel edges and square corners. They shall be burned hard and entirely true, free from injurious cracks and flaws, tough, strong, and shall have a clear ring when struck together. The sides, ends and faces of all brick shall be plane surfaces at right angles and parallel one to the other.

3. Concrete brick may be used in lieu of clay or shale brick for adjustment of water meter vaults and/or water valve vaults. Concrete brick shall meet the requirements of ASTM C-55 for Grade S-II except that the absorption of brick used in minor drainage structures shall not exceed 10 lbs./ft.

PART 3 – EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Commence excavations only after shop drawings have been reviewed and accepted by the Engineer.
- B. Methods of construction for excavations shall be such as to ensure the safety of the Work, Contractor's employees, Engineer and Owner's employees and inspectors, the public, and adjacent property and improvements, whether public or private.
- C. Before beginning construction at any location of this project, adequately protect existing structures, utilities, trees, shrubs, and other existing facilities. Design excavation support systems to limit deformations that could damage facilities including utilities and structures. The repair of or compensation for damage to existing facilities shall be at no additional cost to the Owner.
- D. As a minimum, place fencing, gates, lights, and signs as necessary around the excavations and staging areas to provide for public safety.
- E. Excavations shall provide adequate working space and clearance for the work to be performed therein, and for installation and removal of concrete forms, trench boxes, sheeting, bracing, or shoring. In no case shall excavation faces be undercut for extended footings.
- F. Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.
- G. Except where exterior surfaces are specified to be damp-proofed, monolithic concrete manholes and other concrete structures, or parts thereof, which do not have footings and extend beyond the outside face of exterior walls, may be placed directly against excavation faced without the use of outer forms, provided that such faces are stable, and also provided that a layer of 10-Mil polyethylene film is placed between the earth and the concrete.
- H. Backfilling and construction of fills and embankments during freezing weather shall not be done except by permission of the Engineer. No backfill, fill, or embankment materials shall be installed on frozen surfaces, nor shall frozen materials, snow, or ice be placed in any backfill, fill, or embankment.
- I. Conduct all shaft and tunnel construction work, including excavation, shoring, temporary facilities, materials storage, and construction traffic within construction easements established for the project. All work shall be in accordance with the applicable permits.

- J. If unstable material is encountered during excavation, all necessary measures shall be taken immediately to contain it in place and prevent ground displacement.
- K. A concrete working mat shall be constructed in sending pits as needed.
- L. Excavations shall be kept free of water at all times and a stable subgrade shall be maintained. Excavations shall be dewatered in accordance with the project specifications. Where pit dewatering is required, a drainage layer shall be provided under the concrete mat.
- M. All welding shall conform to the applicable provisions of ANSI/AWS D1.1.
- N. Excavated materials suitable for reuse shall be utilized in the Work where practical, subject to approval by the Engineer.
- O. Maximum trench width at pipe springline shall not exceed the limits assumed in pipe design or manufacturer recommendations without approval of the Engineer.

3.2 EXCAVATION AND TRENCHING WORK IN WETLANDS

- A. The construction corridor shall be limited to widths shown on the Drawings within or immediately adjacent to any areas identified as wetlands
- B. Wetlands shall incur no change in preconstruction contours.
- C. The top 6" to 12" of trench shall be backfilled with topsoil.
- D. All excess material is removed to upland areas or off-site.

3.3 SITE PREPARATION

- A. All sites to be occupied by permanent construction or embankments shall be cleared of all logs, trees, roots, brush, tree trimmings, and other objectionable materials and debris. All stumps shall be grubbed. Subgrades for fills and embankments shall be cleaned and stripped of all surface vegetation, sod, and organic topsoil. All waste materials shall be removed from the site and disposed of by and at the expense of the Contractor.
- B. All pipeline rights-of-way shall be cleared of all logs, trees, roots, tree trimmings, and stumps. All such materials shall either be hauled away and disposed of in an approved manner, or ground or chipped onsite; and placed in areas approved by the ENGINEER.
- C. Remove sod and grass before stripping topsoil.
- D. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
- E. Stockpile topsoil away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.

3.4 UNAUTHORIZED EXCAVATION

- A. Except where otherwise authorized, indicated, or specified, all materials excavated below the bottom of concrete walls, footings, slabs on grade, and foundations shall be replaced, by and at the expense of the Contractor, with concrete placed at the same time and monolithic with the concrete above.
- B. Where trenches for pipelines are excavated below the depths shown or required, all such areas shall be backfilled to subgrade using Class I granular materials as specified in Part 2 of this specification.
- C. Over-excavation resulting from Contractor means and methods shall be at Contractor's expense. Over-excavation required due to unsuitable subsurface conditions may be eligible for an equitable adjustment.

3.5 DEWATERING

- A. The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built, or the pipe to be installed therein, is completed to the extent that no damage from hydrostatic pressure, flotation, or other cause will result.
- B. Dewatering for trench excavation shall utilize well-points, sumps and dewatering pumping, or other means selected by Contractor to maintain water in trenches below the subgrade elevations shown on the drawings. Failure to employ effective dewatering methods which result in unstable trench conditions shall not entitle Contractor to any additional compensation to correct this situation and to remove and replace unstable materials with Class I granular materials, or for proper disposal of such unstable materials.
- C. All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and Maintain groundwater a minimum of 3 feet below the bottom of excavation or as required by the geotechnical report, whichever is more restrictive.
- D. Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property. The Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipes or conduits shall be left clean and free of sediment.
- E. Direct discharge of groundwater from trenches into surface water courses shall comply with all requirements of the North Carolina Department of Health & Environmental Control and the approved Sediment and Erosion Control Permit.
- F. Contractor is responsible for dewatering system performance; however, differing site conditions related to groundwater may be addressed per General Conditions.

3.6 SHEETING AND SHORING

- A. Except where banks are cut back on a stable slope, excavation for structures and trenches shall be sheeted, braced, and shored as necessary to prevent caving or sliding.
- B. Install steel sheet piling with the minimum embedment depths as shown on the shop drawings.
- C. Drive in plumb position with each sheet pile interlocked with adjoining piles for its entire length so as to form a continuous diaphragm throughout the length of each run of wall, bearing tightly against original ground. Exercise care in driving so that interlocking members can be extracted without damaging adjacent structures or utilities. The methods of driving, cutting, and splicing shall conform to the shop drawings.
- D. Use templates or other temporary alignment facilities to maintain piling line.

3.7 INTERNAL BRACING SUPPORT SYSTEM

- A. The internal bracing support system shall include wales and struts.
- B. Provide wales and struts as needed to enable them to carry maximum design load without distortion or buckling.
- C. Include web stiffeners, plates, or angles as needed to prevent rotation, crippling, or buckling of connections and points of bearing between structural steel members. Allow for eccentricities caused by field fabrication and assembly.
- D. Install and maintain all bracing support members in tight contact with each other and with the surface being supported.
- E. Coordinate excavation work with installation of bracing. Excavation shall extend no more than 2 feet below any brace level prior to installation of the bracing.
- F. Use procedures that produce uniform loading of bracing member without eccentricities or overstressing and distortion of members of system.

3.8 STABILIZATION

- A. Sub-grades for concrete structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; free from mud and muck; and sufficiently stable to remain firm and intact under the feet of the workmen.
- B. Subgrades for concrete structures or trench bottoms, which are otherwise solid but which become mucky on top due to construction operations, shall be reinforced with one or more layers of crushed rock or gravel. The stabilizing material shall be spread and compacted to a depth of not more than four inches. If the required depth exceeds four inches, the material shall be furnished and installed as specified for granular fills. Not more than ½ inch depth of mud or muck shall be allowed to remain on stabilized trench bottoms when the pipe bedding material is placed thereon.

- C. The finished elevation of stabilized subgrades for concrete structures shall not be above subgrade elevations indicated on the drawings.

3.9 ALIGNMENT, GRADE, AND MINIMUM COVER

- A. The alignment and grade or elevation of each pipeline shall be fixed and determined from offset stakes. Vertical and horizontal alignment of pipes, and the maximum joint deflection used in connection therewith, shall be in conformity with requirements of the section covering installation of pipe.
- B. Where pipe grades or elevations are not definitely fixed by the contract drawings and specifications, trenches shall be excavated to a depth sufficient to provide a minimum depth of backfill cover over the top of the pipe of 48 inches in other locations. Greater pipe cover depths may be necessary on vertical curves, or to provide necessary clearance beneath existing pipes, conduits, drains, drainage structures, or other obstructions encountered at normal pipe grades. Measurement of pipe cover depth shall be made vertically from the outside top of pipe to finished ground or pavement surface elevation, except where future surface elevations are indicated on the drawings.

3.10 TRENCH EXCAVATION

- A. No more trench shall be opened in advance of pipe laying than is necessary to expedite the work. Unless otherwise shown, one block or 400 feet (whichever is the shorter) shall be the maximum length of open trench on any line under construction.
- B. Except where tunneling is indicated on the drawings, is specified, or is permitted by the Engineer, all trench excavation shall be open cut from the surface.
- C. Maximum open trench length shall not exceed 400 feet unless otherwise approved by the Engineer.
- D. When practical, the banks of the trenches shall be cut in vertical, parallel planes equidistant from the pipe center line. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped, provided that such excavation does not endanger or damage adjacent structures or properties. When trench banks are sloped, the portion of the trench that is below the level of 12 inches above the top of the pipeline shall be cut to vertical planes as specified above. The sides of the remaining portion of the trench shall be graded to a slope which is sufficient to produce a stable embankment or stabilized with mechanical reinforcement. Over-depth excavation shall be backfilled with #67 clean stone.
- E. Trench to the lines and grades shown on the drawings. Where elevations are not shown, trench to a depth sufficient to provide at least 48 inches of cover above the top of pipe, unless otherwise specified. Grade trenches to provide a constant slope free of sags and high spots.
- F. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and

embedment. The horizontal distance between such planes, or the overall width of trench, shall not be less than 12 inches on either side of the nominal diameter of the pipe but in no case less than 3 feet, unless shown otherwise on the Plans.

- G. Cutting trench banks on slopes to reduce earth load to prevent sliding and caving shall be done only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits.
- H. Properly brace, sheet, and support trench walls in strict conformance with all pertinent laws and regulations. Provide adequate bracing and shoring to protect adjacent improvements.
- I. Where trench boxes are employed by the Contractor, the width of the trench shall be increased as necessary to provide minimum clearances listed in Section 02221 Paragraph 1.3.C.
- J. Pipe barrel OD shall be measured at the midpoint between the ends. Where "profile" pipe is installed, the OD shall be the larger outside dimension.

3.11 STRUCTURAL EXCAVATION

- A. Excavation for structures shall be sufficiently large for the proper placing of forms and concrete and for dewatering purposes, but shall not be excessively large in horizontal area. Banks may be sloped at a safe angle provided that such excavation does not endanger or damage existing or proposed structures, pipelines, etc. The bottom of the excavation shall be true to the required shape and elevations shown on the plans. No earth backfilling will be permitted under structures unless specifically shown on the plans. Should the Contractor excavate below the elevations shown or specified, he shall fill the void made with thoroughly compacted Class I pipe embedment materials or with Class B concrete at his own expense.
- B. When muck, quicksand, soft clay, organic matter, soils with excessive moisture content or other material unsuitable for foundations are encountered within the limits of the excavation or which extend beyond the limits of the excavation, such materials shall be removed as directed by the Engineer and replaced with Select Backfill, crushed stone or Class B concrete as directed by the Engineer.

Undercut and replacement of unsuitable material below the planned bottom of structure excavation, when directed or approved by the Engineer, shall be measured and paid for under Bid Item 14, Undercut and Replace Unsuitable Material with Select Backfill.

Only unsuitable material excavated and removed below the planned bottom of excavation and the corresponding replacement volume shall be eligible for payment.

No separate payment shall be made for replacement of excavated material determined to be unsuitable for reuse as ordinary backfill, imported backfill required by the Contract Documents, or undercut resulting from inadequate dewatering, over-excavation, or Contractor means and methods.

- C. In all cases where materials are deposited along open excavation, they shall be placed so that in the event of rain, no damage will result to the work or adjacent property.

3.12 MECHANICAL EXCAVATION

- A. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, building, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.
- B. Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated and that trench alignment is such that pipe when accurately laid to specified alignment will be centered in the trench with adequate clearance between the pipe and sidewalls of the trench. Undercutting the trench sidewall to obtain clearance will not be permitted.

3.13 CUTTING CONCRETE SURFACES AND PAVEMENT

- A. Cuts in concrete and asphalt pavements shall be no larger than necessary to provide adequate working space for proper installation of pipe and appurtenances. Cutting shall be started with a concrete saw in a manner which will provide a clean groove at least 1-1/2 inches deep along each side of the trench, and along the perimeter of cuts for structures.
- B. Pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 12 inches in width at any point is left between the cut edge of the pavement and the top edge of the trench. Trench width at the bottom shall not be greater than at the top, and no undercutting will be permitted. Pavement cuts shall be made to and between straight or accurately marked curved lines which, unless otherwise required, shall be parallel to the centerline of the trench.
- C. Pavement removed for connections to existing lines or structures shall not be of greater extent than necessary for the installation.
- D. Where the trench parallels the length of concrete walks and the trench location is all or partially under the walk, the entire walk shall be removed and replaced. Where the trench crosses drives, walks, curbs, or other surface construction, the surface construction shall be removed and replaced between existing joints or between saw cuts as specified for pavement.

3.14 REMOVAL AND RESTORATION OF PAVEMENT AND ROAD SURFACES

- A. All removal and restoration of pavement and road surfaces will be in accordance with the specifications approved by MSD or the North Carolina Department of Transportation, Division of Highways, whichever applies.
- B. All restored bituminous and concrete pavements shall be constructed in accordance with the pavement replacement detail in the plans. Restored

pavement will in all instances be flush and level with existing pavement at the sawed edges, and at existing gutter lines where applicable unless otherwise approved by the Engineer. When pavement repairs do not meet the above criteria or are not performed in a workmanship manner as determined by the Engineer, MSD, or North Carolina Department of Transportation, whichever applies, the contractor will remove and re-perform the restoration as specified.

- C. When cuts are to be made in street rights-of-way, the Contractor shall contact the appropriate owner of the right-of-way or his designated representative before each separate pavement cut is made and secure a permit if not covered under permits obtained by MSD.
- D. Pavement will be replaced as follows. In all pavement cuts either the permanent pavement or a temporary pavement consisting of 1"-1 1/2" of black asphaltic concrete (later to be replaced permanently) will be placed immediately upon completion of the subgrade unless otherwise approved by the Engineer.

1. Specifications for Cutting Pavement:

- a. Unless otherwise approved or required, concrete pavement shall be removed to the nearest expansion or contraction joint. The Contractor will contact MSD and/or D.O.T.'s District Engineer for a determination of the limits of concrete replacement and location of joints. Where sawed joints are allowed, the depth of the sawed cut shall be at least one (1) inch and shall extend at least 1/5 of the depth of the concrete. More depth may be required if necessary to prevent damage to surrounding pavement.
- b. Bituminous pavement shall be cut in a smooth and straight line. Sawing is required on asphaltic concrete. The width of pavement left between the edge of the ditch and the existing edge of the pavement or the front line of the gutter, shall be at least 2 feet. Residual strips of pavement less than 2 feet in width must be removed and replaced. Existing pavement shall be removed on each side of the trench for at least 12 inches beyond top of trench
- c. The Contractor shall remove and replace pavement which, in the opinion of the Engineer, has been cracked or displaced by the operation of the Contractor.

2. Specification For Restoring Concrete Pavement: The concrete used to restore pavement shall have a minimum 28 day compressive strength of 3600 P.S.I. The concrete as placed shall conform to the shape, grade, and finish of the existing pavement and will be one (1) inch deeper than the original pavement including base, but in no instance less than six (6) inches.

3. Specification For Restoring Asphalt Pavement:

- a. All material above the sub-base level shall be hot-mix bituminous concrete conforming to North Carolina Department of

Transportation Standard Specifications for Roads and Structures for both mix design and placement, as shown on the plans.

- b. The asphalt pavement as placed shall be in accordance with the pavement replacement detail shown on the plans. The asphalt shall be placed in lifts not greater than 2 inches and shall be hot mix bituminous concrete binder as shown on the plans. Asphalt pavement resurfacing will be placed with paving machines and/or rollers of a size and type currently approved by the North Carolina Department of Transportation for use on resurfacing contracts.
- c. If a bituminous surfacing overlays a concrete base, the Contractor, at the option of the Engineer, shall replace the concrete to its original thickness, or to a level 2 inches below the finished surface. The Engineer may direct the Contractor to omit all concrete and to replace the pavement with bituminous materials.
- d. Tack coats shall be employed with each lift. Tack coats shall be placed on both horizontal and vertical surfaces (pavement cuts or face of concrete gutters).
- e. Under normal conditions, asphalt binder will be placed in pavement cuts at the end of each work day. The surface course shall be replaced weekly or within five days following completion of pipeline construction along a continuous section of pavement. During inclement weather, the Engineer may permit the use of temporary asphalt (cold mix) to seal the trench until permanent asphalt can be placed.
- f. Thermoplastic marking shall conform to the NCDOT Standard Specifications for Roads and Structures and the work will be performed in accordance with Div 12 of the standard specifications.

3.14 EXCAVATION BELOW PIPE SUBGRADE

- A. Except where otherwise required, pipe trenches shall be excavated per the detail in the plans.
- B. Where rock is encountered, it shall be removed to a depth of six (6) inches or more below the outside of the pipe.
- C. Where rock is excavated below the minimum depths required, voids shall be backfilled with bedding stone at no additional cost.

3.15 ARTIFICIAL FOUNDATIONS IN TRENCHES

- A. Whenever unsuitable or unstable soil conditions are encountered, trenches shall be excavated in pipeline trenches, trenches shall be excavated below grade, and the trench bottom shall be brought to embedment grade with Select Backfill, Class I material, or other material approved by the Engineer.

Undercut and replacement of unsuitable material below the planned trench bottom, when directed or approved by the Engineer, shall be measured and paid for under Bid Item 14, Undercut and Replace Unsuitable Material with Select Backfill.

Except where compensated under Bid Item 14, Undercut and Replace Unsuitable Material with Select Backfill, trench stabilization, bedding, haunching, embedment, and backfill shall be incidental to the applicable pipeline installation item.

- B. Pipe foundation material shall be quarry run crushed limestone or granite ranging in size from fines to a maximum size of 3 inches. The material shall be power tamped in 6-inch layers.
- C. Unstable conditions resulting from inadequate dewatering practices shall be corrected by the Contractor; and no additional payment, including payment for additional beddings store will be provided.

3.16 BELL HOLES

- A. Bell holes shall provide adequate clearance for tools and methods used in installing pipe. No part of any bell or coupling shall be in contact with the trench bottom, trench walls, or granular embedment when the pipe is jointed.
- B. Bell holes shall be excavated in rock as described above.

3.17 BEDDING, HAUNCHING, AND BACKFILL

- A. Tamp subgrade to provide firm, even bedding. Excavate trenches as detailed in the Drawings. Place bedding and haunching material so as to provide full bearing around the bottom of the pipe. Place bedding, haunching, and backfill as specified below.
- B. All backfill shall be of a non-plastic nature free from roots, vegetative matter, waste, construction material, or other objectionable material. Rock material up to 6-inches in largest dimension shall be acceptable as trench backfill. Excavated rock material greater than 6-inch, shall be disposed of offsite by the Contractor. Rock shall not exceed 10% of the fill material, and shall not be placed within 2-feet of the pipeline or within 2-feet of finish grade. Backfill material shall be capable of being tamped by mechanical tamps using relatively low velocity and heavy blows. The material shall have no tendency to flow or behave in a plastic manner under the tamping blows. Material deemed by the Engineer as unsuitable for backfill shall be removed from the job site before backfilling operations begin.
- C. Replacement of Wet or Unsuitable Material: When the Engineer determines that the material excavated from the trench is unsuitable for backfill because of the material type or because it contains excessive debris, rock, or organics, it shall be removed from the project and replaced with a backfill material approved by the Engineer. When the moisture content of an otherwise suitable material is too high to achieve specified compaction, as determined by moisture content and

density test, the Contractor shall replace the material as necessary to fulfill backfill requirements. The wet material may be dried to optimum moisture content and used for backfill in subsequent phases of the project. Should an otherwise suitable material be found too dry to achieve compaction requirements, water may be added to the material to raise the moisture content to optimum. Borrow material placed at the direction of the Engineer shall be clean earth at optimum moisture content, Concord (pit) gravel or ABC stone.

When unsuitable material is removed below the planned excavation bottom at the direction of the Engineer, the excavation and replacement volume shall be measured and paid for under Bid Item 14, Undercut and Replace Unsuitable Material with Select Backfill.

Replacement of excavated material determined unsuitable for use as ordinary backfill without additional undercut below the planned excavation bottom shall remain subsidiary to the applicable contract items.

- D. Backfilling of Trenches: Trenches shall be backfilled immediately after the pipe is laid. Backfill around pipe and to an elevation of one (1) foot above the pipe bell shall be done only by hand and in layers not exceeding six (6) inches with every layer thoroughly tamped. Successive layers of backfill shall be compacted in place as specified below.

Should water rise in an unbackfilled ditch after the pipe has been placed, the Engineer may require the Contractor to remove the pipe, muck the trench and relay the pipe using Type II or Type III granular bedding.

1. Backfill of trenches within gravity sewer main and force main rights-of-way: Trenches excavated outside existing roadway and railway right-of-way may be backfilled, above the initial one (1) foot, by mechanical means in layers up to twelve (12) inches thick, unless otherwise approved by the Engineer.
2. Backfill of trenches within road and railway rights-of-way: Trenches excavated within existing road and railway rights-of-way shall be backfilled in layers not to exceed (6) inches and layer must be thoroughly tamped.

- E. Compaction for pipeline and structure excavations shall be attained by the use of mechanical tamps. Each layer of backfill shall be placed loose and thoroughly compacted in place. Heavy rollers, vehicles, or other equipment shall not be used for compacting backfill nor allowed to cross over completed work except at points adjudged capable of adequately protecting the pipeline. Pneumatic tamps, ram type tamps, or vibrating tamps with sheepfoot rollers will be required to meet the specifications of "Mechanical Tamp."

1. Where excavation has been made within the limits of easements across private property, the top 1 foot of backfill material shall consist of fine loose earth free from large clods, vegetative matter, debris, stones, and/or other objectionable materials. Backfill material shall be carefully placed and compacted not less than 85% Standard Proctor.

2. Compaction within road and railway rights-of-way: Trenches excavated within existing road and railway rights-of-way, and all structure excavation regardless of location, shall be backfilled as previously specified and thoroughly tamped:
 - a. All material from the bottom of trench to within six (6) inches of subgrade level shall have an in-place density of 95% of the maximum dry density as defined by a standard proctor curve for the material.
 - b. All material within six (6) inches of the subgrade level shall have an in place density of 100% of the maximum dry density.
 - c. On roadway shoulders, all material shall have an in place density of 95% of maximum dry density.
- F. Backfill the remainder of the trench with soils free of organic matter, refuse, rocks and lumps greater than four inches in diameter, and other deleterious matter compacted to a minimum 95% ASTM D698 density. Rock material no larger than 4-inches will be acceptable as trench backfill on pipelines. Rock shall not exceed 10% of the fill material and shall not be placed within 2' of the pipeline or within 2' of finish grade. Excavated rock materials greater than four inches within street rights-of-way shall be disposed of offsite by the Contractor.

3.18 PROTECTION OF UTILITIES

- A. The Contractor shall locate and protect all utilities which could be affected by the work, including but not limited to overhead cables, poles, buried cables, wastewater pipes, gas pipes, water pipes, and drainage pipes and appurtenances. Before working in any area, the Contractor shall contact the local utility locating service to mark the locations of underground utilities. Any underground utilities which could interfere with the work shall be staked and flagged.
- B. Underground pipes and cables which cross the excavations shall be carefully exposed and temporarily supported from overhead beams furnished by the Contractor to the satisfaction of the utility owner. The utility shall be carefully incorporated in the backfill with full support and protection. Should any utilities need to be relocated, the Contractor shall discuss the situation in a meeting with the Engineer and utility owner.
- C. Before operating any equipment near a buried Duke Energy Company or other local provider overhead electric cable, the Contractor shall contact Duke Energy Company to arrange for protection of the cable and the Contractor's personnel and equipment. Compliance with Duke Energy Company's or other local provider conditions shall be considered a subsidiary obligation under the contract. The Engineer shall be invited to attend all meetings with Duke Energy Company or other local provider for information only.
- D. At least 48 hours prior to operating any equipment near a buried gas pipeline, the Contractor shall contact Enbridge. Compliance with Enbridge's conditions shall

be considered a subsidiary obligation under the Contract. The Engineer shall be invited to attend all meetings with Enbridge for information only.

- E. Contractor shall comply with local utility locating requirements (e.g., 811 call system).

3.19 TESTS

- A. All tests to ensure that embedment, fill, and backfill materials and their placement comply with specified requirements, shall be made by an independent testing laboratory approved by the Owner, as required by the Engineer.
- B. Contractor to correct areas that do not meet requirements at no cost to Owner and pay for costs to retest.

3.20 DRAINAGE MAINTENANCE

- A. Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or water shall be constructed on the upstream side of the trafficway to prevent impounding water after the pipe has been laid. Bridges and other temporary structures required to maintain traffic across such unfilled trenches shall be constructed and maintained by the Contractor. Backfilling shall be done so that water will not accumulate in unfilled or partially filled trenches. All material deposited in roadway ditches or other water courses crossed by the line of trench shall be removed immediately after backfilling is completed, and the original section, grades, and contours of ditches or water courses shall be restored. Surface drainage shall not be obstructed longer than necessary.

3.21 PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES

- A. All surfaces and structures (both public and private) within and adjacent to the construction operations shall be restored to a condition comparable to that existing prior to construction or as specified in the special provisions.
- B. All surplus materials shall be disposed of in a manner acceptable to the Engineer, and the construction area shall be left in a neat condition, with special attention called to proper drainage, smoothness of surface, and general clean up. No machinery or equipment shall be left or stored on the job site after the project is completed.
- C. Where trenches are constructed in ditches or other water courses, backfill shall be protected from surface erosion using erosion control matting and/or sediment logs. Where the grade of the ditch exceeds 1%, sediment logs shall be installed. Do not use concrete ditch checks.
- D. Unless otherwise specified, complete restoration to include fertilizing, seeding, and mulching of any and all areas disturbed during construction shall be completed within 7 days following pipe installation or thirty (30) working days following the initial ground disturbing activity, whichever comes first. Pay application may be held until Contractor complies with this requirement.

1. Water meters, valve boxes, drain pipes, and other structures encountered shall be reset or relaid to match or clear surface grade and/or gravity sewer main and force main pipe grade as applicable.
2. All shoulder areas shall be restored, stabilized, and maintained to their original condition. Concrete, asphalt, gravel, and dirt walks, drives and roadways are to be replaced to their original shape and serviceability.

The Contractor should note that all existing side streets and drives which are either dirt or gravel will be restored as specified for graveled areas.
3. Refuse Burial: The Contractor shall not bury rock, broken concrete/asphalt, construction material, timber, etc. within the street or gravity sewer main and force main right-of-way.
4. Rip-Rap:
 - a. The Contractor shall place stone rip-rap as specified in those areas subject to severe water action where directed by the Engineer.
 - b. Placement of rip-rap as shown on the Construction Plans shall be considered a guide only, with final determination made at the time of construction by the Engineer. Either the addition or deletion of quantities may be required.
 - c. Stone rip-rap will be placed as indicated on the Standard Details immediately following pipe installation and will be installed no steeper than a 2:1 slope except when specifically approved by the Engineer. Grading will be required as necessary to insure continuous even flow.
 - d. The rip-rap installation shall include all earthwork necessary to stabilize the creek bank and/or culvert outlets and to provide cover for the water line.
5. Erosion Control Matting: The Contractor shall install jute netting or Erosion Control Matting in areas subject to high runoff velocities, areas subject to concentrated runoff and on steep slopes as shown on the plans and/or as directed by the Engineer.

3.22 DISPOSAL OF EXCESS EXCAVATED MATERIALS

- A. Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site of the work at a suitable and properly permitted disposal site. Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock, debris encountered in excavation work, and other similar waste materials shall be disposed of away from the site of the work.

- B. All excess excavated materials resulting from construction of bedding, haunching, and initial backfill and pipe installation, from construction of manholes or other structures, or from correction of unstable or unsuitable trench conditions, shall be hauled from the site and disposed of by the Contractor at a properly permitted disposal site.
- C. Material wasted on sites designated on the plans shall be carefully finished with a drag, blade machine, or other suitable tool to a smooth, uniform surface, without obstructing drainage at any point.
- D. All excess material from wetland areas will be removed to upland areas or off-site by the Contractor. No change in preconstruction contours will be accepted. All wetland work shall comply with approved environmental permits.

3.23 REMOVAL OF SUPPORT SYSTEM

- A. All shoring and temporary construction elements, including soldier piles, sheet piles, wales, struts, lagging, thrust blocks, and concrete working slabs shall be removed from the excavation prior to restoration. Remove the support system in a manner that will not disturb or harm adjacent construction or facilities. Support members that cannot be removed shall be cut off at least 5 feet below finished grade with the approval of the Engineer. No wood shall remain part of the abandoned portion of the work.
- B. All voids created by the removal of the support system shall be immediately filled. The support system removed from the excavation shall remain the property of the Contractor and shall be removed from the site.

3.25 RESTORATION

- A. Furnish, place and compact backfill in all excavations. Restore the work area disturbed by construction activities, and repair any damage caused to existing utilities, to its original, or better condition. Paved areas shall be restored to match existing conditions as approved.
- B. Remove and dispose of all temporary utilities, drainage facilities, temporary fencing, waste materials and surplus materials, and other site development facilities provided by the Contractor following backfilling of the excavation.
- C. Contractor shall remove all gravel, stones and rocks ½ inch and larger from grassed lawns, rights-of-way, and easement areas.

3.26 TOPSOIL

- A. During construction, the top 12 inches of the trench will be backfilled with topsoil excavated from the trench.
- B. For landscaped areas, Topsoil shall be placed to a minimum depth of 4" and shall be ASTM D 5268 topsoil, with pH range of 5.5 to 7, a minimum of 2 percent organic material content, free of stones 2 inches or larger in any dimension and other extraneous material harmful to plant growth.

1. Topsoil source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous material harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches in depth. Do not obtain from agricultural land, bogs, or marshes.

3.27 MAINTENANCE

- A. The Contractor shall be responsible for all settlement of backfill, fills, and embankments which may occur within the correction period stipulated in the General Conditions.
- B. Settlement tolerance: Contractor shall correct any settlement exceeding 0.10 feet within warranty period.
- C. The Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within ten days after notice from the Engineer or Owner.
- D. Contractor shall maintain all project areas during the specified warranty period. Maintenance shall include the following:
 1. Immediately filling and reseeding any eroded areas.
 2. Reseeding any areas where a full stand of grass does not develop.
 3. Removal and replacement of any trees which die or show distress.
 4. Refilling and reseeding any backfilled areas which settle and develop depressions.

END OF SECTION 02221

SECTION 02722 - SANITARY SEWERS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Work under this section consists of furnishing all plant, labor, materials, and equipment for the installation of sanitary services and appurtenances.

B. Inspection, Testing, and Acceptance - New Pipelines

1. Inspection

a. Upon completion of each section of sewer or at such time as the Engineer may direct, a block or section of sewer shall be cleaned and inspected. All repairs shown necessary by the inspection shall be made. Broken or cracked pipe shall be replaced; defective joints, if any, replaced; all deposits removed; and the sewer left true to line and grade, entirely clean, free from lumps or protruding jointing material, etc., and ready for use. Each section of sewer between manholes shall show, upon examination from either end, a reasonably full circle of light.

b. Manholes shall be precast manhole, and shall have no major defects. Tops shall be properly placed, and castings securely in place. Manholes shall show absolutely no evidence of leakage through the walls or bottom.

2. Deflection Tests

a. After backfilling trenches, all sewer pipes shall be lamped and visually inspected for pipe alignment. Each run of pipe must present a full circle of light when viewed from one of the connected manholes. Any run of pipe which does not present a full circle of light will be removed and reinstalled.

b. After backfilling trenches, all PVC sewer pipe shall be tested for initial diametric deflections by the use of a Go-No-Go type mandrel which is acceptable to the Engineer. The initial diametric deflection shall not exceed five percent of the base inside diameter as defined in ASTM D-3034. Deflection tests will be performed after trench is no longer subject to construction traffic loading and a minimum of 30 days after completion of trench backfill.

<u>Nominal Pipe Size</u>	<u>Pipe I.D. (SDR 35)</u>	<u>Required Mandrel O.D.</u>
8"	7.665"	7.28"
10"	9.563"	9.08"
12"	11.361"	10.79"
15"	13.898"	13.20"

- c. The mandrel shall be pulled through each section of pipe from manhole to manhole. The mandrel must slide freely through the pipe with only a nominal hand force applied. No mechanical device shall be used in pulling the mandrel. Any pipe which refuses the mandrel shall be removed and replaced. Such sections shall be re-tested for deflection 30 days after completion of trench backfill.
- d. Mandrel testing may be performed by the District at any time prior to the expiration of the one-year warranty. Any pipe which refuses the mandrel shall be replaced by the Contractor as described above.

3. Leakage and Infiltration

- a. All pipe and manhole joints shall be watertight. Any leaks into the sewer shall be repaired or corrected as directed by the Engineer. The MSD reserves the right to TV any section of the sewer system to locate point sources of infiltration, either in the pipe or inside manholes. When directed by the Engineer, any desired section shall be isolated and tested separately.
- b. No sooner than 10 days following completion of backfill, the Contractor along with the Engineer, will be required to determine the level of the ground water table. If the ground water table is above the top of the pipe, the sewer line shall be tested for infiltration. If ground water table is less than 2 feet above the top of the pipe, the sewer line shall be low pressure air tested. Each test shall be performed as follows:

1) Infiltration

The infiltration into each section of the sewer shall be measured in wet weather by the temporary installation of suitable metal or wooden weirs as authorized by the Engineer. These weirs shall be furnished, installed and removed by the Contractor. Infiltration test limits shall be applied to single reaches of pipe, up to one mile in length, of the same diameter. For pipes 8 inches through 15 inches in diameter, infiltration into the sewer system (including manholes) shall not exceed 50 gallons per mile of sewer per inch of inside diameter of the sewer per 24 hours, and in no case shall it exceed 3,000 gallons per mile per 24 hours. For all pipe sizes larger than 15 inches in diameter, infiltration into the sewer system (including manholes) shall not exceed 100 gallons per mile of sewer per inch of inside diameter of the sewer per 24 hours, and in no case shall it exceed 3,000 gallons per mile per 24 hours.

2) Air Testing of Gravity Sewers

The Contractor shall conduct low pressure air tests on all

completed sections of gravity sewer. Air tests for PVC, and DIP will be performed in accordance with ASTM C828. Air test results will be used to evaluate materials and construction methods on the sewer line sections, and successful air tests shall be mandatory for the acceptance of the sewers 30 inches in diameter and smaller.

- a) Air tests will not be required on pipe with diameters exceeding 30 inches. Acceptance of pipes exceeding 30 inches will be based on infiltration tests and/or visual inspection of the joints.
- b) The Contractor shall furnish an air compressor of the necessary capacity along with all necessary plugs, valves, pressure gages, air hoses, connections, and other equipment necessary to conduct the air tests. Plugs in sewers 18 inches in size and larger shall be connected by steel cable for thrust reaction.
- c) Compressor capacity shall be sufficient to pressurize the sewer main to 4 psig within a time equal to or less than the required test time. The following equation may be used to ensure compliance with this requirement:

$$C = \frac{0.17 \times D^2 \times L}{T} + Q$$

Where: C = Required Compressor Capacity (cfm)

T = Required Test Time (min)

L = Length of Test Section (feet)

D = Pipe Internal Diameter (feet)

Q = Allowable Air Loss Rate (cfm)

- d) The following allowable air loss rates will be used for all pipe tests:

<u>Pipe Size</u>	<u>Q (cfm)</u>
4"	2.0
6"	2.0
8"	2.0
10"	2.5
12"	3.0
15"	4.0
18"	5.0
21"	5.5
24"	6.0

- e) The sewer section shall be plugged at both ends and air pressure shall be applied until the pressure inside the pipe reaches 4 psig. When a stable condition has been reached, the pressure shall be bled back

to 3.5 psig. At 3.5 psig, the time and pressure shall be observed and recorded. If groundwater is present at the sewer, the height of groundwater above the top of the pipe shall be added to the above air pressure readings (height of water in feet X 0.433 = air pressure in psig). A minimum of 5 readings will be required for each test.

- f) If the time for the air pressure to decrease from 3.5 psig to 2.5 psig is equal to or greater than that shown in the following table, the pipe shall be presumed to be free from defects. When these times are not attained, pipe breakage, joint leakage, or leaking plugs are indicated and the cause must be determined and corrected. After repairs have been made, the sewer sections shall be retested. This process shall be repeated until all sewer sections pass the air test.
- g) Schedule 02722-1 shows the required pipe test times.
- h) For testing a sewer system with one or more installed service lateral pipes, an effective pipe length shall be added to the total sewer main pipe length. The equation used to calculate Effective Pipe Length is as follows:

$$Le = \frac{d^2 \times l}{D^2}$$

Where: Le = Effective Pipe Length (added to Total Test Length)

d = Diameter of Service Lateral Pipe(inches)

l = Length of Sewer Lateral (feet)

D=Diameter of Sewer Main Pipe being tested (inches)

1.2 SUBMITTALS

- A. Shop drawings shall be submitted to the Engineer in accordance with the General Conditions for the following items:
 - 1. Precast manholes
 - 2. Precast valve vaults
 - 3. Metal castings
 - 4. Transition couplings

- B. Manufacturer's certifications shall be submitted to the Engineer certifying that the following materials meet all requirements of the specifications:
 - 1. Sewer Main Pipe
 - 2. Sewer Service Pipe
 - 3. Sewer Pipe Fittings
- C. Mix designs for concrete and asphalt shall be submitted to the Engineer for approval, if requested by the Engineer.
- D. PDF of all submittals are required. None of the above listed equipment or materials shall be used on the project unless the necessary approval for that particular item has been given by the Engineer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. All sanitary sewers 15 inches in size and smaller shall be constructed of either ductile iron or PVC sewer pipe as shown on the Plans. All sanitary sewers 18 inches, 21 inches, and 24 inches in size shall be constructed of ductile iron or unless otherwise shown on the Plans. All sanitary sewers larger than 24 inches in size shall be constructed of ductile iron pipe or unless otherwise shown on the Plans.
- B. All PVC, and ductile iron sewer pipe and fittings shall be suitably marked at their places of manufacture to show their class, strength, or thickness, as applicable.
- C. All materials used in the manufacture of sewer pipe and fittings used on the District's systems and projects shall be certified by the manufacturer to meet or exceed ASTM, AWWA, NSF and other nationwide accepted standards for the appropriate type of pipe or fittings. Each joint of pipe delivered to the job site shall be stamped or otherwise marked to indicate the testing laboratory's acceptance or approval. In addition, if required by the Engineer, all pipe and materials shall be inspected, tested and certified by an accredited commercial testing laboratory, approved by the Engineer, prior to or after delivery of such pipe and/or materials to the job site and shall be certified to meet or exceed the requirements set forth in these specifications. Certified copies of all testing and acceptance reports shall be delivered, in duplicate, to the Engineer prior to the use of such materials on the project. The cost of any inspecting and/or testing shall be borne by the Contractor or pipe manufacturer. Laboratory testing of other materials may be required if deemed necessary by the Engineer.

2.2 DUCTILE IRON PIPE

- A. Ductile iron pipe shall conform to the requirements of ANSI Specification A21.51. The pipe class, bedding, and loading shall comply with MSD standard details. When loading conditions are beyond those shown, the Contractor will submit design computations to the Engineer or MSD. The pipe class shall be as shown

on the Plans. Bedding shall be as shown on the trench details. Joints shall be "push-on" which conform to the requirements of ANSI Specification A21.11. Ductile iron fittings shall conform to the requirements of ANSI Specification A21.10, Class 350 in sizes 24 inches and smaller and Class 250 in sizes larger than 24 inches, unless otherwise shown on the Plans. All ductile iron pipe shall have a ceramic-filled anime-cured epoxy, Protecto 401 by Induron or approved equal, including Permox-CTF by Permite Corporation.

- B. All fittings for ductile iron pipe, including but not limited to wyes, tees, saddles, bends, crosses, sleeves, plugs, caps, reducers, and glands, shall be gasketed push-joint pipe or mechanical joint. Fittings shall conform to the requirements of ANSI/AWWA C110/A21.10 (Standard fittings, 3 inches thru 48 inches) or ANSI/AWWA C153/A21.53 (Compact fittings, 3 inches thru 48 inches) with the joints meeting the requirements of ANSI/AWWA C111/A21.11 (Rubber-gasket joints) and shall be pressure rated at the same rating as the mainline sewer pipe but in no case less than 250 psi. Gasketed push-joint type fittings shall meet or exceed the requirements as set forth in ANSI/AWWA C 111/A 21.11 and may be used only in non-pressurized in-line locations and below ground installations. Mechanical joint fittings shall meet or exceed the requirements as set forth in ANSI/AWWA C111/A21.11. All fittings shall be manufactured from ductile iron grade 70-50-05 (min. tensile strength – 70,000 psi; min. yield strength – 50,000 psi, min. elongation – 5%) as specified in AWWA C110 or C153 and ASTM A536. All ductile iron pipe fittings and materials shall conform to paragraph 2.01 (d) of this section of the Technical Specifications. All ductile iron pipe fittings shall have a cement mortar lining of standard thickness conforming to the requirements of ANSI Specification A21.4. Note: Couplings for ductile iron pipe to ductile iron pipe shall be ductile iron mechanical joint sleeves, only.
- C. All sanitary sewer cleanout boxes and covers shall be manufactured from gray iron meeting the requirements of ASTM A48 or ductile iron grade meeting the requirements of AWWA C110 and ASTM A536. All sanitary sewer cleanout boxes shall conform to the dimensions and requirements as set forth in MSD's Standard Detail for Cleanout Boxes (MSD-12) and shall be U.S. Foundry Handhole Ring and FC Cover model #7610 or East Jordan Iron Works Heavy Duty Monument Box model #1574 or approved equal. Note: U.S. Foundry Handhole Ring and FC Cover model #7630 may be used where cleanout box is within an asphalt or concrete paved area.
- D. For all pipe other than potable and plant water, ductile iron pipe and fittings shall be lined with a ceramic-filled anime-cured epoxy, Protecto 401 by Induron or approved equal, including Permox-CTF by Permite Corporation. The lining shall be 40 mils minimum.

2.3 POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

- A. PVC gravity sewer pipe shall be C900 DR-18 or better conforming to ASTM D3034. Joints shall be integral bell and spigot type with compression type rubber gaskets. Joints shall conform to ASTM Specification D 3212. Couplings for PVC pipe to PVC pipe shall be PVC "Closure" or "Stop" couplings and shall meet ASTM D 3034. Transition Couplings for PVC pipe to ductile iron pipe shall be mechanical

joint ductile iron fittings utilizing transition gaskets. No more than one material transition will be allowed in any one reach of pipe.

2.4 TEES, WYES, AND MISCELLANEOUS FITTINGS

- A. Wyes and Saddles shall be of the same material and strength as the sewer mains on which they are installed, unless otherwise specified. Saddle type fittings shall not be used on new construction or existing mains for pipes 12 inches in diameter or smaller, unless specifically called for in the Plans and/or Specifications or approved in writing by the Engineer. For ductile iron mains greater than 12 inches in diameter, "CB" Romac tapping saddles as manufactured by Romac Industries Inc. or an approved equal may be used. Unless otherwise specified in the Plans and/or Specifications, house services shall be constructed of 4-inch diameter Schedule 40 PVC pipe or Class 350 psi ductile iron pipe.
- B. For taps and services on an existing MSD maintained PVC or VCP sewer main (6 inches in diameter) that are being repaired by trenchless construction methods, flexible saddles as manufactured by NDS/HPI or an approved equal may be utilized. Flexible Saddles shall be affixed to the Main by bands or straps as provided by the manufacturers and by using a two-part epoxy glue uniformly spread over the contact surface of the saddle.
- C. A compression coupling by Inserta-Tee or approved equal shall be used to reconnect services to existing 8-inch and larger diameter sewer mains that are being rehabilitated by trenchless construction methods.
- D. Wyes shall be placed in sanitary sewers so as to properly serve each existing house and each vacant lot facing or butting on the street or alley in which the sewer is being laid, and at such other locations as may be designated by the Engineer.
- E. The Contractor shall measure the distance to the tap or tee from the downstream manhole and the offset distance to each cleanout assembly to obtain the information required for the "As-Built" records. As-built data shall be marked on the Plans and turned over to the Engineer at the end of the project.
- F. The location of all wyes, cleanouts, and house sewers installed in the work shall be identified on the Plans and in the field.

2.5 SEWER SERVICE LINES

- A. Where existing sewer mains are being rehabilitated, sewer service lines shall be constructed for each property that is occupied by a business or dwelling if it is currently served by the new construction. For extensions of the existing public system, all buildable lots adjacent to the extension shall have a sewer service line provided.

Additional service lines may be installed by the Contractor as directed and authorized by the Engineer. In general, service lines shall be constructed from the public sewer to a point located at the edge of the public right-of-way or the sewer easement. Service lines shall consist of a 4-inch or 6-inch diameter pipe, as listed in the Bid Schedule and/or shown on the Plans.

- B. The Contractor shall be responsible to locate and connect all existing sewer service lines. In the event a service is missed during construction, the Contractor shall return to the site and perform all work necessary to reinstate the connection. The Contractor will be compensated in accordance with the original contract unit pricing; however, re-mobilization to the site will not be paid for.
- C. Service lines built for vacant lots/future connections shall have a cleanout assembly constructed, which includes a 1 foot capped stub-out on the service line. The vertical cleanout pipe shall also be capped, and shall be a minimum of 3 feet above the finish grade.
- D. Service lines 4 inches or less shall be tapped into the sewer main, not into a manhole. Service connections 6 inches or greater shall only be made into an existing or proposed manhole, unless otherwise approved by the ENGINEER.
- E. The MSD-maintained portion of each sewer service line shall have a minimum of 3 feet of cover, unless approved by the Engineer.
- F. Sewer service lines and clean-outs shall be Class 350 DIP (with Class 350 appurtenances) if:
 - 1. The service line is installed underneath gravel or paved areas which will have less than 3 feet of cover and will be subjected to traffic loads; or
 - 2. The service line crosses a creek or drainage ditch (whether aerial or subaqueous).
- G. The minimum slope on any residential sewer service line shall not be less than 2 percent, unless approved by the Engineer.
- H. Sewer service line connections to sewer mains 12 inches and smaller shall be made with a wye of the same material and joint type as the sewer main. Sewer service connections to sewer mains larger than 12 inches may be made with Romac Saddles, style "CB" as manufactured by Romac Industries, Inc., or approved equal.
- I. Cleanouts shall be constructed at the edge of the permanent easement or at the edge of the public right of way, whichever applies. In addition, one cleanout shall be constructed for:
 - 1. Every four 45-degree changes located in series (a long sweep is equivalent to two 45-degree bends); and
 - 2. At intervals no greater than 100 feet.

PART 3 - EXECUTION

3.1 LOCATIONS

- A. Pipework shall be installed at the locations shown on the Plans and to the position, alignment, and grade shown thereon. Prior to beginning work at any location, the Contractor shall consult with the Engineer and Owner to determine that all rights-

of-way, permits, or other legalities are in order. He shall familiarize himself with all conditions and/or limitations of such rights-of-way or permits and shall fully comply with all such requirements. All work shall be confined to rights-of-way or permit limits and any encroachment beyond such limits shall be the Contractor's liability.

3.2 RELATION OF SEWERS TO WATER MAINS

- A. Crossing a sewer under a water main: Whenever it is necessary for a sewer to cross under a water main, the sewer shall be laid at such elevation that the top of the sewer is at least 18" below the bottom of the water main, unless local conditions or barriers prevent an 18" 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' on each side of the point of crossing.
- B. Crossing a sewer over a water main: Whenever it is necessary for a sewer to cross over a water main, 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' on each side of the point of crossing. A section of water main pipe shall be centered at the point of crossing.

3.3 CLEARING AND GRUBBING

- A. Clearing and grubbing, where required, shall be done prior to beginning of pipe installation. It shall be done in accordance with applicable portions of items of General Conditions and the following:
- B. The Contractor shall consult with the Owner and Engineer prior to starting clearing and a full understanding is to be reached as to procedure. The Contractor shall then conduct clearing and grubbing operations in strict accordance with these agreements.
- C. Clearing of trees and brush along the pipeline shall be carefully done so that no damage will occur outside of the limits of the right-of-way. Trees and brush must be cut by hand and trees felled within the right-of-way limits.
- D. Brush, laps, roots, etc., shall be disposed off-site in a manner approved by the Engineer. Burning of trees, brush and debris will not be permitted.
- E. Grubbing of stumps that are in the way of construction shall be done in any convenient manner which will not cause damage to remaining trees or adjacent property. Stumps shall be disposed as for brush or laps above.
- F. Limits of the pipe-laying operation shall be confined to the right-of-way and easements. The width of clearing shall be held to a minimum and in no case wider than the right-of-way or easement.
- G. Site clearing and grubbing shall be limited to 3,000 feet ahead of pipe laying, unless specified or directed otherwise by the Engineer.

3.4 WORK ON HIGHWAY RIGHT-OF-WAY

- A. The contractor shall not begin work on any property of the Department of Transportation until necessary permits are in hand. He shall conform to all requirements of the Department of Transportation or its authorized representatives in the prosecution of this portion of the work. It shall be the responsibility of each Bidder to contact the local highway representative and to determine the exact requirements for work to be done. Requirements shall include, but are not limited to the following:
- B. Where a pipeline crosses under a highway, it shall be installed either by open cut, in tunnel or in encasement under the highway. Materials and method of crossing shall be as indicated on the plans for each crossing. Where pipe is installed by open cut, at least one full lane for traffic shall be kept open and clear at all times.
- C. The Contractor shall provide full-time flagmen, with appropriate red flags, at all times when work is in progress.
- D. Necessary warning and descriptive signs shall be provided and placed at each end of the working area while work is in progress along highways. These signs shall be well tended and shall be placed at sufficient distances from the site of the work so that ample warning is given to approaching traffic. Signs shall be adequately lighted at night.
- E. The Contractor shall keep all streets open to traffic at all times unless permitted otherwise by the Engineer or Department of Transportation as applicable. The Contractor shall provide, place and maintain temporary traffic control devices as directed by the Engineer or Department of Transportation. The latest edition of the *Manual on Uniform Traffic Control Devices for Streets and Highways* as prepared by the National Joint Committee on Uniform Traffic Control Devices shall be used as a guide in the placement of devices and all devices shall meet the requirements of said manual.
- F. Where pipe is installed in open cut across a highway, the cut shall be immediately backfilled and all work of repairing the pavement completed immediately. Any subsequent settlement shall be immediately corrected and repaired.
- G. Where pavement is cut and replaced, the Contractor shall cut the edges to a straight and even line before repairing the pavement. No ragged edges will be allowed or accepted.
- H. Where asphalt pavement or bituminous surfacing is cut, the entire area to be repaired shall be primed with an asphalt prime coat, acceptable to the Department of Transportation before the pavement is replaced.
- I. When required, the Contractor shall furnish to the Department of Transportation a 100% Performance Bond for the amount of paving to be cut and replaced along highways. Bond is required in North Carolina.
- J. Unless otherwise indicated, no excavated material shall be placed on the pavement side of the ditch, along State Highways. The least possible amount of

trench will be left open when work is not in progress and equipment shall be removed from the pavement and shoulders during shutdown periods.

- K. Shoulders of roadways shall be left in good, acceptable condition and all topsoil and grass that is disturbed shall be replaced. Grassing shall include seeding fertilizing, and mulching to conform with the Department of Transportation requirements.
- L. The Contractor shall pay the cost of all Department of Transportation inspectors time, if required on the job.

3.5 WORK ON RAILROAD RIGHT-OF-WAY

- A. The Contractor shall not begin work on any property of the railroad until he has secured necessary permits. He shall conform to all requirements of the railroad, or its authorized representatives, in the prosecution of this portion of the work, including but not limited to the following:
- B. Where a pipeline crosses under a railroad, the work shall be done in accordance with requirements of the Railway Company. Pipe shall be installed by boring and jacking (or open cut as designated). Excavation shall be done ahead of the pipe. The encasement must be kept on accurate line and slightly below grade. A tolerance of 2% will be allowed on short lines in good soil and not over 1% in any case.
- C. The Contractor shall furnish the Railway Company the following:
 - 1. Certificate of Worker's Compensation or Employer's Liability Insurance according to the laws of the State.
 - 2. Certificate of the Contractor's Public Liability Insurance to protect the Contractor and Subcontractor for loss of life or injury to persons in an amount not less than \$1,000,000 for any one person, not less than \$1,000,000 for any one accident; and for property loss or damage in an amount not less than \$1,000,000 for any one accident and not less than \$1,000,000 aggregate or as required by the Railroad Company.
 - 3. The original policy of Railroad Protective Liability Insurance naming the Railway Company as the insured for loss of life or injury to persons in an amount not less than \$1,000,000 for one person, and not less than \$1,000,000 for any accident and for property loss or damage in an amount not less than \$1,000,000 aggregate. The Railroad Protective Liability Policy should show the location and description of work and name of Owner for whom the work is done.
- D. The Contractor shall also pay the cost of flagmen or other expenses of the railroad in protecting traffic. He shall notify the railroad of the time that the work will be done and shall not begin work until authorized by railroad officials.

3.6 PROPERTY OWNER NOTICE AND PROTECTION OF SITE

- A. The District will secure rights-of-way or easements where required through private lands. The Contractor shall be responsible for any damage to buildings, walls, fences, utility poles, bridges, utilities, railroad, or other improvements encountered, whether public or private. All such improvements shall be carefully protected from damage and, in case of damage or removal, shall be completely repaired or re-stored to its original or better condition. All damage to such improvements and all damage to property or persons resulting from damage to such improvements shall be the responsibility of the Contractor. Special care shall be taken in trenching near buildings, roads and railroads, to avoid or minimize all delays, damage, or injury thereto.
- B. Prior to any operation, the Contractor shall give advance notice to all property owners and/or tenants within the project.

3.7 USE OF EASEMENTS AND RIGHTS-OF-WAY

- A. Prior to disturbing any area, the Contractor shall stake the limits of all easements and/or rights-of-way. The Contractor shall confine all his operations and personnel within limits of all rights-of-way and easements as shown on the Plans. There shall be no disturbance outside the easement or rights-of-way nor shall the workmen be allowed to travel at will through the surrounding private property, except as provided below. The Contractor is responsible to note any areas where limits have been reduced from typical limits. Prior to using any areas outside the rights-of-way and easements provided, the Contractor shall provide written approval of the current property owner and submit to the Engineer for his approval. The Contractor shall abide by all Special Provisions Detail Sheets provided in the Special Conditions section of the Specifications.

3.8 TRENCH EXCAVATION

- A. Trench excavation shall be made along the lines designated by the Engineer and to the depth necessary for laying the sewer to the required grade.
- B. Sides of trenches shall be kept as nearly vertical as is allowable by the Occupational Safety and Health Administration. They shall be at least 12" and not more than 24" wider at the top of the pipe than the outside diameter of the pipe plus sheathing where it is necessary. Where pavement is to be cut. It shall be cut in advance of trenching 1' wider than the required width of the trench.
- C. Where soil conditions prohibit vertical walls, the trench width at the bottom and to 1' above the top of the pipe shall be as specified above with the remainder being held to the least possible width greater than that specified. Where soil conditions prevent ditch excavation without excessive widths, or where directed by the Engineer, wood or steel sheeting, as hereinafter specified, shall be driven to support the trench walls, or a suitably reinforced steel trench box shall be employed.
- D. Trench bottoms shall be hand graded to provide uniform and continuous bearing for the pipe along its entire length, with bell holes being dug for pipe bells. No

ridges, sags, or undercutting will be allowed. Excess excavating below grade shall be backfilled at the Contractor's expense with suitable material which shall be thoroughly stamped.

- E. If approved by the Engineer and subject to suitable soil conditions, the trench may be excavated a few inches below the established subgrade and backfilled with selected material (from the excavation, if available) well compacted and so shaped as to give the pipes uniform bearing throughout their lengths at the established grade. Bell holes shall be dug to relieve the bells of load and to provide for completing the joints.
- F. Where the material at grade is unstable, soft, and incapable of supporting the pipe, the trench shall be excavated below grade, as directed by the Engineer, and refilled to grade with crushed stone or gravel to form a foundation for the pipe.
- G. When authorized by the Engineer, the Contractor shall dispose of material excavated from the trench that is unsuitable for backfill material. The Contractor shall provide the place select borrow material to replace unsuitable material for backfilling the trench as directed.
- H. Stone shall be compacted and graded to provide stable foundation and a uniform bearing for the pipe. Bell holes shall be provided as in other types of foundations.
- I. Should ground water be encountered in the bottom of the trench, causing the trench bottom to be unstable, the material, as directed by the Engineer, shall be excavated below grade sufficiently to allow a bed of crushed rock or gravel to be place in which to bed the pipe. The work shall be done as for unstable foundations. The depth of cut below grade shall be only the minimum amount to accomplish the purpose, and shall be as directed by the Engineer.
- J. The Contractor shall furnish all machinery for pumping, bailing, and/or well pointing and shall pump, bail, or otherwise remove any water which may be found or shall accumulate in the trenches, and shall perform all work necessary to keep them clear of water while the pipe is being laid. The disposal of water after removal shall be satisfactory to the Engineer.
- K. Whenever necessary, the side of the trench shall be braced and rendered secure and either open or close sheathing used to the satisfaction of the Engineer; such sheathing and bracing to be left in place until the trench is refilled to a safe limit, not less than 2' above the top of the pipe. The top portion may be then cut off, but the lower portion shall remain undisturbed. In lieu of sheeting, suitable trench boxes may be employed. All sheeting, bracing, trench boxes, and trench construction methods shall conform to the latest Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety and Health Act of 1970. No extra payment will be made for sheeting and bracing. Such cost shall be included in the cost of installing the pipe.
- L. All existing water, sewer, and gas lines, buried electrical and telephone cable, and other known utilities intersecting the lines of construction, if requested by the Engineer, shall be uncovered by the Contractor at his expense and exposed to the Engineer at least 100' ahead of pipe laying operations of insure the correctness of

grades. Existing utilities shown on the Plans are as accurately located as existing records and field surveys allow; however, the Contractor shall verify with the various utility companies before excavating and shall save harmless the Owner from any claims for damages as a result of this work.

- M. The Contractor shall at all times take necessary precautions in preventing gutters, catch basins, ditches and other drainage facilities from being clogged that might cause flooding conditions and damage to public or private properties.
- N. Rock Removal, Blasting
 - 1. See Section 02213
- O. Upon completion of the backfilling and repair operation, all excess earth, broken pavement, rock, shoring and all left over materials and debris resulting from the Contractor's operations shall be removed from the work areas and disposed of by the Contractor. The Contractor shall provide his own disposal site. He shall comply with all State of North Carolina, County and Local regulations, rules and ordinances regarding the disposal of such material. All costs arising from the disposal of the material shall be borne by the Contractor at no additional cost to the Owner. The work areas and adjoining areas used by the Contractor shall be left clean and free of evidence resulting from the Contractor's presence.

3.9 PIPE LAYING

- A. Before sewer pipe is placed in position in the trench the bottom and sides of the trench shall be carefully prepared and the necessary bracing and sheeting installed. Each pipe shall be accurately placed to the exact line and grade called for on the Plans.
- B. Each piece of pipe and special fitting shall be carefully inspected before it is placed and no defective pipe shall be laid in the trench. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. Pipe shall be straight when placed in the trench. Curved pipe shall not be laid. Trench bottoms found to be at incorrect grade after pipe laying operations has begun shall be corrected and brought to exact line and grade. Any fill required to bring the trench bottom to grade, shall be pipe foundation material or pipe embedment material as specified herein, as applicable.
- C. Bell holes shall be of sufficient size to allow ample room for properly making the pipe joints. The bottom of the trench between bell holes shall be carefully graded so that the pipe barrel will rest on a solid foundation for its entire length.
- D. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets or inequalities in the flow lines. The inside of all bells and the outside of all spigots shall be wiped to remove all dirt, water, or other foreign matter. Joint lubricants shall be compatible with the pipe and gasket materials and shall be as recommended by the pipe manufacturer.
- E. All jointing of pipe and fittings shall be in accordance with the pipe manufacturer's recommendations.

- F. Any leaks or defects discovered at any time shall be repaired immediately. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed. Any pipe which has been disturbed shall be taken up, the joint cleaned and remade, and the pipe re-laid at Contractor's expense.
- G. Water shall not be allowed to run or stand in the trench while pipe laying is in progress or before the joints are completed or before the trench has been backfilled. The Contractor shall not open up at any time more trench than his available pumping facilities are able to dewater.
- H. As the work progresses, the interior of all pipe in place shall be thoroughly cleaned. After each line of pipe has been laid it shall be carefully inspected and all dirt, trash, rags, and other foreign matter removed from the interior. When pipe laying is not in progress, the Contractor shall place a watertight plug in the last section of pipe which has been laid. The Contractor shall install temporary watertight plugs in the proposed sewer line at any manhole that is incomplete, at the open end of the pipeline prior to leaving the job site daily and elsewhere as dictated by good engineering and construction practices. All installed pipe shall be backfilled to prevent flotation in the event water enters or rises in the trench. The plugs as installed shall prevent infiltration or the introduction of any foreign material into either the existing or proposed systems. Upon completion of all construction, the Contractor will be responsible for the complete removal of all watertight plugs.
- I. Backfilling of trenches shall be started immediately after the pipe is in place and the joints completed.

3.10 DEEP SERVICES AND MAXIMUM SERVICE GRADE

- A. When the depth of cut is over 8 feet and the grade of a sanitary sewer is lower than necessary to serve abutting property, and at such other locations as may be designated by the engineer, the Contractor may install the service line with a 22 ½ or 45 degree bend just upstream of the cleanout assembly to bring the service line up to the necessary elevation.
- B. Unless required service depth is noted on construction Plans, the Contractor shall contact the Engineer and request confirmation of grade prior to constructing any sewer service line at a depth greater than 8 feet.

3.11 DUST CONTROL

- A. The Contractor shall control dust throughout the life of the project within the project area and at all other areas affected by the construction of the project. Dust control shall not be considered effective where the amount of dust creates a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property. The Contractor will not be directly compensated for any dust control measures necessary, as this work will be considered incidental to the work covered by the various contract items. The Contractor will provide dust control measures as directed by the Engineer.

3.12 CUTTING AND REPLACING PAVEMENT

- A. Where pavement is to be cut for installation of pipe or other utilities, the Contractor shall cut it nearly in advance of trenching and shall replace the pavement with base and new pavement.
- B. In areas where roadway is to be patched pavement shall be neatly cut to a straight edge in advance of trenching with the method of cutting being subject to approval of the Engineer. Pavement shall be cut 12" wider than the excavated area on each side. Ragged and irregular edges will not be allowed and work completed with ragged edges shall be redone. Concrete pavement shall be sawed with suitable concrete saw cutting equipment.
- C. Trench backfilling shall be done in layers not over 6" thick and thoroughly compacted. Compaction shall be such as to prevent future settlement and shall be done by acceptable means, approved by the Engineer. Rolling with rubber-tired vehicles or track-type equipment will not be allowed. Compaction shall be at least 95% of maximum as established by AASHTO Specification T99, Method A.
- D. Base for pavement shall be crusher run stone for all non-NCDOT maintained streets, HB binder for all secondary highways, and reinforced concrete for all primary highways. All base shall be placed in accordance with plan and/or encroachment permit details. Base width shall be as shown on the Plans and/or encroachment permits for various types of pavement cuts.
 - 1. Crusher run stone shall be well mixed and compacted by tamping and rolling. Compaction shall be to such degree as to preclude settlement. Crusher run base material shall be placed at the same time that the trench is backfilled. Backfilling to top of ditch, to be cut out and replaced with base material at a later date, will not be allowed.
 - 2. Crusher run base for highway pavement and adjacent drives shall be 8" of stone, stabilized with 5% Portland Cement. It shall be thoroughly mixed prior to compacting.
 - 3. Crusher run base for non-highway pavement and drives shall be 8" of stone without the addition of cement.
 - 4. Binder base for secondary roads shall be a minimum of 6" HB binder conforming to specifications of the Department of Transportation.
 - 5. Concrete base shall consist of 8" of concrete, reinforced with #4 reinforcing steel bars placed at 8" on center in the transverse direction #4 tie bars in the longitudinal direction. Concrete shall be designed to produce a compressive strength of 3000 psi at 28 days. The design of the mix and source of supply shall be subject to approval of the Engineer.
- E. Pavement shall be replaced with the same type of pavement that exists prior to cutting and shall consist of either bituminous surface course (double treatment), 2" of hot plant mix asphaltic concrete, or 8" of Portland Cement concrete; all conforming to specifications of the Department of Transportation for each type.

1. Pavement shall be replaced with the same type of pavement that exists prior to cutting and shall consist of either bituminous surface course (double treatment), 2" of hot plant mix asphaltic concrete, or 8" of Portland Cement concrete; all conforming to specifications of the Department of Transportation for each type.
2. For asphalt pavement or bituminous surfacing, the entire area to be resurfaced (including edges of existing pavement) shall be primed with an acceptable asphalt prime coat just prior to placing new pavement.

3.13 TIE-INS TO EXISTING PUBLIC OR PRIVATE COLLECTION SYSTEMS

- A. Tie-ins to existing public or private collection systems will be allowed when proper precautions are taken to protect the existing MSD public collection system. Tie-ins to existing inactivated sewer lines not installed under the same contract will not be allowed without written approval from all parties involved (MSD, Contractor, contract holders, etc.).
- B. If the proposed sewer does not begin at an existing manhole, a new manhole will be "cut in" at the required location and the existing pipe(s) repaired as specified. For extensions of the system, the new "cut in" manhole or the connection to the existing manhole will not be constructed until all other sewer construction has been completed and tested in compliance with the Specifications.
- C. Pipelines or manholes which contain silt, sedimentation, or other foreign material shall not be connected to any portion of the existing public collection system or any private collection system already connected to the MSD's system. The Contractor shall at his own expense flush, or otherwise cause the line (and manholes) to be cleaned out without any discharge into the existing system.

3.14 ABANDONMENT OF EXISTING SEWERS AND MANHOLES

- A. Manholes which are to be abandoned shall first have both influent and effluent lines plugged inside the manhole with watertight masonry or concrete. The manhole will then be filled with non-compressible material (crushed stone or as approved by Engineer), to a point not less than 3 feet below the finish grade. The remainder of the manhole shall be broken down and removed. Then the excavation shall be backfilled to finish grade as specified under trench backfill.
- B. Abandoned mains at active manholes shall be completely disconnected from the manhole by cutting the pipe outside the manhole and then plugging the abandoned main and the manhole wall with watertight masonry. The invert shall then be rebuilt to conform to the standard details.
- C. Exposed sections of abandoned mains shall be removed to a point not less than 5 feet from the adjacent banks or surface waters. The remaining ends of the pipe shall be plugged with watertight masonry. Concrete piers or collars in the creek channel shall be removed completely. Concrete piers or collars not located in the creek channel shall be removed to a point 3 feet below the finish grade. Steel piers shall be cut off 3 feet below finish grade.

- D. The minimum length of watertight masonry plugs will be the diameter of the abandoned pipe plus 1 foot.

3.15 ABANDONED SEWER GROUTING

- A. Existing sewers shall be completely filled with high strength (pressure) grout where indicated on the Plans after the new sewer is placed in service.
- B. High strength (pressure) grout shall be composed of cement, flyash, and water proportioned and mixed to produce a plastic pumpable mixture. Cement shall be portland cement conforming to ASTM Specification C150, Type I. Flyash shall be Type C. Water shall be fresh, clean and free from injurious amounts of oil, acid, alkali, and organic matter.
- C. The following ingredients shall be selected, proportioned and mixed to produce a pumpable, high strength (pressure) grout:

Wt. of cement per cu. yd.	940 lb.
Wt. of flyash per cu. yd.	1,925 lb.
Vol. of water per cu. yd.	60 gal.
Amount of air entrainment in fresh mix	2 % of volume
Retarder	Max. Allowed / 100 WT

- D. Pressure grout shall be pumped into place via a pipe cemented into the sewer line to be grouted full. This pump line shall have vent pipes on each end and the pipe used shall be capable of withstanding the pressure it will be subjected to during the pump process.

3.16 REMOVING AND REPLACING SIDEWALK, OTHER ITEMS

- A. Where pipe is to be placed under existing concrete sidewalk, the concrete shall be removed in construction units unless their length is more than 10', in which case the concrete shall be cut as specified in paragraph 3.11.2. of this section. The backfill shall be thoroughly compacted for the entire depth of the trench.
- B. The sidewalk shall be replaced with 3000 psi concrete, 4" thick, except for driveways where it shall be 6" thick. The concrete shall be placed monolithic and dressed off with a wooden float, brush and edging tool. Where pipe is to be placed under concrete walk, the Contractor may, with the permission of the Engineer, install the pipe by tunneling instead of removing and replacing the walk. If pipe is to be placed under curb and gutter, it shall be done by tunneling. No additional payment will be made therefor.
- C. The Contractor shall be responsible for removing and replacing items such as mail boxes, fences, shrubbery, walls, steps, and any other private ornamental items that are in direct conflict with the sewer line work. No additional payment will be made therefor.

3.17 PIERS AND PROTECTION WORK

- A. Concrete piers: Foundation for piers shall be adequate to support the intended load and will be subject to the Engineer's approval prior to pouring concrete. Concrete piers shall have a rubbed finish.
- B. Protection concrete shall be poured in such locations as shown on the plans or directed by the Engineer. It shall consist of one part Portland Cement, two parts sand and four parts crushed stone.

3.18 MISCELLANEOUS ITEMS

- A. The Contractor shall be responsible for removing and replacing miscellaneous items in conflict with the sewer line work such as mail boxes., signs, fences, walls, shrubbery, private ornamental items, etc. Shrubby and plantings shall be preserved by proper root protection and watering until replanted. Tree limbs shall be protected where possible. Damaged trees shall be repaired with an approved tree dressing. No additional payment will be made for removing and replacing miscellaneous items.

3.19 REPAIRS TO DAMAGED SERVICES AND UTILITIES

- A. Repairs to damaged services and utilities shall be promptly made at the Contractor's expense. The Contractor shall use every effort to avoid damaging or breaking water, sewer, gas, power, telephone or other utility services. Utility lines shall be properly supported across the pipe trench until backfilling is completed. Should damage occur, immediate action shall be initiated to effect satisfactory repairs. All repair work shall be satisfactory to the Engineer and owner of the damaged utility.

3.20 CLEANUP

- A. All pipeline rights-of-way and pipework areas shall be cleaned up and left in satisfactory condition.
- B. Cleanup of work along highways or roads shall be made immediately upon completion of the backfill operation. Ditching and pipe laying shall be stopped at any time that cleanup work lags and shall not be resumed until cleanup progress is satisfactory to the Engineer. Final cleanup and condition of the work area shall be subject to the approval of the State Highway Representative, the Owner, and the Engineer.
- C. Cleanup of work for cross-country locations shall follow immediately upon the completion of any major part of the work or upon instructions by the Engineer. Topsoil shall be replaced on all areas disturbed by the pipeline work throughout the length of the sewer main, and to the full satisfaction of the property owner. Topsoil may be removed from the line of work and stockpiled for future use. It shall be carefully removed, stockpiled, protected, respread, dressed off, and the entire right-of-way left in condition acceptable to the Engineer and property owner. If topsoil is not stockpiled and protected, suitable, approved material from other

sources shall be provided. Where the line is located on pasture land, grassed areas, or roadway shoulders, grass shall be replaced.

3.21 BY-PASS PUMPING

A. See Section 11500.

Schedule 02722-1 Minimum Test Times for Pipe

Pipe-Size →	4"	6"	8"	10"	12"	15"	18"	21"	24"	
↑	25	0:04	0:10	0:17	0:22	0:26	0:31	0:36	0:44	0:53
	50	0:09	0:20	0:35	0:44	0:53	1:02	1:12	1:29	1:47
	75	0:13	0:30	0:53	1:06	1:20	1:34	1:48	2:14	2:40
	100	0:17	0:40	1:11	1:29	1:47	2:05	2:24	2:58	3:33
LENGTH	125	0:22	0:50	1:29	1:51	2:13	2:36	3:00	3:43	4:27
	150	0:26	1:00	1:47	2:13	2:40	3:07	3:36	4:27	5:20
	175	0:31	1:10	2:04	2:35	3:07	3:39	4:12	5:12	6:14
	200	0:35	1:20	2:22	2:58	3:33	4:10	4:48	5:57	7:07
OF	225	0:40	1:30	2:40	3:20	4:00	4:41	5:24	6:41	8:00
	250	0:44	1:40	2:58	3:42	4:27	5:13	6:00	7:26	8:54
	275	0:49	1:50	3:16	4:05	4:53	5:44	6:36	8:10	9:47
	300	0:53	2:00	3:33	4:27	5:20	6:15	7:12	8:55	10:41
PIPE	325	0:58	2:10	3:51	4:49	5:47	6:47	7:48	9:40	11:34
	350	1:02	2:20	4:09	4:11	6:14	7:18	8:25	10:24	12:28
	375	1:06	2:30	4:27	5:34	6:40	7:49	9:01	11:09	13:21
	400	1:11	2:40	4:45	5:56	7:07	8:21	9:37	11:54	14:14
TESTED	425	1:15	2:50	5:02	6:18	7:34	8:52	10:13	12:38	15:08
	450	1:20	3:00	5:20	6:40	8:00	9:23	10:49	13:23	16:01
	475	1:24	3:10	5:38	7:03	8:27	9:54	11:25	14:07	16:55
	500	1:29	3:20	5:56	7:25	8:54	10:26	12:01	14:52	17:48
↓	525	1:33	3:30	6:14	7:47	9:21	10:57	12:37	15:37	18:42
	550	1:38	3:40	6:31	8:09	9:47	11:28	13:13	16:21	19:35
	575	1:42	3:50	6:49	8:32	10:14	11:60	13:49	17:06	20:28
	600	1:47	4:00	7:07	8:54	10:41	12:31	14:25	17:51	21:22

END OF SECTION 02722

SECTION 02723 – FORCE MAINS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Work covered under this section of these specifications consists of the construction of force main lines and miscellaneous pipework, including all valves, fittings, and appurtenances. The scope of work shall be as detailed under Project Drawings and Specifications.

1.2 QUALITY ASSURANCE

- A. Standards:
 - 1. American Society for Testing and Materials
 - a) ASTM D2241
 - b) ASTM D1784
 - c) ASTM D1598
 - d) ASTM D1599
 - e) ASTM D2152
- B. The Contractor shall retain the services of a testing laboratory to perform all compaction tests required at the project site. The testing laboratory shall be approved by the Engineer. In areas of fill and backfill, field density tests shall be performed in sufficient numbers to ensure that the specified density is obtained. These tests shall be made and paid for by the Contractor in accordance with the testing allowance, except as follows.
 - 1. Areas in which testing reveals compaction below the specified density shall be reworked, or removed and replaced by the Contractor until specified compaction is obtained. In the event results fail after reworking material, the Contractor shall be liable for retesting.
 - 2. The Contractor shall be responsible for the cost of testing of borrow material which shall include standard density tests (Proctor curves)

1.3 SUBMITTALS

- A. Submittals shall be as specified in the General Conditions.
- B. Submit the following:
 - 1. Manufacturer's Certificate of Compliance with the applicable specifications and standards.

2. Shop drawings with physical characteristics and dimensions of pipes.

PART 2 – PRODUCTS

2.1 GENERAL

- A. All material and appurtenances shall meet the following minimum standard requirements. It shall be each manufacturer's responsibility to check the installation and to furnish material that will be fully capable of performing its intended function.
- B. Pipe shall be of the type, size, class and diameter as hereinafter specified and called for by the Drawings.
- C. Trench construction shall be in accordance with the MSD's Standard Details.

2.2 DUCTILE IRON PIPE

- A. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51 and be centrifugally cast of ductile iron having a minimum tensile strength of 60,000 psi, a minimum yield strength of 42,000 psi, and a minimum elongation of 10% (Grade 60-42-10). All ductile iron pipe shall conform to ANSI/AWWA C150/A21.50 and shall be Pressure Class (PC) 350 for pipes 12-in. and smaller; and shall be PC 250 for pipes 14-in. and larger.
- B. Nominal laying lengths shall be 18-ft or 20-ft. A maximum of 20% of the total number of pipes of each size delivered may be provided in lengths that are as much as 24-in. shorter than the nominal lay length; an additional 10% may be provided in lengths that are as much as 6-in. shorter than the nominal lay length.
- C. Fittings for flanged ductile iron pipe shall be of ductile iron. Flanged fittings shall conform to the requirements of ANSI/AWWA Specification C110/A21.10 and shall be suitable for a water working pressure of 250 psi. Flanges shall conform to the requirements of ANSI/AWWA Specification C110/A21.10.
- D. Underground Sewage Force Main piping, inside the pumping station site, (generally inside the fenced area), shall be ductile iron pipe with gasketed, compression type joints, "slip-joints". Ductile iron pipe with slip joints shall conform to the requirements of ANSI/AWWA Specification C151/A21.51. The pipe shall be Class 350. Slip joints shall conform to the requirements of ANSI/AWWA Specification C111/A21.11. Minimum cover shall be 30 inches.
- E. All ductile iron pipe shall have exterior coatings and interior linings as follows:
 1. Interior Lining
 - a. Material: a ceramic-filled anime-cured epoxy, Protecto 401 by Induron or equal, including Permox-CTF by Permite Corporation.
 - b. Material Standard: ANSI/AWWA C104/A21.4

c. Lining Thickness: 40 mils nominal dry film thickness.

2. Exterior Coatings (Exposed)

- a. Exposed ductile iron pipe and fitting shall have a three part coating system such as Sherwin Williams Exterior Tank System, or approved equal. The surfaces to which the system is to be applied shall be prepared in accordance with the manufacturer's recommendations.
- b. The first part or application shall be a rust penetrating epoxy pre-primer (Sherwin Williams Macropoxy 920 Pre-Prime or approved equal). After cure, the intermediate coat or base coat (Sherwin Williams Macropoxy HS high solid epoxy or approved equal) shall be applied.
- c. The finish or top coat (High Gloss Sherwin Williams Acrolon 218 HS acrylic polyurethane or approved equal) shall be applied.
- d. Color for pump station piping shall be Sherwin Williams Item Number SW4001 Bolt Brown, or approved equal. Colors for applications other than force main piping shall be submitted to the ENGINEER for approval.

F. Weights and Markings:

- 1. Weights of pipe and fittings shall conform to the requirements of AWWA specifications. The class designations for the various classes of pipe and fittings shall be cast on fittings in raised numerals and cast or stamped on the outside of individual joints of pipe. Weights shall be plainly painted in white on the outside of each joint of pipe after the exterior coating has hardened.
- 2. The manufacturer's year of production and the letters DI or DUCTILE shall be clear and legible and on, or near, the bell end.

G. Polyethylene Encasement for Buried Ductile Iron Pipe:

- 1. Polyethylene encasement shall be provided for all buried ductile iron pipe.
- 2. Material Standard: ANSI/AWWA C105/A21.5
- 3. Linear low density polyethylene film (8 mil minimum, 3600psi tensile strength) or high density (4 mil minimum, 6300psi tensile strength) cross laminated polyethylene film shall be used.
- 4. All polyethylene encasement shall be marked showing trademark, year of manufacture, type of resin, specification conformance, and applicable pipe sizes.

5. A 2-in. wide plastic adhesive tape shall be used for sealing seams, cuts, or tears in polyethylene encasement. Duct tape shall not be allowed.

2.3 POLYVINYL CHLORIDE PIPE

- A. PVC pipe shall be rigid polyvinyl chloride with integrally formed, factory fabricated for rubber ring type joints. PVC pipe shall be made from clear virgin material and shall conform to all requirements of ANSI/AWWA C900, with cast-iron equivalent outside diameter (CIOD).
- B. All PVC force main pipe shall be Pressure Class 200 (DR 21), unless approved otherwise by the MSD.
- C. Each length of pipe shall be furnished in standard 20-ft ($\pm$ 1-in.) laying lengths.
- D. PVC material used in the manufacture of PVC pipe shall conform to ASTM D1784 and shall be made from a compound meeting or exceeding the requirements of cell classification 12454.
- E. Force mains of PVC pipe shall have gasketed push-on joints. Gaskets shall be manufactured of elastomeric material in accordance with ASTM F477 "Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe".
- F. Identification:
 1. All PVC force main pipe shall be green in color and shall be marked "FORCE MAIN" and "NOT FOR POTABLE USE".
 2. Each length of pipe shall be marked with the name of the manufacturer, size, and class. All gaskets shall be marked with the name of the manufacturer, size, and proper insertion directions.
- G. Provisions must be made for expansion and contraction at each joint, through the rubber gasket and pipe bell. Laying lengths shall be 20'-1", except random lengths may be furnished for special connections and other special uses.

2.4 PVC FITTINGS

- A. PVC fittings shall not be allowed on force mains. All fittings for PVC force main pipe shall be ductile iron fittings, conforming to ANSI/AWWA C110/A21.10 for mechanical joint fittings. All fittings shall be restrained joint type.

2.5 HIGH DENSITY POLYETHYLENE (HDPE) PIPE

- A. Pipes: HDPE force main pipe shall meet the requirements for Type III, Grade P345 Polyethylene Material as defined in ASTM Specification D1248 (PE 4710). The minimum pressure class/SDR rating acceptable shall be Class 200/SDR 11. The pipe shall be DIPS and shall have an interior diameter no less than the piping that it is connected to.

- B. Joints: Joints shall be of a heat fusion joining system. Pipe and fittings shall be thermal butt fusion, saddle fusion, or socket fusion in accordance with manufacturer recommended procedures and ASTM D-2161. At the point of fusion, the outside diameter and minimum wall thickness of the fitting shall match the outside diameter and minimum wall thickness specifications of ASTM D-1248 for the same size pipe.

Joining of the pipes and fittings shall be performed in accordance with ASTM D-2774. Depending upon the installation requirements and site location, joining shall be performed within or outside the excavation. Joints of the pipe sections shall be smooth on the inside and internal projection beads shall not be greater than 3/16 inch.

The tensile strength at yield of the butt-fusion joints shall not be less than the pipe. A specimen of the pipe cut across the butt-fusion joints shall be tested in accordance with ASTM D-638.

The manufacturer shall provide fusion training. The Contractor and the onsite joint inspector shall be trained by the manufacturer or manufacturer's authorized representative.

The fusion equipment and operator shall be required to demonstrate successful field experience. Regarding fusion over 36" capability, the fusion unit shall be field tested for a period of five years and the fusion operator shall have pipe size experience of the same size pipe on this project for five years or longer.

- C. Fittings: All fitting shall be provided as indicated on the plans. HDPE Fittings shall be of the same material and class as the pipe and shall be manufactured by the manufacturer of the pipe. HDPE Elbows, tees, and wyes shall be manufactured by mitered fabrication. The manufacturer shall have a written specification for all standard mitered fittings, which establishes Quality Control criteria and tolerances. The manufacturer may be required to demonstrate its ability to produce product required by this specification.

Mechanical joint anchor fittings (MJ Adapter or Harvey Adapter) shall be used to transition from ductile iron to HDPE and from HDPE to PVC. The fitting shall be stronger than the pipe in that when it is subjected to tensile stress the pipe will pull apart before the fitting will pull out and the pipe will blow before the fitting will rupture under pressure.

The MJ Adapter shall have a pre-installed stainless steel stiffener, in accordance with Plastic Pipe Institute (PPI) recommendations, to neutralize point-loading, ACQ, creep and loss of gasket seal due to diameter contraction. The stiffener shall be engineered sufficiently thick to avoid radial buckling due to gasket pressure.

The MJ Adapter requires longer bolts and shall be sold with the modified longer bolt kit to avoid construction crew delays or improper installation with too short bolts.

All fittings for force mains or pressure rated fittings shall be rated according to the manufacturer's written specifications, and clearly labeled on the fittings as such.

- D. Installation: The installation shall conform to the requirements of the manufacturer, the AWWA Standard, and as indicated on the plans and specified herein.
- E. Marking and Certification: Each length of HDPE sanitary sewer shall be clearly marked with the Manufacturer's Name, Tradename or Trademark, Nominal pipe size, Pipe Stiffness, Production Code/Extrusion Code, Material Cell Class Designation and ASTM number.

The pipe manufacturer shall provide certification that the stress regression testing has been performed on the specific product. The said certification shall include a stress live curve per ASTM D-2837. The stress regression testing shall have been performed in accordance with ASTM D-2837, and the manufacturer shall provide a product supplying a minimum Hydrostatic Design Basis of 1,600 psi as determined by ASTM D-2837. This certification shall also state that the pipe was manufactured from one specific resin in compliance with these specifications. The certificate shall state the specific resin used and its source.

2.6 JOINT MATERIAL

- A. Gasket lubricant shall be a potable hydrogenated vegetable oil, insoluble in cold water, non-toxic, and shall not support the growth of bacteria. It shall contain no deleterious ingredients and shall have no deteriorating effects on the gaskets. The lubricant shall be semi-paste, easily applicable, readily adherent to the inside of the bell, and shall remain in a usable state throughout the range of temperature in which pipe is normally installed. Lubricant shall be delivered to the job site in unopened containers bearing the manufacturer's name and trade name or trademark.

2.7 ANCHORAGE / JOINT RESTRAINT

- A. Force mains shall be adequately anchored to resist thrusts that may develop at bends, tees, plugs, valves, and at any other location where a change in flow direction occurs.
- B. Restrained Joint Pipe and Fittings:
 - 1. Provide restrained joint pipe and fittings where called for on the drawings. Length of restrained pipe shall be as indicated on the Drawings. Restrained joints shall be Flex Ring and Lok-Ring (American), TR Flex (U.S. Pipe), Field Lok (U.S. Pipe), Snap-Lok (Griffin Pipe), or approved equal.
 - 2. Restrained joint pipe and fittings shall be ductile iron manufactured in accordance with ANSI/AWWA C151/A21.51 and C110/A21.10. Restrained joint pipe and fittings shall meet all AWWA standards and other requirements as specified above for standard ductile iron pipe and fittings unless addressed herein.
 - 3. Field made joints are allowable but should be avoided where possible. Careful planning to locate field cuts in standard pipe sections is preferred. For field made joints in restrained piping, use field weldments, an insert

equal to TR Flex Gripper Rings, or gasket-type bolt-less restraint using Field Lok or Fast Grip gaskets or approved equal.

- a. Field Lok or Fast Grip gaskets for field made restrained joints shall be Tyton or Fast Tite joint in design with corrosion resistant stainless steel locking teeth vulcanized into the rubber. Gaskets shall meet all applicable requirements of ANSI/AWWA C111/A21.11 and shall be rated for a working pressure of 250 psi, minimum.
 - b. All gasket-type bolt-less restraints shall be a visible color other than black to ensure immediate identification and correct installation where required. Field Lok gaskets shall be red in color, and Fast Grip gaskets shall be Amarillo Fast Grip gaskets yellow in color for increased visibility, or equal.
 - c. Gasket-type bolt-less restraints shall only be allowed for joining ductile iron pipe and fittings. Gasket-type bolt-less restrains shall not be used on PVC pipe.
4. Restrained joint fittings shall be provided by the restrained joint pipe supplier. Fittings shall be of the same model / type as the pipe supplied from the pipe manufacturer.

C. Mechanical Joint Restraints:

1. Mechanical joint restraints may be used consisting of a follower gland with restraining device that imparts a wedging action against the pipe. The restraining device shall have twist off nuts to ensure proper contact with the pipe. Glands and restraining devices shall be manufactured of Ductile Iron. The restraining devices shall be heat treated to a hardness of 370BHN. Gland dimensions shall be compatible with the MJ fittings hereinbefore specified. The restrained joint shall be rated for a minimum 250 PSI working pressure with a 2:1 safety factor. Mechanical joint restraints may be through the use of a specially machined ductile iron ring and follower gland that is used with standard mechanical joint gaskets and T-bolts.
 - a. Restrained mechanical joints shall be Megalug as manufactured by EBAA Iron, Inc., Stargrip as manufactured by Star Pipe Products, or approved equal.
 - b. Where additional fittings/valves are required for pipes not shown on Drawings, consult with the Engineer for length of restrained joint

pipe necessary each side of fittings/valve prior to installation of pipe/fitting.

- c. Contractor shall develop a field layout schedule and drawing for restrained joint pipe installations for the MSD's review prior to installation.

2.8 VALVE BOXES

- A. Valve boxes shall be of cast iron, three-piece, screw type with covers and bases. They shall be of suitable size for the valve with which they are used and fully adjustable for depth of setting, extension pieces being furnished where necessary. Drop type covers shall be provided for each box with the proper work designating the valve service cast into its top surface. Oval type bases shall be provided and shall be so designed to fully support the box without weight of the box and/or superimposed load being transmitted to any part of the valve or adjacent pipe on either side.
- B. Valve boxes shall be Figure 4905 as manufactured by Opelika Foundry Company, or comparable boxes as manufactured by the Mueller Company, John Bouchard & Sons, Company, or pre-approved equal.

2.9 CONCRETE

- A. Concrete for protection and for thrust blocks shall be composed of Portland Cement, sand, coarse aggregate, water and such admixtures as may be allowed, in such proportions as to provide in minimum compressive strength of 3,000 psi. The source of concrete and mix design shall be reviewed and approved by the Engineer prior to use.

2.10 CRUSHED STONE

- A. Crushed stone for pipe bedding shall conform to ASTM C33, size no. 67 with a range of ¾" to 1.

2.11 TRACER WIRE

- A. All sanitary sewer force mains shall have a solid copper or copper clad steel core tracer wire, specifically manufactured for underground installations, buried on top of the pipe, as per MSD Detail Force Main Tracer Tape and Wire Installation. THHN, TNN or uncoated copper wire shall NOT be allowed.
 - 1. The tracer wire shall have a #12 AWG (minimum) solid copper, 7 strand copper conductor wire or steel core, copper clad wire capable of carrying a low voltage (up to 600 volts) current for low voltage applications for locating buried sewer lines and shall meet or exceed ASTM Specifications, UL Standards, and National Electrical Codes (NEC) requirements.
 - 2. For #12 AWG solid copper tracer wire, the insulation shall be a flame retardant, heat, moisture and chemical resistant polyvinyl chloride (PVC)

material (60 mil minimum thickness) and shall be PRO-LINE Safety Products CU UF Tracer Wire No. 7430405 or approved equal.

3. For #12 AWG 7 stranded copper tracer wire, the insulation shall be a flame retardant, heat, moisture and chemical resistant polyvinyl chloride (PVC) material (60 mil minimum thickness) and shall be PRO-LINE Safety

Products CU UF Tracer Wire No. 7431005 or approved equal.

4. For #12 AWG steel core, copper clad tracer wire, the insulation shall be a flame retardant, heat, moisture and chemical resistant polyvinyl chloride (PVC) material (60 mil minimum thickness) and shall be Copperhead High Strength CCS Tracer Wire No. CH1230BHS500 or approved equal.
5. The color of the outer cover shall be "green" in accordance with NC811 and AWWA Uniform Color Code for sanitary sewer uses and shall come in a continuous roll of not less than 1000 feet per roll, unless the distance between tracer wire access boxes, for which the wire is to be installed, is less than 1000 feet; in such cases, the minimum length of the wire on the roll shall be not less than the distance between the terminal boxes plus twenty (20') feet.
6. The tracer wire shall be placed over the sewer pipe or force main pipe after backfilling to 12" to 18" above top of pipe with ABC stone or other acceptable backfill material. After placing tracer wire in pipe trench, the Contractor shall backfill the remainder of the trench as per MSD Backfill Specifications. In no case shall the tracer wire be disturbed by the backfill process or installation.
7. The tracer wire shall be continuous from the beginning point to the ending point. Should it become necessary to splice this wire, a splice kit/connector capable of handling two (2) to four (4) wires per connection and designated to be "waterproof" shall be provided. Such connector / splice kits shall be Scotchlok DBY by 3M, LV 9000 by SNAPLOC or approved equal.
8. The ends of the tracer wire shall terminate at an approved terminal box (or tracer wire access box) specifically made for assisting in the location of underground tracer wire. The ends of the tracer wire shall be tracer wire affixed to the connector points of the tracer wire access boxes as per the tracer box manufacturer's requirements. Tracer wire access boxes shall be provided at and between each air release valve, air/vacuum valve, combination valve, and the terminal manhole. Tracer wire access boxes shall be those manufactured by VALVCO Inc. or approved equal and capable of supporting and withstanding H2O highway loads.
9. Where the distance between the terminal boxes (tracer wire access boxes) as specified above, exceeds 1000 feet, additional tracer wire access boxes

shall be provided and installed so that the distance between any two adjoining boxes does not exceed 1000 feet.

10. The location of all tracer wire access boxes and air release valves shall be marked with a fiberglass utility marker post of not less than 3.75" (w) x 72" (L) x 0.125" (t). Marker Posts, as manufactured by Rhino Markers or approved equal, shall be embedded not less than 24 inches, nor more than 36 inches into the ground and shall be green in color conforming to NC811 and AWWA color code requirements for sanitary sewers.
 11. Fiberglass Utility Marker Posts shall include the following information either printed directly on the face of the post or on a plastic water resistant label affixed with a waterproof glue or adhesive (see MSD Details for layout):
 - a. "WARNING" (yellow letters on white background)
 - b. "Sanitary Sewer Force Main" (black letters on white background)
 - c. "Owner – Metropolitan Sewerage District of Buncombe County, NC" (black letters on white background)
 - d. Emergency Phone Number – 828-255-0061 (black letters on white background)
 - e. NC811 "Call Before You Dig" logo - (color on white background)
 12. A non-detectable 6.0 mil x 6" (w) pigmented polyethylene utility marker tape, green in color with the wording "Caution – Buried Sewer Line Below" or Caution – Buried Sanitary Sewer Below) imprinted thereon shall be installed in the backfill directly above the sewer force main pipe at a depth of 24" to 36" above the top of the pipe but less than 12" below the finish ground surface. This marker tape shall be PRO-LINE 10434 183 3 or 10434 193 3 or approved equal.
- B. The Contractor shall be responsible for testing the Tracer Wire System for conductivity after all connections have been made. If the Tracer Wire does not function as intended, the Contractor shall take appropriate and necessary measures to bring the system into compliance.

2.12 COMBINATION AIR/VACUUM AND AIR RELEASE VALVES

- A. The route of the force main shall be such that the number of combination air/vacuum release valves (CARV) are minimized to the greatest extent possible.
- B. An automatic air release valve shall be provided at all high points to prevent air locking of the force main. An automatic combination air/vacuum release valve (CARV) shall be provided at the ultimate high point and when necessary for surge control where sub-atmospheric pressures or column separation may occur. Automatic air release valves shall be used at all other high points. Air release valves are required when the difference between the low point and high point

exceeds one pipe diameter. These valves shall be of the quick-opening, slow-closing type with a minimum 2-in. diameter screw-threaded inlet and a stainless-steel quarter-turn ball valve between the force main and the air release valve for isolation purposes.

2.13 RESTRAINED FLANGE COUPLING ADAPTERS

A. Manufacturers and Type

1. EBAA Iron Sales, Inc., 2100 MEGAFLANGE
2. Romac Industries, Inc., Style RFCA
3. Smith-Blair Style 911
4. Or equal restrained flange coupling adapters by US manufacturer.

PART 3 – EXECUTION

3.1 LOCATION

- A. Pipework shall be installed at the locations shown on the plans and to the position, alignment and grade shown thereon. Prior to beginning work at any location, the Contractor shall consult with the Engineer and the MSD to determine that all rights-of-way, permits, or other legalities are in order. He shall familiarize himself with all conditions and/or limitations of such rights-of-way or permits and shall fully comply with all such requirements. All work shall be confined to rights-of-way or permit limits and any encroachment beyond such limits shall be the Contractor's liability.
- B. Force mains shall not be installed closer than 25 feet from a private water supply well or 50 feet from a public water supply well, even if ferrous pipe material with joints equivalent to water main standards is used.

3.2 RELATION OF WATER MAIN TO SEWER

- A. Crossing a Force Main under a Water Main: Whenever it is necessary for a force main to cross under a water main, the force main shall be laid at such an elevation that the top of the force main is at least 18" below the bottom of the water main, unless local conditions or barriers prevent an 18" vertical separation, in which case 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' on each side of the point of crossing.
- B. Crossing a Force Main over a Water Main: Whenever it is necessary for a force main to cross over a water main, 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' on each side of the point of crossing. A section of force main pipe shall be centered at the point of crossing.

3.3 INSTALLATION OF FORCE MAINS AND APPURTENANCES

- A. Force mains shall be installed in accordance with AWWA C600 for ductile iron, AWWA C605 for PVC, and AWWA C906 for HDPE. Continuous and uniform bedding, haunching, and backfill that is appropriate for the soil type and pipe material shall be provided in the force main trench.
- B. The Contractor shall haul the pipe and appurtenances to the site of work and distribute them neatly along the trench prior to laying. The pipe shall be carefully handled to prevent damage, mechanical hoists or other approved methods being used in the handling. Depth of cover shall not be less than 3'-0" for pipe up to 8" in diameter or 3'-6" for pipes 10" and larger in diameter, measured to the top of pipe, except where shown differently on a profile or specifically authorized by the Engineer.
 - 1. In the event that the appropriate installation depth cannot be met by the design, the force main shall be constructed of ferrous pipe or provided with a ferrous pipe encasement in accordance with 15A NCAC 2H .0305(g)(4).
- C. Pipe and appurtenances shall be kept clean, and open ends securely plugged, when pipe laying is not in progress. The inside of pipe and bell and spigots shall be thoroughly inspected and cleaned prior to lowering into the ditch and care shall be exercised after the pipe is in place to prevent dirt or other extraneous material from getting into the pipe or bells and into the spigot.
- D. Spigots shall be fully seated in the bells and the pipe shall be uniformly bedded on the bottom of the trench for its entire length with bells lying in previously dug bell holes sufficiently large to allow proper bedding and jointing. Fittings, valves and other appurtenances shall be located where shown on the plans or directed by the Engineer, with the pipe being cut where necessary. After jointing, a reasonable amount of deflection may be made in the joint. Such deflection shall not exceed the allowable amount specified by the manufacturer for each size of pipe.
- E. For mechanical joint pipe, the rubber rings shall be properly lubricated and the spigots and bells cleaned before assembling the joint. Nuts of bolted joints shall be tightened with special torque limiting wrenches set to provide the proper strain on the bolt, and all nuts tightened to that limit.
- F. Rubber ring joints, shall be assembled in accordance with the manufacturer's instructions. The bell and spigot shall be absolutely clean prior to seating of the gasket. The gasket shall be wiped clean, flexed and properly inserted into the socket and seated evenly and properly. Care shall be taken to eliminate any bulges which might interfere with the proper entry of the spigot. A thin film of lubricant, shall be applied to the inside surface of the gasket. The spigot shall then be completed by forcing the spigot into the bell until it makes contact with the bottom of the socket. This shall be done by use of pipe jack and assembly, or other methods as approved by the Engineer.
- G. Fittings shall be installed where shown on the plans or directed by the MSD. They shall be handled and installed in the same manner as the pipe and all shall be well blocked or restrained as specified herein.

- H. Where shown on the plans, or directed by the MSD, concrete supports, walls, or other protective work shall be constructed.
- I. Contractor shall take elevation shots every 100 feet on the installed force main pipe along the entire route to ensure positive and uniform grades to each air release valve. The elevations shall be recorded by the Contractor with a record provided to the MSD.

3.4 THRUST BLOCKING

- A. Restrained joint pipe and mechanical joint restraints shall be used in lieu of concrete thrust blocking wherever possible. Concrete thrust blocking shall only be used where connections are made to existing pipes or structures, or restrained joint pipe or mechanical joint restraints cannot be used, or at the direction of the MSD.
- B. Concrete for blocking and protection shall be poured in accordance with the following requirements: All fittings, bends, dead ends, etc., shall be acceptably blocked with concrete having bearing on undisturbed earth in the side and/or bottom of the trench. Bearing area shall be equal to that shown on the Plans and greater if deemed necessary by the MSD. No concrete shall be poured or splattered on fitting bells, glands, or bolts.
- C. Reaction blocking for force mains 10" and larger shall be transit-mixed concrete. Bags of unmixed sacrete or other bagged concrete for blocking and bracing shall not be acceptable. This concrete shall have a 28 day compressive strength of 3000 psi.
- D. Material for reaction blocking for force mains less than 10" may be composed of bagged concrete that has been mixed with the correct proportion of water.

3.5 REPAIRS TO DAMAGED SERVICES AND UTILITIES

- A. Repairs to damaged services and utilities shall be promptly made at the Contractor's expense. The Contractor shall use every effort to avoid damaging or breaking water, sewer, gas, power, telephone or other utility services. Utility lines shall be properly supported across the pipe trench until backfilling is completed. Should damage occur, immediate action shall be initiated to effect satisfactory repairs. All repair work shall be satisfactory to the Engineer and the Owner of the damaged utility.

3.6 CONNECTIONS TO EXISTING FACILITIES

- A. Connections to existing facilities shall be made where shown on the plans or directed by the MSD's authorized representative. All connections to the MSD's facilities shall be witnessed by a representative of the MSD, in which case, the main shall be cut and the connections made with fittings. In no case shall the Contractor operate the existing systems without the expressed permission of the MSD.

3.7 TESTING

- A. Prior to testing any segment of force main, care should be taken to prevent the pipe from moving while under pressure.
- B. Temporary taps and air releases shall be permissible to facilitate testing.
- C. Water used for testing force main installations shall either be disposed in a nearby sanitary sewer, as authorized by the MSD or other local sewer authority, or in another location in accordance with state and federal laws and regulations.
- D. All testing shall be performed in the presence of the MSD's authorized representative and the Engineer or other authorized representative.
- E. The results of all testing shall be submitted to the MSD by the Contractor or Engineer as part of the construction record documentation.

3.8 PRESSURE TESTING

- A. A hydrostatic pressure test shall be performed on each segment of installed force main.
- B. The test shall be performed after the force main has been backfilled and at least seven days following the pouring of the last thrust block (if applicable).
- C. The following procedures shall be followed in performing hydrostatic pressure tests on force mains:
 - 1. The force main segment shall be carefully filled with water at a velocity of approximately one foot per second. Water may be introduced from either the pump station or a temporary connection made in the force main. Appropriate measures necessary to eliminate all air from the force main shall be taken during this process.
 - 2. Once full of water, the force main segment shall be pressurized and allowed to stabilize at a minimum test pressure of 100 psi, or 1.5 times the maximum design pressure of the force main pipe material, whichever is greater.
 - 3. The pressure shall be maintained within 5 psi of the test pressure for at least two (2) consecutive hours.
 - 4. If the stated pressure cannot be maintained, the Contractor shall make all necessary repairs, and repeat the hydrostatic pressure test until the force main segment passes.
- D. The pressure test may be performed concurrently or separately with the leakage test.

3.9 LEAKAGE TESTING

- A. A leakage test shall be performed on each segment of installed force main at the hydrostatic pressure test stipulated herein, a minimum of 100 psi or 1.5 times the maximum design pressure of the force main pipe material, whichever is greater.
- B. Leakage shall be defined as the quantity of water required to maintain a pressure within 5 psi of the specified test pressure after the pipe has been filled with water and all air has been expelled.
- C. Leakage shall be measured with a calibrated test meter and shall not exceed the amount given by the following formula:

$$L = \frac{S * D * \sqrt{P}}{133,200}$$

Where:

S = Length of Pipe (feet)

L = Leakage (gph)

D = Nominal Diameter of Pipe Segment Tested (inches)

P = Test Pressure (psi)

All visible leaks shall be repaired regardless of the amount of leakage. If leakage exceeds this rate, the Contractor is responsible for assuring that the cause of test failure is determined, all necessary repairs are made, and repeating the test until the force main segment passes.

- D. Water for testing two (2) times the volume of the new line's total volume will be furnished by the Owner at no cost to the Contractor after which normal water usage charges will be made. Contractor shall furnish all necessary pipe or hose extensions or transportation to the point of use and shall exercise care in the use of water.

3.10 PIPE FITTINGS

- A. Pipe fittings shall be subject to inspection and testing in accordance with standard manufacturing practice.

3.11 GASKETS

- A. Gaskets shall be tested, if required, in accordance with Section 3-4 of ANSI/AWWA C111/A21.11.

3.12 OTHER MATERIAL

- A. Other material shall be subject to such testing as the MSD may require, should its acceptability be questioned.

END OF SECTION 02723

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SECTION 17120 - INSTRUMENTATION AND CONTROL, DEVICES AND EQUIPMENT

PART 1 - GENERAL

1.1 REQUIREMENT SUMMARY

- A. Contractor shall furnish, test, install and place in satisfactory operation all equipment 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. Control System Integrator (CSI) shall provide full onsite supervision of all equipment provided under this section, where installation is provided by others.
- C. ICS devices and equipment (i.e., primary elements, measuring devices, transmitters, field controllers, chart recorders, indicators, and other instrumentation and accessories) shall be provided with all components necessary for a fully functional device whether specifically mentioned in these specifications or not. This shall include, as applicable or recommended by the manufacturer: sample conditioning, sensors, sensor holder and mounting brackets, transmitter, all required cables, calibration equipment, chemicals, reagents and spare parts.
- D. Specialty cables between sensors/probes and their electronics/transmitters shall be furnished with each instrument. Cables shall be coordinated with the conduit installation and be of sufficient length to not require any splicing. Specialty cables include any type of cable not specified in Division 16.
- E. Panels will be designed with consideration given to routing of cables and piping, maintenance, and calibration. The panel designs will be submitted with the field measurement equipment for approval.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. In addition to the requirements specified in this Section and the requirements of Division 17 to include those Project Documents referenced herein shall be applied.
- B. Instrumentation and Controls Schedules. Reference Instrumentation Schedule and PLC Input/Output Schedule Attachments for a listing of major equipment, enclosure construction and signal monitoring requirements
- C. Related Specification Section(s) include but not limited to
 - 1. 17000 – INSTRUMENTATION AND CONTROL, GENERAL REQUIREMENTS

1.3 REFERENCES

- A. ICS devices and equipment installations shall comply with the National Electric Code, National Electric Safety Code, OSHA, and with all applicable federal, state, county, municipal, and electrical utility codes and regulations, as well as

the Contract Documents. In the event of any conflict between these codes, regulations, and Contract Documents, the most restrictive shall apply.

B. Codes and Standards

1. All applicable state, county, and municipal code requirements
2. All applicable standards of the National Fire Protection Association (NFPA)
 - a. National Electrical Code (NEC)
3. All applicable standards of the Underwriter's Laboratories, Inc. (U.L.)
4. All applicable standards of the Institute of Electrical and Electronics Engineers (IEEE)
5. All applicable standards of the National Electrical Manufacturers Association (NEMA)
6. All applicable standards of the International Society of Automation (ISA) to include but not limited to
 - a. S5.1 Instrumentation Symbols and Identification
 - b. S5.4 Instrument Loop Diagrams
 - c. S20 Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves
 - d. TR20.00.01 Specification Forms for Process Measurement and Control Instruments
7. All Owner related construction and installation specifications and details

1.4 SUBMITTALS

- A. Contractor shall reference and provide all documentation for all Division 17 Sections as required per Specification Section(s)
1. 01340 – SUBMITTALS
- B. In addition to the requirements in Division 17, the following specific submittals items shall be provided
1. An ISA specification sheet for each instrument furnished and/or calibrated shall be submitted with the field equipment submittals. The ISA data sheet shall be in accordance with ISA Standards ISA S20 "Specification Forms for Process Measurement and Control Instruments, Primary Elements, and Control Valves" and ISA TR20.00.01 "Specification Forms for Process Measurement and Control Instruments".

2. CSI and ICS devices and equipment manufacturer(s) shall review the proposed installation and configuration of all field equipment, prior to submittal for approval, and shall identify any condition which shall require corrective measures. The following as a minimum shall be reviewed for the installation configuration of each instrument:
 - a. Listed features
 - b. Material of construction
 - c. Consideration of process fluid
 - d. Environmental conditions
 - e. Installation location
 - f. Process connections
 - g. Ability to perform maintenance
3. Submit in writing in the field equipment submittal, that each piece of equipment is suitable for the proposed installation. Any proposed deviations shall be reviewed by the Engineer prior to execution.

1.5 DELIVERY, STORAGE AND HANDLING

- A. ICS devices and equipment and all components shipped loose shall be handled and stored in accordance with manufacturer's instructions and recommendations as outlined in applicable Installation and Maintenance Manuals.
- B. Inspect and report concealed damage to carrier within their required time period. Owner is not responsible for damages incurred during shipping, handling and storage.
- C. Store in a clean, dry space. Maintain factory protection and/or provide an additional heavy canvas or heavy plastic cover to protect structure from dirt, water, construction debris, and traffic. Where applicable, provide adequate heating within enclosures to prevent condensation.

1.6 OPERATION AND MAINTENANCE MANUALS

- A. ICS devices and equipment operation and maintenance manuals shall be provided with each assembly shipped, and shall include instruction leaflets and instruction bulletins for the complete assembly and each major component.

1.7 WARRANTY

- A. Manufacturer shall warrant ICS devices and equipment to be free from defects in materials and workmanship for the lesser of one year (1YR) from date of installation or eighteen months (18MTH) from date of purchase.

1.8 IDENTIFICATION

- A. ICS devices and equipment shall be identified with the equipment tag number indicated on the Contract Documents and the accepted shop drawings. Nameplates shall be furnished and installed as required Specification Section(s)

1. 16075 – ELECTRICAL IDENTIFICATION

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

- A. ICS devices and equipment shall be provided within enclosures to suit the specified environmental conditions or as indicated on the Contract Documents. Field-mounted devices shall be rated for hard-usage and securely mounted on walls, equipment racks, or pipe stanchions. Where the field equipment integral enclosure for a specified instrument is not available with the specified environmental rating, the field equipment shall be provided in a control enclosure. Reference Specification Section(s)

1. 17110 – INSTRUMENTATION AND CONTROL, CONTROL ENCLOSURES

- B. Where separate elements and transmitters are required, they shall be fully matched, and unless otherwise noted or shown on the Contract Documents, installed adjacent or near to the sensor, in a readily accessible location. Special cables that are required for interconnection between sensors or probes and transmitters shall be furnished with the instrumentation devices by the associated equipment manufacturer. Special cables shall be of the required length for the equipment locations and conduit routing paths shown on the Contract Documents. No splicing of cables will be accepted.
- C. Electronic equipment shall utilize printed circuitry and shall be coated (tropicalized) to prevent contamination by dust, moisture and fungus. Ambient conditions shall be -15C to 50C and twenty to ninety-five percent (20% - 95%) relative humidity, unless otherwise specified. Field mounted equipment and system components shall be designed for installation in dusty, humid and corrosive service conditions.
- D. All non-loop-powered instruments and equipment shall be designed to operate on a 60Hz alternating current power source at a nominal 120VAC, except where specifically noted. All regulators and power supplies required for compliance with the above shall be provided. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.
- E. All analog transmitter and controller outputs shall be isolated, 4-20mA into a load of 0-750 OHM minimum, unless specifically noted otherwise.
- F. Process taps for primary sensors shall be sized to suit each individual installation and the requirements of the instrument served. Contractor is responsible to ensure that the location, supports, orientation and dimensions of the connections and taps for instrumentation furnished under this Division are such as to provide the proper

bracing, the required accuracy of measurement, protection of the sensor from accidental damage, and accessibility for maintenance while the plant is in operation. Isolation valves shall be provided at all process taps.

- G. All instrumentation exposed to sunlight shall be provided with sunshields constructed from 316 stainless steel. Sunshields shall be designed to withstand regional wind and ice loads. Sunshield design shall be submitted for approval.
- H. All outdoor external sample/process piping, including valves and appurtenances, shall be insulated with weather-proof insulation, and heat-taped to prevent freezing. Heat taping shall be thermostatically controlled, self-regulating and shall adjust its heat output to the temperature of the lines.
- I. Each instrument shall include a stainless-steel tag, with tag number and calibration data from the Contract Documents, attached to the instrument. Where not physically connected to the instrument, the tag shall be attached with stainless-steel wire.

2.2 LEVEL SWITCH, SUSPENDED FLOAT TYPE

- A. Float switches shall be of the non-mercury displacement type, encapsulated in polyurethane or vinyl floats.
- B. Units shall be waterproof, shockproof, explosion-proof and equipped with sufficient submersible cable to extend to the control panel or junction box without splicing.
- C. Any required weights shall be provided. Switches shall be suspended on a suitable rack or rail of stainless-steel construction.
- D. Suspended type float switches shall be equal to
 - 1. Flygt ENM-10
 - 2. Anchor Scientific Eco-Float
 - 3. Dwyer Series CFS2
 - 4. Engineer Approved Equal

2.3 LEVEL TRANSMITTER, RADAR TYPE

- A. Radar level transmitters shall be provided for measurement of tank, wet well, and pond levels. Equipment shall be provided with features and accessories as described herein and suitable for the application.
- B. Ultrasonic level transmitters shall meet the following specifications as a minimum:
 - 1. 24 VDC loop powered
 - 2. 80 GHz nominal frequency
 - 3. Output signal: isolated 4-20 mA DC with HART communications

4. Programmable over a Bluetooth connection
 5. Operating range: 0-50 feet
 6. Accuracy: +/- 2mm
 7. Enclosure: PDVF, rated hazardous environment C1, DII
 8. Process connection: 1-1/2 inch NPT
 9. Cable connection: 1-inch NPT. The cable provided with the transducer shall be ordered with sufficient length to provide installation without splicing the cable at any point.
 10. Siemens SITRANS LR110 transmitter with SITRANS mobile IQ application
- C. The transmitter shall provide a 4-20 mA DC signal to a display and pump controller. The display unit shall retransmit the 4-20 mA DC level signal to the RTU through the pump control panel.
- D. The display unit/pump controller shall be used to control the pump station when the pump control panel selector switch is set to Level mode. The control shall utilize the pump wet well level control scheme and control relays for operation of the pumps in an alternating lead/lag configuration.
- E. The CSI shall provide all mounting hardware and coordinate the details of the installation and control so that the instruments are installed in keeping with the best standard and recommended practices of the manufacturer and conforming to the requirements set forth by the Engineer.
- F. Level display unit/pump controller shall be fully programmable and configurable using a computer and keypad. The final 'As-Built' documentation shall be provided with a tabulation of the Programming Parameters used in the level transmitter so that the initial calibration can be reproduced if a spare transmitter is installed.
- G. Level transmitters shall be provided with optional integral analog signal isolators, as part of the transmitter assembly. All conduit connections shall be sealed to prevent damage or corrosion due to vapors or wetness.
- H. Ultrasonic Level/Flow Transmitters shall be Siemens SITRANS LT500.
- I. The CSI shall provide mounting hardware components and appropriate mounting assistance to install and secure the transducers in a manner in keeping with the recommendations of the manufacturer of the equipment and in keeping with the general details provided in the drawings. All hardware shall be fabricated from corrosion resistant materials and shall utilize stainless steel hardware. The mounting system shall be secure and permanent and shall allow easy access to the sensor for servicing. All cables shall be installed in suitable rigid conduit with only short lengths of flexible conduit allowed to complete the installation.
- J. Spare parts: Provide one (1) spare radar level transmitter of each type used, supplied with the longest cable utilized in the project.

2.4 FLOW TRANSMITTER, MAGNETIC

- A. Magnetic flow meters shall consist of a flow tube with remote-mounted signal converter/transmitter that is capable of converting and transmitting a signal from the flow tube. The flow tube shall utilize the characterized principle of electromagnetic induction and shall produce DC signals directly proportional to the flow rate
- B. The flow meter accuracy shall be $\leq \pm 0.5\%$ of reading from 2% to 100% meter capacity.
- C. The flow meter shall include but not be limited to the following:
 - 1. NEMA 6P / IP68 submersion enclosure
 - 2. Meter body shall be powder coated aluminum or carbon steel with an epoxy finish
 - 3. Electrical Housing shall be epoxy painted aluminum
 - 4. ANSI Class 150 flanges (minimum)
 - 5. EPDM, polyurethane or hard rubber liner to suit process requirements
 - 6. Flush type or bullet type (slurry applications) electrodes compatible with process fluid
 - 7. Empty pipe detection
 - 8. SST bolts/nuts, centering device, Teflon gaskets
 - 9. Grounding rings when installed in non-metallic piping. Grounding rings shall be chemically resistant to process, 316 SST minimum.
 - 10. The cables for interconnecting the flow tube to the transmitter shall be furnished by the manufacturer and of sufficient length as to not require splicing.
- D. The transmitter shall include but not be limited to the following
 - 1. NEMA 6P enclosure / IP68 submersion enclosure
 - 2. 120VAC, 60Hz input power
 - 3. Process display with keypad for menu driven configuration
 - 4. One (1) 4-20mA output, minimum
 - 5. HART protocol
 - 6. One (1) alarm relay output

7. Empty pipe detection
 8. Lo-flow cutoff
 9. Damping
 10. Flow Totalizer
 11. Non-volatile memory
- E. Magnetic flowmeter, transmitter, electrical/control connections, and appurtenances shall be rated for continuous submergence of up to 10 mH₂O.
- F. Magnetic Flowmeters shall be equal to
1. Siemens
 - a) Sitrans F M Mag 5100W flow tube
 - b) Sitrans F M Mag 6000 signal converter/transmitter
 2. Engineer Approved Equal

2.5 PRESSURE TRANSMITTER, GAGE AND DIFFERENTIAL PRESSURE (Addenda 1)

- A. 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 30:1 input range.
- B. Span and zero shall be continuously adjustable externally over the entire range. Span and zero adjustments shall be capable of being disabled internally.
- C. Transmitters shall be NEMA 4X weatherproof and corrosion resistant construction with low copper aluminum body and 316 stainless steel process wetted parts.
- D. Accuracy, including nonlinearity, hysteresis, and repeatability errors shall be plus or minus 0.10 percent of calibrated span, zero based. The maximum zero elevation and maximum zero suppression shall be adjustable to anywhere within sensor limits.
- E. Output shall be linear isolated 4-20mA 24 VDC with HART protocol. Power supply shall be 24 VDC, two wire design.
- F. Each transmitter shall be furnished with a 4-digit LCD indicator capable of displaying engineering units and/or milliamps, and mounting hardware as required.
- G. Overload capacity shall be rated at a minimum of 25 MPa. Environmental limits shall be 40 to 85 °C at zero to one hundred percent (0-100%) relative humidity.
- H. Each transmitter shall have a stainless steel tag with calibration data, attached to body.

- I. Each transmitter shall be mounted with a 316 stainless steel 2-valve (Gage pressure transmitter) or 3-valve (Differential pressure transmitter) manifold.
- J. The capacitance 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.
- K. 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.
- L. 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.
- M. 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 4-20 mA output signal, with a remote interface device. Output signal damping shall be provided, with an adjustable time constant of 0-36 seconds.
- N. Where scheduled, differential pressure indicating transmitters shall be calibrated in feet of liquid for liquid level service. Refer to the Contract Drawings for installations and applications. When used for flow measurement, the transmitter electronics shall be capable of performing the square root extraction within the transmitter so the local display and 4-20 mA signal are in terms of flow rate.
- O. Where scheduled, Gage pressure indicating transmitters shall be calibrated in feet of liquid for liquid level service. Refer to the Contract Drawings for installations and applications.
- P. Differential pressure indicating transmitters shall be Rosemount Model 2051CD or approved equal.
- Q. Gage pressure indicating transmitters shall be equal to Rosemount Model 2051TG or approved equal.

2.5 TOOLS, SUPPLIES AND SPARE PARTS

- A. Tools, supplies and spare parts shall be provided as required in Division 17 and as specified for each equipment item. In addition, the following items shall be provided:

2.6 ACCESSORIES

- A. Instrument tubing shall be 1/4IN x 0.065IN seamless, annealed, ASTM A-269 Type 316L stainless-steel with Type 316 - 37 stainless-steel flared fittings, or equal to Swagelok or Parker-CPI flareless fittings.

- B. Diaphragm seals shall be provided to systems as shown on the Contract Documents, as specified herein and/or for isolation of pressure gauges, switches and transmitters attached to systems containing chemical solutions or corrosive fluids. As a minimum, seals shall be of all 316 stainless-steel. Diaphragms shall be 316L stainless steel for operating pressures at or above 15PSI, and elastomers for operating pressures below 15PSI. Diaphragm material shall be non-reactive with the process fluid. Refer to the Instrument Schedules for specific materials requirements. Seal shall have fill connection, 1/4IN NPT valve flush port and capable of disassembly without loss of filler fluid. Where specified, diaphragm seals shall comply with the above requirements, and shall be provided with 316 stainless-steel factory filled capillaries. Seals shall be equal to Helicoid Type 100 HA, Mansfield & Green, Ashcroft or approved equal.
- C. Isolating ring seals shall be provided for sensing elements measuring pressure in solids bearing fluids. For heavy solids/slurry applications, wherever the associated pressure instrument is used for control purposes, or as shown on the Contract Documents, the sensor body shall be full line size wafer design, with 316 stainless-steel housing and assembly flanges, and Buna N flexible cylinder lining for in-line mounting. The wafer shall have through bolt holes or centerline gauge for positive alignment with the associated flanged piping. The captive liquid chamber and associated instrument(s) shall be furnished with threaded drain tap and plug. Isolating ring seals shall be equal to RED Valve Series 40, Ronningen-Petter Iso-Ring, Moyno RKL Series W or approved equal.
- D. For all other solids bearing fluids, pressure shall be sensed via a 1/2IN diameter spool-type isolating ring seal, mounted on a 1/2IN pipe nipple at ninety-degrees from the process piping. An isolation ball valve shall be provided between the process piping and the ring seal, and a cleanout ball valve shall be provided between the ring seal and the atmosphere. The pressure instrument shall be back or side mounted to the ring seal such that the gauge or readout may be viewed normally. Isolating ring seals for normal solids service shall be equal to Red Valve Series 42, Ronningen-Petter Iso-Spool, or equal.
- E. Isolation valves shall be 1/2IN diameter ball valves with 316 stainless-steel body, 316 stainless-steel ball.

PART 1 - EXECUTION

3.1 INSTALLATION

- A. In addition to the requirements specified in this Section, reference Specification Section(s)
 - 1. 17000 – INSTRUMENTATION AND CONTROL, GENERAL REQUIREMENTS

END OF SECTION 17120

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SECTION 17120A – INSTRUMENT SCHEDULE**Magnetic Flow Meters**

Tag Number	Description	State/Span	Dwg. #	Additional Requirements
FE/FIT-100	Pump Station Discharge Flow	0-1000 gpm	E01.0	16-inch Flow Tube; Field SPD for 120 VAC and 4-20mA; Sunshield for FIT

Radar Level Transmitters

Tag Number	Description	State/Span	Dwg. #	Additional Requirements
LE/LIT-100A, LE/LIT-100B	Pump Station Wetwell Level	0-25 feet	E01.0	Sensor rated for Class 1, Div 1.; Field SPD for 120 VAC and 4-20mA, Sunshield for LIT

Pressure Transmitter

Tag Number	Description	State/Span	Dwg. #	Additional Requirements
PIT-101	Pump No. 1, No. 2 Discharge Pressure	0-60 psi	E01.0	60 PSIG, 1/2" NPT with diaphragm seal; Manufacturer Assembled

Float Level Switches

Tag Number	Description	State/Span	Dwg. #	Additional Requirements
LSLL-100	Pump Station Wetwell Low Level Float	Elev. XXX.XX	E01.0	Sensor rated for Class 1, Div 1.
LSHH-100	Pump Station Wetwell High Level Float	Elev. XXX.XX	E01.0	Sensor rated for Class 1, Div 1.
LSHH-101	Pump Station Meter Vault High Level Float	Elev. XXX.XX	E01.0	Sensor rated for Class 1, Div 1.

END OF SECTION 17120A

SECTION 17130A – CONTROL SYSTEM INPUT/OUTPUT SCHEDULE

Tag Number	Description	I/O Type	State/Span	Remarks
METROPOLITAN SEWERAGE DISTRICT ITT PUMP STATION				
YI-100	Inline Grinder Running	DI	0 - Stopped, 1 - Running	
XA-100	Inline Grinder Fault	DI	0 - Normal, 1 - Fault	
RL-101	Wastewater Pump No. 1 Running	DI	0 - Stopped, 1 - Running	
YI-101	Wastewater Pump No. 1 In Auto	DI	0 - Not In Auto, 1 - In Auto	
YI-101	Wastewater Pump No. 1 In Hand	DI	0 - Not In Hand, 1 - In Hand	
XA-101	Wastewater Pump No. 1 Overload	DI	0 - Normal, 1 - Overload	
TAH-101	Wastewater Pump No. 1 Overtemp	DI	0 - Normal, 1 - Overtemp	
UAH-101	Wastewater Pump No. 1 Seal Fail	DI	0 - Normal, 1 - Seal Fail	
HS-101	Wastewater Pump No. 1 Start/Stop Command	DO	0 - Stop Command, 1 - Run Command	
II-101	Wastewater Pump No. 1 Current	AI	0-XX Amps	
RL-102	Wastewater Pump No. 2 Running	DI	0 - Stopped, 1 - Running	
YI-102	Wastewater Pump No. 2 In Auto	DI	0 - Not In Auto, 1 - In Auto	
YI-102	Wastewater Pump No. 2 In Hand	DI	0 - Not In Hand, 1 - In Hand	
XA-102	Wastewater Pump No. 2 Overload	DI	0 - Normal, 1 - Overload	
TAH-102	Wastewater Pump No. 2 Overtemp	DI	0 - Normal, 1 - Overtemp	
UAH-102	Wastewater Pump No. 2 Seal Fail	DI	0 - Normal, 1 - Seal Fail	
HS-102	Wastewater Pump No. 2 Start/Stop Command	DO	0 - Stop Command, 1 - Run Command	
II-102	Wastewater Pump No. 2 Current	AI	0-XX Amps	
HS-104	Control Mode Selection	DI	0 - Level Mode, 1 - PLC Mode	
LSHH-100	Wetwell High Level Float	DI	0 - Normal, 1 - High Level	
LSLL-100	Wetwell Low Level Float	DI	0 - Low Level, 1 - Normal	
LSHH-101	Meter Vault High Level Float	DI	0 - Normal, 1 - High Level	
LE/LIT-100A	Wetwell Level No. 1	AI	0-25 feet	
LE/LIT-100B	Wetwell Level No. 2	AI	0-25 feet	* Addenda 1
FE/FIT-100	Wastewater Pump Station Discharge Flow	AI	0-1000 gpm	
PIT-100	Wastewater Pump Station Discharge Pressure	AI	0-60 PSI	* Addenda 1
RL-120	Generator Running	DI	0 - Stopped, 1 - Running	
YCI-120	Generator In Auto	DI	0 - Not In Auto, 1 - In Auto	
XA-120	Generator Alarm	DI	0 - Normal, 1 - Alarm	
LAH-120	Generator Low Fuel	DI	0 - Normal, 1 - Low Fuel	
YCI-130A	MTS On Utility	DI	0 - Not on Utility, 1 - On Utility	
YCI-130B	MTS On Generator	DI	1 - Not on Generator, 1 - On Generator	
XA-130	MTS Alarm	DI	0 - Normal, 1 - Alarm	
YCI-140A	ATS On Utility	DI	0 - Not on Utility, 1 - On Utility	
YCI-140B	ATS On Generator	DI	1 - Not on Generator, 1 - On Generator	
XA-140	ATS Alarm	DI	0 - Normal, 1 - Alarm	
JA-140	Station Phase Fail	DI	0 - Normal, 1 - Alarm	
JA-150	Control Panel Power Fail	DI	0 - Power Fail, 1 - Normal	
ZSC-150	Control Panel Intrusion Switch	DI	0 - Normal, 1 - Intrusion	
UAH-150	Control Panel 24VDC Power Supply Status	DI	0 - Power Supply Fail, 1 - Normal	
JA-150A	UPS On Battery	DI	0 - Not On Battery, 1 - On Battery	
JA-1510B	UPS Battery Warning	DI	0 - UPS Normal, 1 - UPS Warning	
JA-150C	UPS Battery Alarm	DI	0 - Normal, 1 - Battery Alarm	
TSH-150	Control Panel Temperature High	DI	0- Normal, 1- High	
HS-150	Alarm Horn Silence	DI	0- Normal, 1- Silence	
YA-150	Alarm Light/Horn	DO	0- Normal, 1- Alarm	
TI-150	Outside Temperature	AI	0-120 degrees	

NOTES:

Input / Output types are as follows:

DI - Discrete Input

DO - Discrete Output

AI - Analog Input

AO - Analog Output

END OF SECTION 17130A

BID SCHEDULE**Schedule of Estimated Quantities and Bid Prices**

Item No.	Description	Qty.	Units	Bid	Total
1	Mobilization (3%)	3%	LS		
2	10' Diameter Pre-Cast Submersible Lift Station w/ Grinder (Expandable to Triplex Lift Station)	1	LS		
3	Demolition and Abandonment of Existing Pump Station	1	LS		
4	Manholes				
4a	Demolish and Remove Existing 4' Diameter Gravity Sewer Manhole	1	EA		
4b	Demolish and Remove Existing 5' Diameter Gravity Sewer Manhole	1	EA		
4c	Abandon Existing 5' Diameter Gravity Sewer Manhole	1	EA		
4d	Abandon Existing 4' Diameter Air Release Valve Manhole	6	EA		
4e	Modify Existing Sewer Manhole	1	EA		
4f	Modify Receiving MH 49-23725	1	EA		
4g	Install 4' Diameter Gravity Sewer Manhole	3	EA		
4h	Install 4' Diameter Gravity Sewer Manhole w/ Vent Stack	1	EA		
4i	Install 5' Diameter Gravity Sewer Manhole	2	EA		
4j	Install 5' Diameter Manhole w/ Air Release Valve on 16" HDPE Force Main	2	EA		
5	Gravity Sewer Mains				
5a	Demolish and Remove Existing 24" DIP Gravity Sewer	620	LF		
5b	Abandon Existing 24" PVC Gravity Sewer In Place	230	LF		
5c	Abandon Existing 12" PVC Gravity Sewer In Place	90	LF		
5d	Install 8" PVC Gravity Sewer	30	LF		
5e	Install 12" PVC Gravity Sewer	550	LF		
5f	Install 24" PVC C900 Gravity Sewer	410	LF		
5g	Install 30" DIP Gravity Sewer with Ceramic Epoxy Liner	30	LF		
6	Force Mains				
6a	Abandon Existing 6" DIP Force Main on Bridge	1	LS		
6b	Abandon Existing 6" PVC Force Main at ARV Manholes and Existing Receiving Manhole	1	LS		
6c	Install 16" HDPE Force Main by Open Cut	2,200	LF		
6d	Install 24" HDPE Force Main by Open Cut	20	LF		
6e	Install 24" HDPE Casing w/ 16" HDPE Carrier Pipe Force Main by Horizontal Directional Drill	440	LF		
6f	Install Force Main Bypass Connection	1	LS		
6g	Rock Bore for Horizontal Directional Drill	250	LF		
7	Site Development	1	LS		
8	Access Road	1	LS		

Item No.	Description	Qty.	Units	Bid	Total
9	Retaining Wall	420	LF		
10	Storm Water Installation				
10a	18" Concrete Headwall	1	EA		
10b	24" Concrete Headwall	2	EA		
10c	18" RC Pipe	125	LF		
10d	24" RC Pipe	55	LF		
10e	Concrete Spillway	1	EA		
10f	4' Diameter Storm Water Manhole	1	EA		
10g	Modify Existing Storm Water Manhole	1	EA		
11	Electrical Improvements	1	LS		
12	Erosion Control	1	LS		
13	Trench Rock Excavation	100	CY		
14	Undercut and Replace Unsuitable Material with Select Backfill	250	CY		
15	Instrumentation & Control Integration Allowance	1	AL		\$272,815.00
16	Henderson County Electrical Trade Permit Fee Allowance	1	AL		\$3,500.00
Total Bid Amount (Items 1 – 16)					

Total Written Base Bid Price (Items 1 – 16):

_____ and _____/100 Dollars

ALTERNATE BIDS

Alternate Bid No. 1 – Stainless Steel Wet Well Riser Piping

Provide 316L stainless steel wet well riser piping in lieu of the ductile piping specified within the wet well. Include all materials, fabricated, supports, welding, testing, coatings/passivation, and incidental work required for a complete installation.

Add to Base Bid: \$_____

Total Bid Price (Written Base Bid with Alternate):

_____ and _____/100 Dollars

END OF BID SCHEDULE

LIST OF SUBCONTRACTORS:

The Bidder shall list below the name and the location of the place of business of each subcontractor who will perform work or labor or render service to the prime contractor in or about the construction of the work or improvement, or a subcontractor licensed by the State who, under subcontract to the prime contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the Contract Documents, in an amount in excess of one-half of 1 percent of the prime contractor's total bid. The Bidder shall also list below the portion of the work, which will be done by each subcontractor under this Contract. The prime contractor shall list only one subcontractor for each portion as is defined by the prime contractor in its bid.

<u>Work to be Performed</u>	<u>Subcontractor License Number</u>	<u>Percent of Total Contract</u>	<u>Subcontractor's Name & Address</u>
<u>1.</u>			
<u>2.</u>			
<u>3.</u>			
<u>4.</u>			
<u>5.</u>			
<u>6.</u>			

Note: Attach additional sheets if required.

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST:

The Contract Documents are based upon the equipment or products available from the suppliers listed below. Provisions are made in the Contract Documents for alternate suppliers in certain instances whose equipment or products may be deemed equivalent in quality. However, the Bidder must indicate in its Bid which named supplier the Bidder intends to use (in the event an alternate is not accepted) for each item of equipment / material item listed on this form by circling one of the listed Suppliers below for each type of equipment / material noted. Should a Bidder fail to circle a named supplier in any category it hereby agrees to furnish the first supplier listed (denoted by the letter A). Should a Bidder circle more than one named supplier in any category it hereby agrees to furnish the first supplier circled.

Where "or equal" is specified in the technical specifications, the Bidder may write in the proposed "or equal" Supplier name in the "OR EQUAL" SUPPLIER/MATERIAL SUPPLIER LIST (page Bid Schedule -5), but it must nevertheless also circle one of the listed Suppliers below.

If the proposed "or equal" Supplier is not accepted by the Engineer, the Bidder must furnish the circled Supplier as noted above.

<u>Equipment/Material Item</u>	<u>Supplier</u>
HDPE Pipe	
Ductile Iron Pipe	
PVC Pipe	
Manholes	
Pumps	
Grinder	
Sewage Combination Air & Vacuum Valves	
Davit Crane	
Generator	

"OR EQUAL" SUPPLIER/MATERIAL SUPPLIER LIST

The Bidder proposes the following "or equal" Suppliers for the equipment or material categories so identified:

Equipment or Material Item	Alternate Supplier (list one only per item)
1.	
2.	
3.	
4.	
5.	

The acceptance of equipment or materials by the proposed "or equal" Suppliers shall be at the sole discretion of the Owner based on the SUBSTITUTES OR "OR EQUAL" ITEMS requirements of the General Conditions. Note that only one "or equal" Supplier may be proposed per Equipment or Material Item. In the event that the single proposed "or equal" item is not ultimately accepted by the Owner, the Contractor shall furnish the named equipment / material item per the NAMED EQUIPMENT/MATERIAL SUPPLIER LIST.

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PRE-BID CONFERENCE AGENDA

For the

METROPOLITAN SEWERAGE DISTRICT MSD ITT PUMP STATION REPLACEMENT

Tuesday, July 7, 2026; 9:00 AM EST

C. Kenneth Stines Training Center (2229 Riverside Drive, Asheville, NC 28804)

Nothing discussed or said at this Pre-Bid Conference in any way amends the Contract Documents.

Only addenda can amend the Contract Documents.

1. INTRODUCTIONS

- a. Sign-in sheet

2. BID OPENING INFORMATION

- a. Deadline for receiving questions: Tuesday, July 14, 2026, at 2:00 PM.
- b. Deadline for issuing addendum: Thursday, July 16, 2026, at 2:00 PM.
- c. Bid opening: Tuesday, July 21, 2026, at 2:00 PM EST.
 - i. Sealed Bids will be opened in the second floor conference room of the MSD W. H. Mull Building, located at 2028 Riverside Drive, Asheville, NC 28804.
- d. Only bids submitted by contractors who are registered plan holders will be opened and read aloud.

3. REQUIRED BID DOCUMENTS

- a. Per Section III (Instructions to Bidders) of the Contract Documents:
 - i. Bids shall be submitted in a two (2) envelope system. The outer envelope shall bear the project name and project number and shall be sealed and addressed to the Metropolitan Sewerage District of Buncombe County, North Carolina, 2028 Riverside Drive, Asheville, North Carolina 28804. The name, address, and license number of the bidder, as well as the type of contract (Single-Prime-General) shall also be shown on the outside. The outer envelope shall contain the following documents, fully executed and signed/sealed as required in the Contract Documents:
 1. Proposal Guaranty (Bid Security) and Power of Attorney
 2. Certification of receipt of Addenda written on Contractor's letterhead
 3. Non-Collusion Affidavit
 4. A sealed smaller envelope containing the proposal and Schedule of Estimated Quantities and Bid Prices and marked on the outside "PROPOSAL". This envelope should also contain the project name and the name, address, and license number of the bidder. Attached to the proposal shall be the appropriate MBD form(s).

4. PROJECT SCHEDULE/CONTRACT TIMES

- a. Bid is expected to be tentatively awarded during the August 19th regular Metropolitan Sewerage District of Buncombe County (District) board meeting.

- b. Construction contract anticipated to be executed on or before October 5, 2026.
- c. Substantial Completion: 540 consecutive calendar days after NTP.
- d. Final Completion: 600 consecutive calendar days after NTP.

5. PROJECT SUMMARY

- a. The project shall generally consist of the furnishing of all services, supplies, materials, and equipment, and performing of all labor for the construction of:
 - i. 10-ft diameter duplex submersible sanitary sewer lift station (expandable to a triplex lift station);
 - ii. Wastewater grinder inside a dedicated 5-ft diameter manhole;
 - iii. Approximately 20 LF of 24-inch and 2,640 LF of 16-inch HDPE DR 11 force main (approximately 440 LF of which will be encased in a 24-inch HDPE DR 11 pipe to be installed by horizontal directional drill across the French Broad River);
 - iv. Approximately 550 LF of 12-inch and 410 LF of 24-inch PVC C900 gravity sewer;
 - v. Approximately 30 LF of 30-inch DIP gravity sewer;
 - vi. Manholes and related appurtenances;
 - vii. Approximately 800 LF of upper access road;
 - viii. Extension of lower access road; and,
 - ix. Demolition/abandonment of existing sewer lift station, force main, and gravity sewer.

6. GEOTECHNICAL EXPLORATION

- a. Geotechnical Exploration Report included in Appendix B of Section VI (Technical Sections) of the Contract Documents.

7. SPECIAL CONDITIONS

- a. Easements and Right of Entries
 - i. An executed easement agreement for each property listed below is included in Section V (Special Conditions) of the Contract Documents.
 - 1. Henderson County (Parcel 9642-47-1366)
 - 2. UPM Raflatac, Inc. (Parcel 9642-27-5609)
 - 3. Wild River Corp (Parcel 9642-29-9794)
 - 4. State of North Carolina (French Broad River Subaqueous Crossing)
 - 5. Quality Point LLC (portion of Parcel 9642-36-1779)
 - ii. An executed right of entry for each property listed below is included in Section V of the Contract Documents.
 - 1. State of North Carolina (Parcel 9642-28-4413)
 - iii. A DRAFT right of entry for the properties listed below was included in Section V of the Contract Documents. A final right of entry was executed on June 22, 2026, and will be included in a future addendum.
 - 1. Board of Trustees of The Endowment Fund of North Carolina State University at Raleigh
 - a. Parcel 9642-38-3057
 - b. Parcel 9642-38-0737

- iv. The temporary and permanent easement for a portion of the property owned by Quality Point LLC (Parcel 9642-36-1779) is still in the acquisition process. The District anticipates obtaining full access by October 2026. The Contractor shall refrain from entering this property from the upper access area (and constructing the proposed upper access road) until a final easement agreement is acquired and supplied by the District. The Contractor is cleared to enter the property from the lower (existing) access area.
- b. Special Provisions Detail Sheets (SPDS)
 - i. Three SPDS were included in Section V of the Contract Documents. These special provisions are reproduced below.
 - 1. Wild River Corp (Parcel 9642-29-9794)
 - a. The MSD Inspector shall contact the property owners (Wild River Corp) at 828-808-4643 (adam.wallace@sierranevada.com) at least two weeks prior to any work being performed on the property (except for emergencies) to give owner notice of when work will begin.
 - b. The MSD Contractor must ensure equipment is clean when it arrives at the project site for this parcel due to the Organic Certifications held on this parcel. MSD Contractor equipment must not have any caked-on dirt on treads or buckets before entering subject parcel and be clean of foreign material.
 - c. MSD Contractor must submit the seed and/or fertilizer product label to Oregon TILTH Organic Certification (OTCO) for review before any is applied to the field. MSD Contractor to go through adam.wallace@sierranevada.com. Wild River Corp is responsible for their certification and fees associated with said certification.
 - d. MSD Contractor must inform OTCO if any fill dirt will be used so that they can review the source and approve its use. MSD Contractor to go through adam.wallace@sierranevada.com.
 - 2. State of North Carolina (Parcel 9642-28-4413)
 - a. The MSD Inspector shall contact Tom Hoyt with Mountain Horticulture Crops Research & Extension Center (Mailing Address: 455 Research Drive, Mills River, NC 28759) at 828-808-5185 at least two weeks prior to any work being performed on the property (except emergencies) to give owner advance notice of when work will begin. The same notice requirements shall be made to Janice Veilleux, Real Property Agent State of North Carolina Department of Administration at 984-236-0275. Additionally periodic updates shall be provided to both contacts above throughout the project until final restoration is completed.
 - b. MSD's Contractor shall not be working on or accessing the subject parcel between April 15 to October 15 since this is their planting & harvest season. The contractor should plan on their work occurring between November 1 – March 31 on this parcel.
 - 3. Board of Trustees of The Endowment Fund of North Carolina State University at Raleigh (Parcel 9642-38-3057 and Parcel 9642-38-0737)
 - a. The MSD Inspector shall contact Tom Hoyt with Mountain Horticulture Crops Research & Extension Center (Mailing Address: 455 Research Drive, Mills River, NC 28759) at 828-808-5185 at least two weeks prior to any work being performed

on the property (except emergencies) to give owner advance notice of when work will begin. The same notice requirements shall be made to Sierra Everhart with NCSU Real Estate Services (saeverh2@ncsu.edu) or at 919-513-0470. Additionally periodic updates shall be provided to both contacts above throughout the project until final restoration is completed.

- b. MSD's Contractor shall not be working on or accessing the subject parcel between April 15 to October 15 since this is their planting & harvest season. The contractor should plan on their work occurring between November 1 – March 31 on this parcel.
- c. Permits
 - i. A copy of each approved permit listed below is included in Section V of the Contract Documents. Contractor shall thoroughly review these permits and comply with all conditions therein.
 - 1. NCDEQ Fast Track Permit (approved February 12, 2025)
 - 2. US Army Corps of Engineers Nationwide Permit (approved April 3, 2025)
 - 3. Town of Mills River, NC Non-Residential Zoning Permit (approved May 16, 2025)
 - 4. NCDEQ Erosion and Sedimentation Control Permit (approved June 3, 2026)
 - ii. The Henderson County Electrical Trade Permit is still outstanding. McKim & Creed shall submit Issued for Construction Plans to the Henderson County building permit portal upon contract award.
- d. NCDOT Encroachment
 - i. Per discussion with Troy S. Wilson, NCDOT District Engineer, no encroachment is needed to perform the work under and around Old Fanning Bridge; however, Contractor shall notify the office of Troy S. Wilson 72 hours in advance of crews starting work. Contact information is listed in Section V of the Contract Documents.
- e. Duke Energy Letter of No-Objection (LONO)
 - i. A copy of this LONO, dated April 22, 2026, is included in Section V of the Contract Documents. Contractor shall thoroughly review the approval and comply with all provisions therein.

8. MISCELLANEOUS

- a. Contractor may use water from the French Broad River for horizontal direction drilling operations. River water is also acceptable for testing the proposed pump station, force main, and gravity sewer.
- b. Duke Energy is in the process of relocating the underground electrical lines.
- c. The invert elevations of MH 49-479269 are still unknown. MSD has initiated a work order to determine these elevations. If this information is not received before the deadline for issuing an addendum, contractor shall field verify these elevations, as indicated throughout the plans.

9. AVAILABILITY OF SITE FOR EXAMINATION

- a. Site available for examination immediately after pre-bid conference adjournment.
- b. Site visits are available upon request.

10. WORK RESTRICTIONS

- a. See restrictions listed in SPDS.

- b. Contractor shall ensure that the existing pump station remains in operation during construction. Bypass pumping is allowed as specified in Specification Section 11500 Temporary Wastewater Bypass Pumping Systems.

11. USE OF SITE DURING CONSTRUCTION

- a. Site storage/staging areas are available onsite. Contractor to coordinate storage/staging areas with the District.

12. CONTRACT DOCUMENTS

- a. Complete plans, specifications, and Contract Documents may be examined on the DISTRICT website (<https://www.msdbc.org/adsforprojects.php>); however, copies of the complete plans, specifications, and Contract Documents must be obtained from Amanda Cutshaw (acutshaw@msdbc.org) for a contractor to become a registered plan holder.

13. QUESTIONS

- a. Answers to questions will be provided in written formal addenda.

MEETING SIGN-IN SHEET

PROJECT:	MSD ITT Pump Station Replacement	MEETING DATE:	July 7, 2026
PROJECT MANAGER:	Manjiang Chen, Ph.D., PE	PLACE/ROOM:	C. Kenneth Stines Training Center (2229 Riverside Drive, Woodfin, NC 28804)

NAME	TITLE	COMPANY	PHONE	EMAIL
MS chen	Senior Project Manager	McKim & Creed		mchen@mckimcreed.com
Patrick Cusack	Project Engineer	McKim & Creed		pcusack@mckimcreed.com
Amanda Cutshaw	MSD → Admin			
Tim Coates	Maintenance Manager	MSD		
John Coar	SA. EST. CHANDLER	CHANDLER	864 680-0262	jcoar@chandlerconstruction.com
Matthew Gilbert	General Superintendent	Chandler	364-361-8210	
John Patrick	Vice President	Teraflex Group	919-609-6114	jpatrick@teraflexgroup.com
Nick Scipio	PROJECT MANAGER	Ruby - Collins	832.773.4943	ESTIMATING @Ruby.Collins.com
WILL HILTON	SALES	SOUTHERN CONCRETE	828-785-3115	william.hilton@SCMUSA.com
Amanda White	Field Administration	Harlen Construction	423-263-5501	bid@harlenconstruction.com

NAME	TITLE	COMPANY	PHONE	EMAIL
John Middleton	Field Engineer	Morgan Contracting, Inc	865-244-8640	Estimating@MorganC.com
Calvin Mitchell	Assistant Project Manager	GreenStone Construction	864-496-8874	Mitchell@GreenStoneConstruction.com
Danny Dash	TP Howard PM	TP Howard	828-628-1367	danny.d@tpgroup.net
Carson Cabiner	Project Manager	TEP	704-473-4066	ccabiner@tepgroup.net
David Estavis	Proj. Super	Ruby Collins	830-225-0685	estavis @rubycollins.com
Jason Beard	Manager	Brushy Mountain	828-292-7198	jbeard@brushymountaininc.com
Ryan Ferber	MSD Pump stations	MSD	828-206-5648	rferber@msdisc.org
Mike Bull		MSD		mike@msdisc.org
Chris Asue	PM	Pisgah Electrical	828-400-8993	casue@pisgahelctric.com
Kirstin Gornell	PM	Pisgah Electric	828-242-6205	KGornell@PisgahElectric.com
Evan Fender	PM	Tennova	828-774-1519	efender@tennova.com
Rylyn Mulvaney	Estimator	Crowder Construction	704-231-6606	rmulvaney@crowderusa.com
Nick Druss	RSM	Underground Solutions	704-619-0522	ndruss@azuria.com
Nathan Lasik	Proj. Mgr	CREARY CONSTRUCTION	309-267-3627	ESTIMATING@CREARYCONSTR.COM
Em Bootwright	Proj. Coordinator	Hobgood Electric	(803) 833-0422	bootwright@hobgoodelectric.com



The Board of Trustees
of the Endowment Fund

Campus Box 7472
Raleigh, NC 27695-7472

June 18, 2026

Wesley G. Banner
Right of Way Manager
Metropolitan Sewerage District of Buncombe County
2028 Riverside Drive
Asheville, NC 28804
WesleyB@msdbc.org
(828) 254-9646

SUBJECT: Right of Entry – Board of Trustees of the Endowment Fund of North Carolina State University

Mr. Banner,

As per the attached letter dated June 18, 2026 from the Metropolitan Sewerage District of Buncombe County (the "MSD"), a Right of Entry has been requested for MSD and their contractors (the "Contractors") on property owned by the Board of Trustees of the Endowment Fund of North Carolina State University (the "BOTEF") located at the Mountain Horticultural Crops Research Station (the "MHCRS") in Henderson County, North Carolina, as shown on the attached maps (the "Exhibits"). The BOTEF will agree to provide the Right of Entry to MSD and Contractors, conditioned on the following terms:

- i. The scope of work to be performed shall be expressly limited to clearing, grading, and installation of common utility infrastructure in the area identified as "Permanent Force Main Easement" and "Temporary Construction Easement" on the attached Exhibits.
- ii. MSD and Contractors shall be responsible for all costs associated with any work performed by or on behalf of MSD and Contractors on the MHCRS and/or pursuant to the Right of Entry, as well as all costs associated with the items specified below.
- iii. Upon completion of its work, MSD shall provide an as-built survey for all MSD facilities and equipment located in the "Permanent Force Main Easement" area included in the Exhibits.
- iv. All work to be completed pursuant to the Right of Entry shall be completed on or before April 30, 2028. The rights granted to MSD and Contractors by this Right of Entry shall cease as of 5:00 pm on April 30, 2028.
- v. MSD and Contractors shall use commercially reasonable efforts to ensure that its activities on the MHCRS do not unreasonably interfere with the normal business operations of NC State University (the "University") on and adjacent to the MHCRS and shall endeavor to provide prior notice and coordinate with the MHCRS Superintendent, Tom Hoyt (Tom_Hoyt@ncsu.edu), if any material interference or disruption to the MHCRS's operations is anticipated.
- vi. To the extent permitted by North Carolina Law and provided such damage or injury does not proximately result from the negligence, gross negligence or intentional acts of the State of North Carolina, the Federal Government, or any of their respective agencies, contractors, and subcontractors, MSD and the Contractors shall indemnify and hold harmless the BOTEF and the University for injury, loss or damage arising out of the actions of MSD, the Contractors, or any of their respective agents or subcontractors performing work at the MHCRS pursuant to the Right of Entry.

Right of Entry – Board of Trustees of the Endowment Fund of North Carolina State University
Page 2
June 18, 2026

Please evidence your agreement with the terms outlined above by signing in the space provided below.
Return a signed copy of this letter by email to saeverh2@ncsu.edu.
Thank you,

Signed by:

Alicia Knight

2AAB57A78A57475...

Alicia Knight

Authorized Signatory, Board of Trustees of the Endowment Fund of North Carolina State University

cc: Jessie Askew, Director, Real Estate & Development

ACCEPTED AND AGREED:

METROPOLITAN SEWERAGE DISTRICT OF BUNCOMBE COUNTY

By: *Thomas E. Hartys*
Print Name: Thomas E. Hartys
Title: General Manager
Date: 6/22/26

I, TIMOTHY A. BROWN PLS L-5369, CERTIFY THAT THIS PLAT WAS PREPARED UNDER MY SUPERVISION FROM AN ACTUAL SURVEY MADE UNDER MY SUPERVISION (DEED DESCRIPTIONS RECORDED IN THE DEEDS AND MAPS/PLATS AS SHOWN HEREON); THAT THE BOUNDARIES NOT SURVEYED ARE CLEARLY INDICATED AS DRAWN FROM INFORMATION FOUND IN THE DEEDS AND MAPS/PLATS AS SHOWN HEREON; THAT THE RATIO OF PRECISION AS CALCULATED IS BETTER THAN 1:10,000; THAT THIS PLAT WAS PREPARED IN ACCORDANCE WITH G.S. 47-30 AS AMENDED; AND THAT THE SURVEY IS OF ANOTHER CATEGORY, SUCH AS THE RECOMBINATION OF EXISTING PARCELS, A COURT-ORDERED SURVEY, OR OTHER EXEMPTION OR EXCEPTION TO THE DEFINITION OF SUBDIVISION, G.S. 47-30 (f)(1)(d).

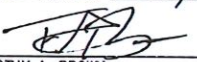
THAT THE GPS SURVEY MADE WAS UNDER MY SUPERVISION USING GPS FOR SETTING CONTROL ONLY.

CLASS OF SURVEY:
POSITIONAL ACCURACY:
TYPE OF GPS FIELD PROCEDURE:
DATES OF SURVEY:
DATUM/EPOCH:
PUBLISHED/FIXED-CONTROL USED:
GEOID MODEL:
COMBINED GRID FACTOR:
UNITS:

A
0.03' @ 95%
NC RTK
FEBRUARY 7TH-14TH, 2024
NAD 83(2011)
NGS "BOYLESTON" & "BANNING"
18 (CONUS)
0.9997840368
US SURVEY FEET

WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER L-5369

THIS 5th DAY OF May 2025


TIMOTHY A. BROWN
PROFESSIONAL LAND SURVEYOR L-5369



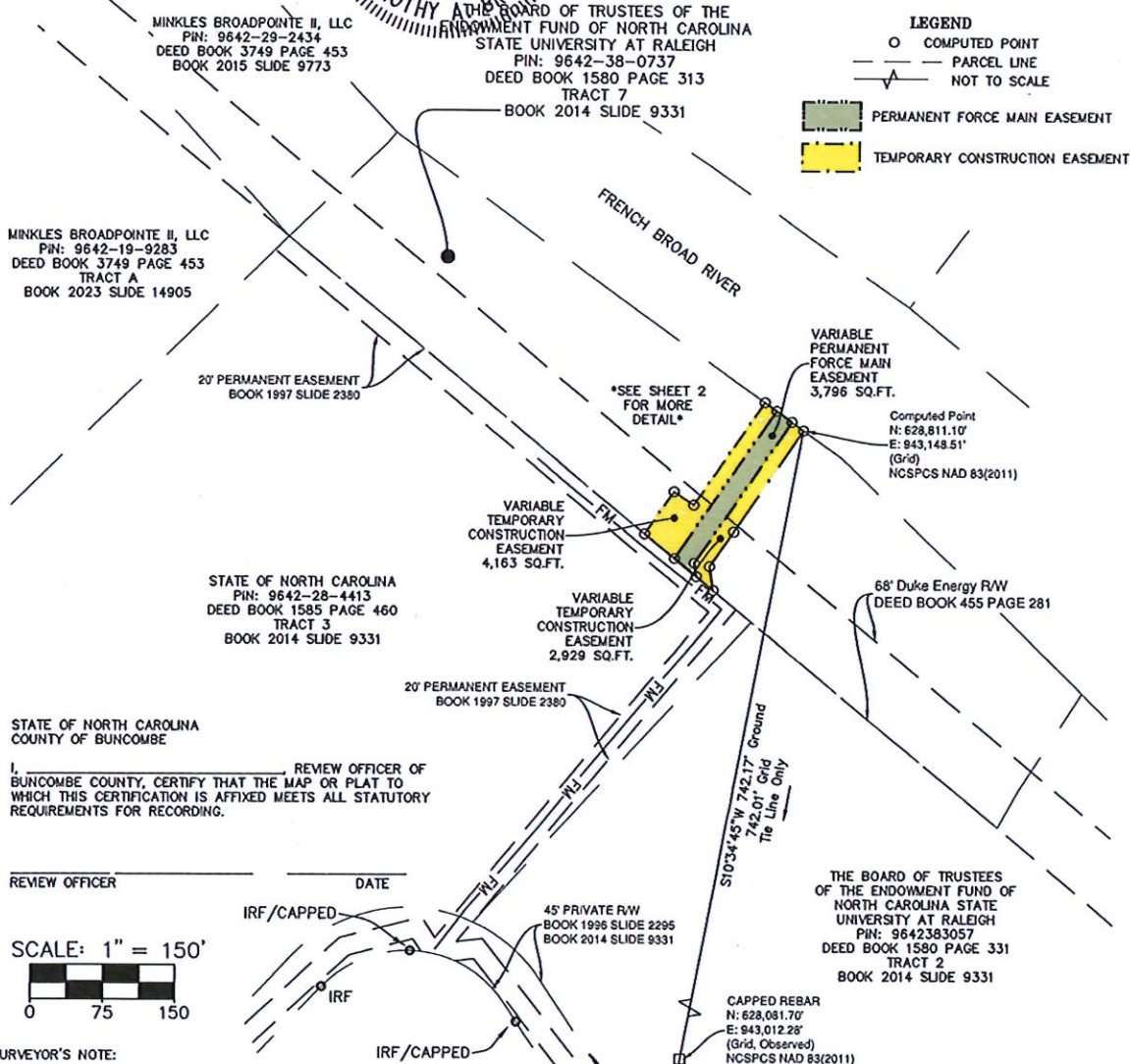
VICINITY MAP - NOT TO SCALE



NC GRID NAD83/2011

LEGEND

- COMPUTED POINT
- PARCEL LINE
- NOT TO SCALE
-  PERMANENT FORCE MAIN EASEMENT
-  TEMPORARY CONSTRUCTION EASEMENT



SURVEYOR'S NOTE:

- ALL DISTANCES ARE HORIZONTAL GROUND IN U.S. SURVEY FEET UNLESS OTHERWISE SHOWN.
- BEARINGS BASED ON NORTH CAROLINA GRID, NAD 83/2011. NO CORNERS SET UNLESS OTHERWISE NOTED. ALL DISTANCES ARE GROUND UNLESS OTHERWISE NOTED.
- REFERENCES: DEED BOOK 1580 PAGE 313, AND PLAT BOOK 2014 SLIDE 9331 AS RECORDED IN THE HENDERSON COUNTY REGISTER OF DEEDS.
- THIS SURVEY WAS PERFORMED WITHOUT THE BENEFIT OF A TITLE COMMITMENT.
- THE EXISTENCE OR NONEXISTENCE OF WETLANDS ON SUBJECT PROPERTY HAS NOT BEEN DETERMINED BY THIS SURVEY.
- SUBJECT TO ALL EASEMENTS, RIGHT OF WAYS, AND OR ENCUMBRANCES THAT MAY AFFECT THIS PROPERTY.
- SUBSURFACE AND ENVIRONMENTAL CONDITIONS WERE NOT EXAMINED OR CONSIDERED AS A PART OF THIS SURVEY. NO STATEMENT IS MADE CONCERNING THE EXISTENCE OF UNDERGROUND OR OVERHEAD CONTAINERS OR FACILITIES THAT MAY AFFECT THE USE OR DEVELOPMENT OF THIS TRACT.
- THIS SITE WAS LOCALIZED AT A CAPPED #5 REBAR HAVING NORTHING OF 628,081.70, EASTING OF 943,012.28 AND A COMBINED SCALE FACTOR OF 0.9997840368. COORDINATES SHOWN HEREON ARE GRID UNLESS OTHERWISE NOTED.
- TOTAL AREA: PERMANENT FORCE MAIN EASEMENT: 3,796 SQ.FT., 0.09 ACRES (1,412 SQ.FT. IN 68' DUKE ENERGY R/W)
TEMPORARY CONSTRUCTION EASEMENT: 7,092 SQ.FT., 0.16 ACRES (3,516 SQ.FT. IN 68' DUKE ENERGY R/W)
- THE PURPOSE OF THIS EASEMENT EXHIBIT IS TO SHOW NEW PERMANENT FORCE MAIN EASEMENT AND TEMPORARY CONSTRUCTION EASEMENT TO BE ACQUIRED AS SHOWN HEREON.

DATE	REVISION	BY

EASEMENT EXHIBIT
MSD PROJECT #2020061
ITT PUMP STATION REPLACEMENT
EASEMENT ACROSS THE PROPERTY OF
OWNER: THE BOARD OF TRUSTEES OF THE ENDOWMENT FUND
OF NC STATE UNIVERSITY AT RALEIGH
PARCEL 9642-38-0737
TOWN OF MILLS RIVER, HENDERSON COUNTY, NORTH CAROLINA

PROJECT #: 09596-0001
PROJ. SVYR: TAB
DRAWN BY: GHL
SCALE: 1" = 150'
DATE: 05/05/2025
SHEET #: 1 of 2

MCKIM & CREED
8020 Tower Point Drive
Charlotte, North Carolina 28227
Phone: (704) 841-2588, Fax: (704) 841-2567
NC License# F-1222
Internet Site: <http://www.mckimcreed.com>

LINE TABLE		
LINE #	BEARING	LENGTH
L1	S08°46'24"E	25.23'
L2	N50°19'21"W	30.52'
L3	N50°19'21"W	29.78'
L4	S55°58'56"E	25.00'
L5	S54°10'47"E	15.01'
L6	S54°10'47"E	20.01'
L7	S54°10'47"E	15.01'
L8	S08°46'24"E	14.18'

TAB
TIMOTHY A. BROWN
PROFESSIONAL LAND SURVEYOR L-5369



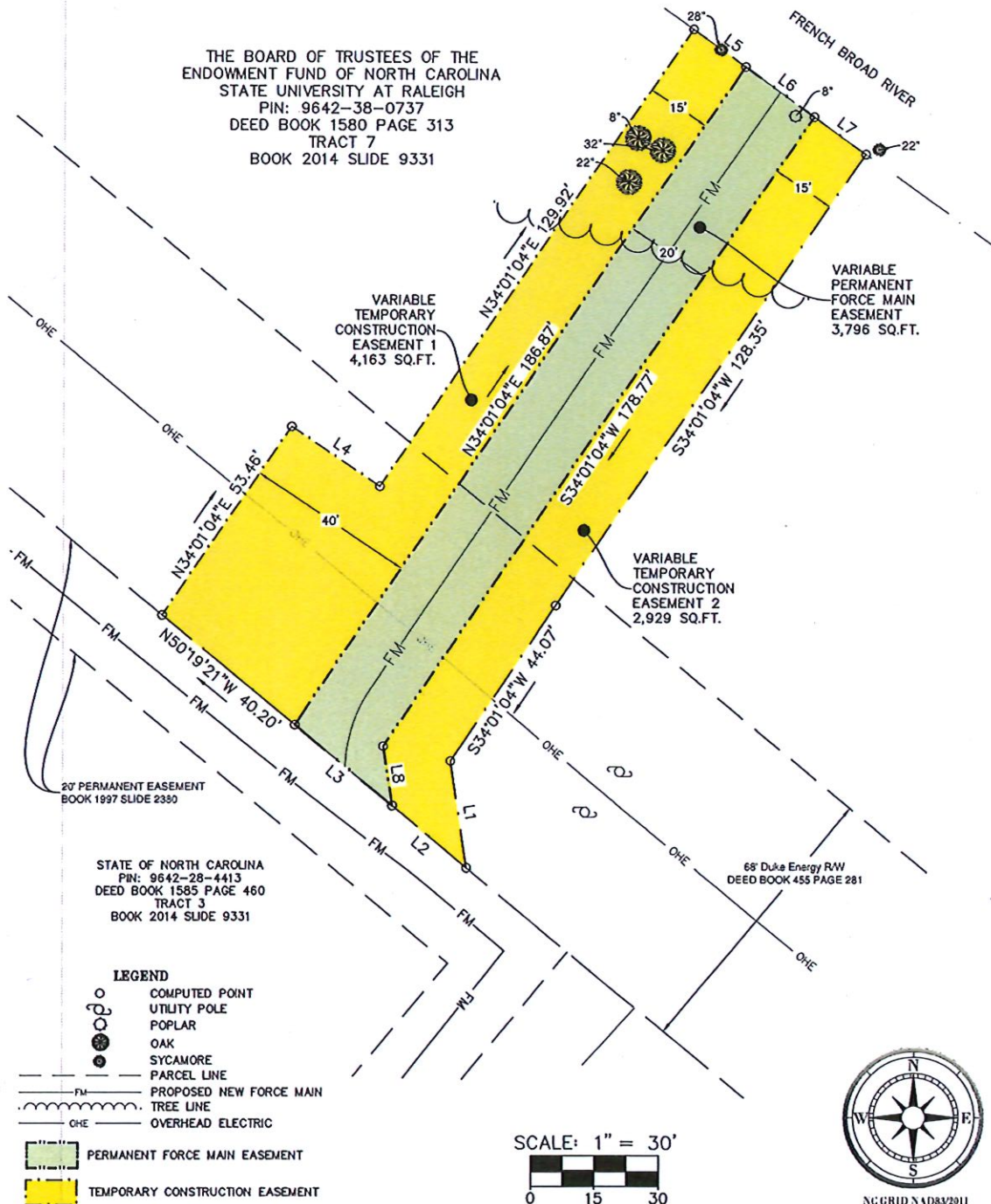
AREA TABLE

PERMANENT FORCE MAIN EASEMENT 1:
TEMPORARY CONSTRUCTION EASEMENT 1:
TEMPORARY CONSTRUCTION EASEMENT 2:

3,796 SQ.FT., 0.09 ACRES
4,163 SQ.FT., 0.10 ACRES
2,929 SQ.FT., 0.06 ACRES

TOTAL EASEMENT AREA:

10,888 SQ.FT., 0.25 ACRES

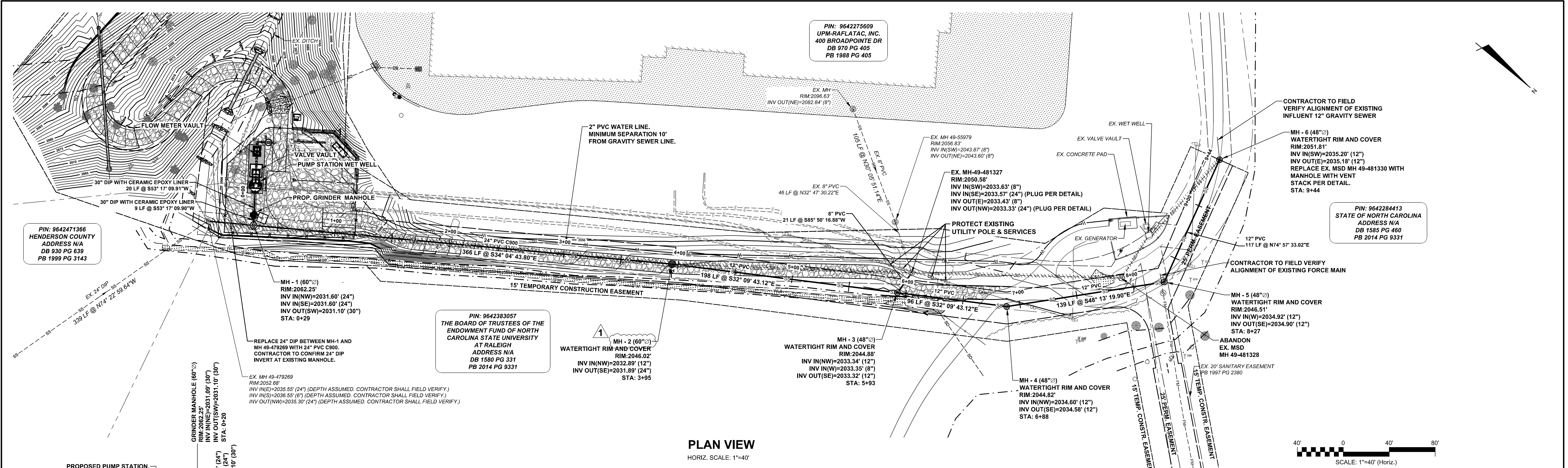


EASEMENT EXHIBIT
MSD PROJECT #2020061
ITT PUMP STATION REPLACEMENT
EASEMENT ACROSS THE PROPERTY OF
OWNER: THE BOARD OF TRUSTEES OF THE ENDOWMENT FUND
OF NC STATE UNIVERSITY AT RALEIGH
PARCEL 9642-38-0737
TOWN OF MILLS RIVER, HENDERSON COUNTY, NORTH CAROLINA

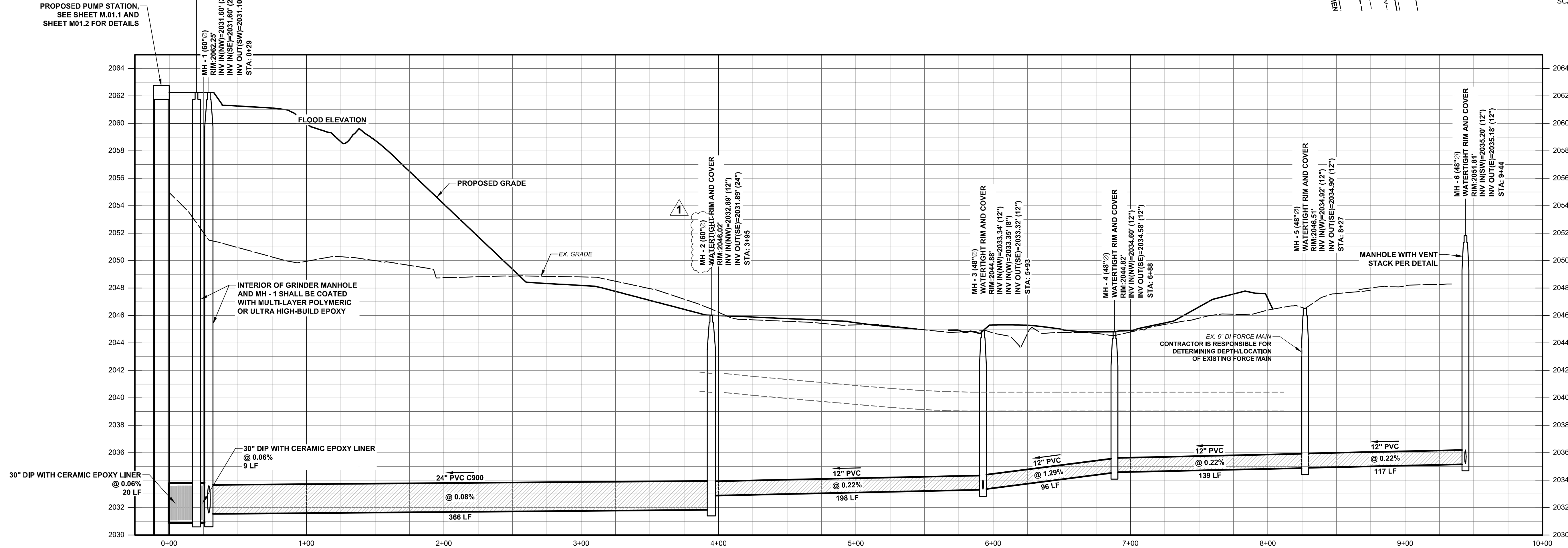
PROJECT #: 09596-0001
PROJ. SVYR: TAB
DRAWN BY: GHL
SCALE: 1" = 30'
DATE: 05/05/2025
SHEET #: 2 of 2

MCKIM & CREED
8020 Tower Point Drive
Charlotte, North Carolina 28227
Phone: (704) 841-2558, Fax: (704) 841-2567
NC License# F-1222
Internet Site: <http://www.mckimcreed.com>

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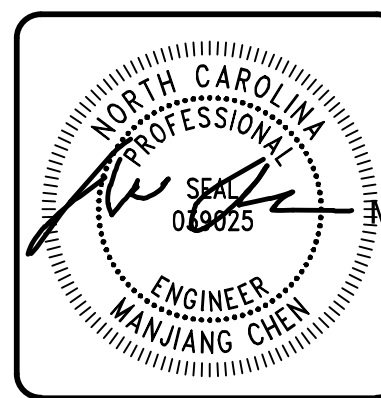
PLAN VIEW
HORIZ. SCALE: 1"=40'



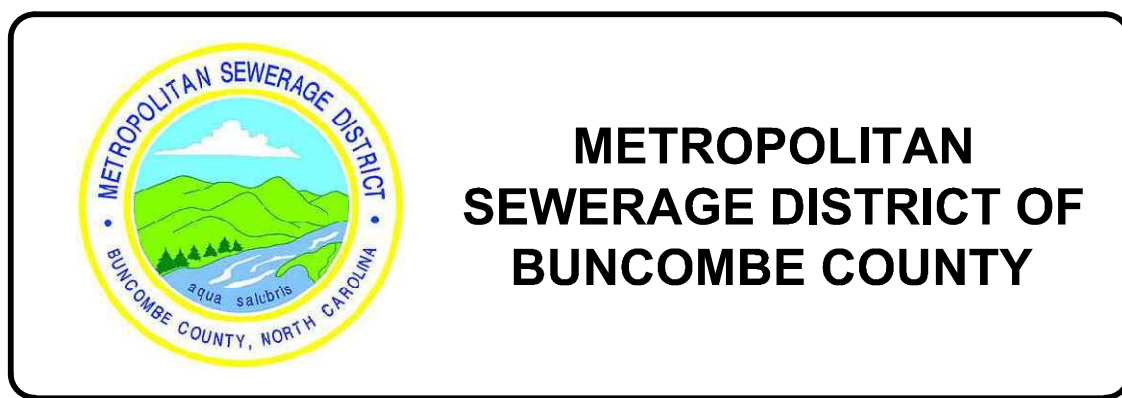
NOTE:

- EXISTING 24" DIP SEWER LINE SHALL BE DEMOLISHED PRIOR TO THE INSTALLATION OF THE PROPOSED SEWER LINE. BYPASS PUMPING SHALL BE PROVIDED WITHOUT THE INTERRUPTION OF EXISTING SEWER SERVICE.
- ORIENTATION OF THE 6" SERVICE LINE ENTERING EXISTING MH 49-479269 FROM THE SOUTH MAY NOT BE COMPLETELY ACCURATE SINCE THE UPSTREAM END OF THE EXISTING GRAVITY SEWER MAIN WAS OUTSIDE THE BOUNDS OF THE SURVEY. ORIENTATION OF THIS SERVICE LINE BASED ON AVAILABLE MSD GIS DATA.
- ALTHOUGH SHOWN AS EXISTING ON THESE PLANS, THE UNDERGROUND ELECTRICAL LINES ARE EXPECTED TO BE RELOCATED BY DUKE ENERGY IN ADVANCE OF OR CONCURRENT WITH CONSTRUCTION ACTIVITIES.

REV. NO.	DESCRIPTION	DATE
1	ADDENDUM NO. 1	JULY 2026
2	ISSUED FOR BID - NOT RELEASED FOR CONSTRUCTION	JUNE 2026
REVISIONS		

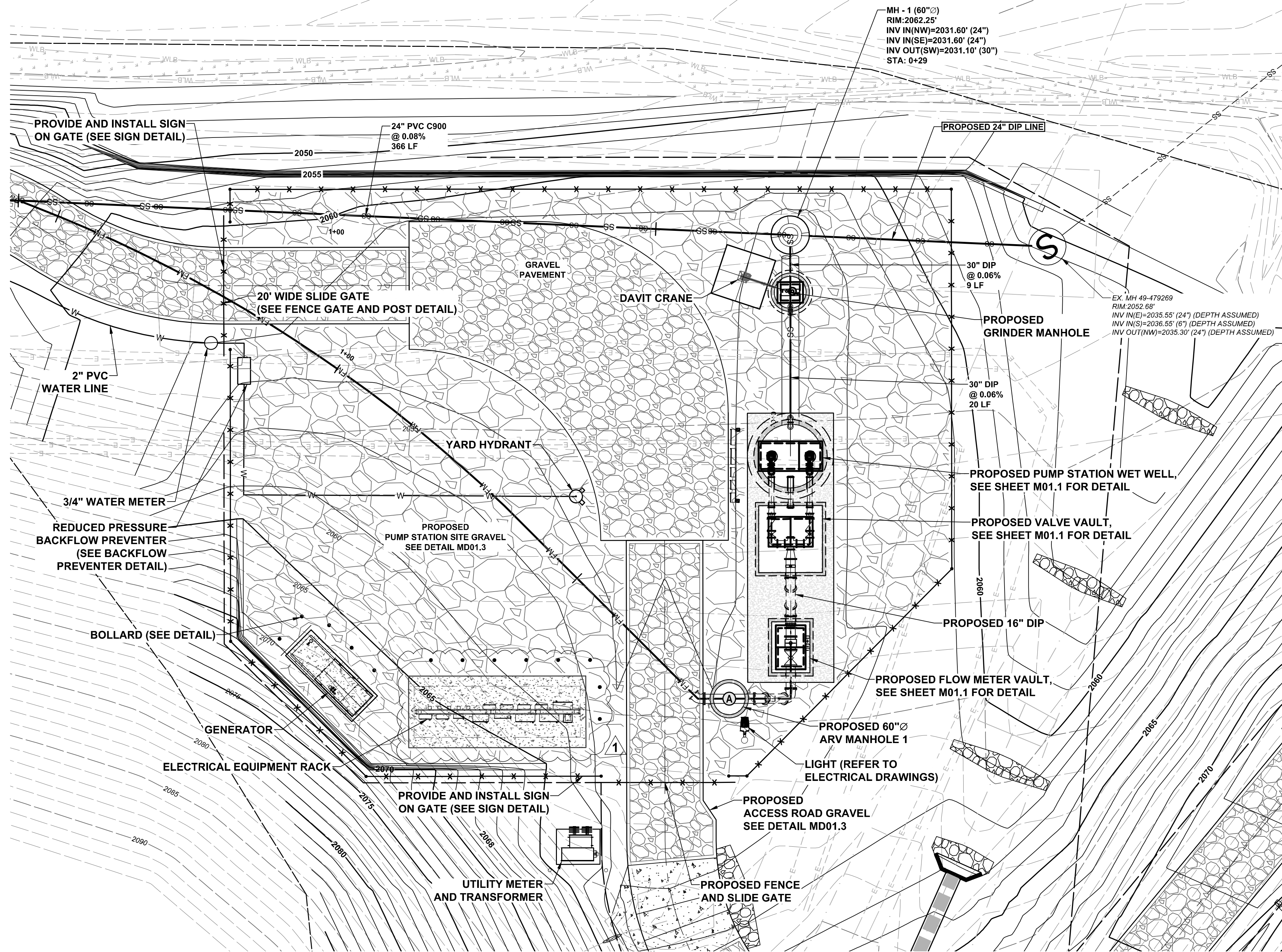


Digitally signed by
Manjiang Chen
Reason: I am
approving this
document
Date: 2026.07.09
16:20:05-04'00'



ITT PUMP STATION REPLACEMENT
CIVIL
GRAVITY SEWER PLAN AND PROFILE
STA. 0+00 - STA. 9+31

PROJ. START DATE: 2024 MAR	SCALE: 1"=40'	CU05.1
MSD PROJ. # 20200601	HORIZONTAL: 1"=40'	
DRAWN: AWB	VERTICAL: 1"=4'	1
DESIGNED: MC		REVISION
CHECKED: MC		
PROJ. MGR: MC		
STATUS: NOT RELEASED FOR CONSTRUCTION		ISSUED FOR BID

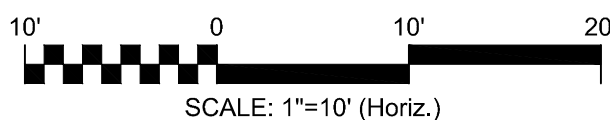


SITE PLAN

HORIZ. SCALE: 1"=10'

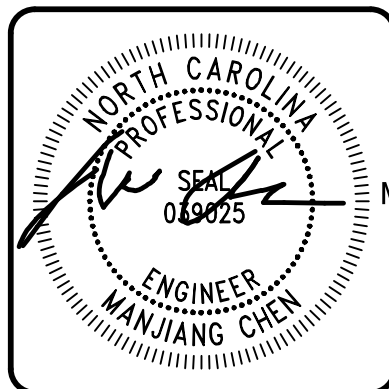
NOTE:

1. ORIENTATION OF THE 6" SERVICE LINE ENTERING EXISTING MH 49-479269 FROM THE SOUTH MAY NOT BE COMPLETELY ACCURATE SINCE THE UPSTREAM END OF THE EXISTING GRAVITY SEWER MAIN WAS OUTSIDE THE BOUNDS OF THE SURVEY. ORIENTATION OF THIS SERVICE LINE BASED ON AVAILABLE MSD GIS DATA.
2. ALTHOUGH SHOWN AS EXISTING ON THESE PLANS, THE UNDERGROUND ELECTRICAL LINES ARE EXPECTED TO BE RELOCATED BY DUKE ENERGY IN ADVANCE OF OR CONCURRENT WITH CONSTRUCTION ACTIVITIES.



REV. NO.	DESCRIPTION	DATE
1	ADDENDUM NO. 1	JULY 2026
0	ISSUED FOR BID - NOT RELEASED FOR CONSTRUCTION	JUNE 2026

REVISIONS



Digitally signed by
Manjiang Chen
Reason: I am
approving this
document
Date: 2026.07.09
16:20:14 -04'00'

35 N Market Street
Asheville, North Carolina 28801
Phone: (828) 252-8181, Fax: (828) 252-8857

NC License# F-1222
www.mckimcreed.com

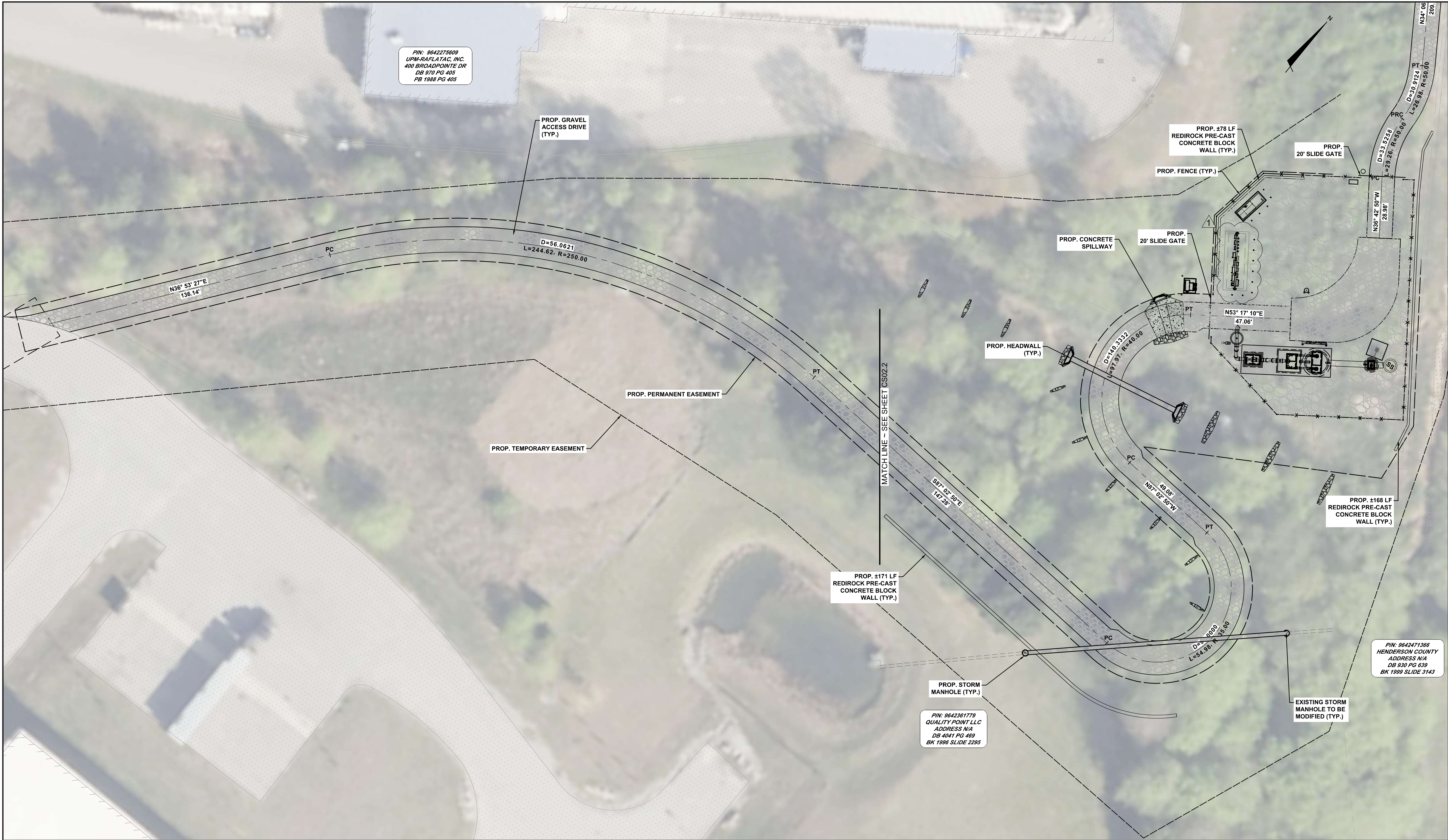
**METROPOLITAN
SEWERAGE DISTRICT OF
BUNCOMBE COUNTY**

ITT PUMP STATION REPLACEMENT

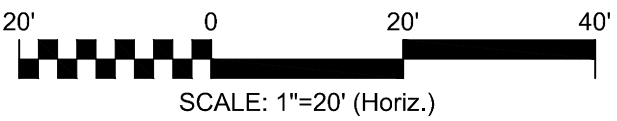
CIVIL

PROPOSED SITE PLAN

PROJ. START DATE: 2024 MAR	SCALE	CS01.1 DRAWING NUMBER	
MSD PROJ. # 00000001	HORIZONTAL: 1"=5'		1 REVISION
DRAWN: AWB	VERTICAL: N/A		
DESIGNED: MC			
CHECKED: MC			
PROJ. MGR: MC			
STATUS:		ISSUED FOR BID	
		NOT RELEASED FOR CONSTRUCTION	



SITE PLAN
HORIZ. SCALE: 1"=20'



REV. NO.	DESCRIPTION	DATE
1	ADDENDUM NO. 1	JULY 2026
0	ISSUED FOR BID - NOT RELEASED FOR CONSTRUCTION	JUNE 2026
REVISIONS		



**MCKIM & CREED**

35 N Market Street
Asheville, North Carolina 28801
Phone: (828) 252-8181, Fax: (828) 252-8857

NC License# F-1222
www.mckimcreed.com

**METROPOLITAN
SEWERAGE DISTRICT OF
BUNCOMBE COUNTY**

ITT PUMP STATION REPLACEMENT

CIVIL

PROPOSED UPPER ACCESS ROAD PLAN

PROJECT INFORMATION
PROJ. START DATE: 2024 MAR
DATE PROJ. # 20200601
DRAWN: PNH
DESIGNED: PNH
CHECKED: PNH
PROJ. MGR.: MC

SCALE
HORIZONTAL: 1"=20'
VERTICAL: N/A

CS02.1
DRAWING NUMBER
1
REVISION

STATUS: ISSUED FOR BID
NOT RELEASED FOR CONSTRUCTION

PIN: 9642275609
UPM-RAFLATAC, INC.
400 BROADPONTE DR
DB 970 PG 405
PB 1988 PG 405

RETAINING WALL NOTES:

- SEGMENTAL BLOCK RETAINING WALL DESIGN SHALL BE PROVIDED BY THE CONTRACTOR AS PART OF THE BASE BID. CONTRACTOR SHALL PROCURE A QUALIFIED SEGMENTAL BLOCK RETAINING WALL DESIGNER FOR THE PROJECT. SEGMENTAL BLOCK RETAINING WALL INFORMATION SHOWN ON THESE PLANS IS FOR LOCATION AND GRADE INFORMATION ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING NECESSARY INFORMATION TO WALL DESIGNER AS REQUIRED FOR PROPER DESIGN OF RETAINING WALLS.
- CONTRACTOR SHALL PROVIDE DETAILED SHOP DRAWINGS, SEALED BY A LICENSED PROFESSIONAL ENGINEER SPECIALIZING IN SEGMENTAL BLOCK RETAINING WALL DESIGN, FOR REVIEW AND APPROVAL PRIOR TO INSTALLATION AS PART OF THE SHOP DRAWING SUBMITTAL PROCESS.
- TOP GRADE OF WALL AND BOTTOM GRADE OF WALL SPECIFIED IN PLANS ARE INTENDED TO BE THE FINISHED PAVEMENT OR EARTH GRADE. THE WALL DESIGNER SHALL ADJUST SHOP DRAWING WALL ELEVATIONS FOR THE TOP AND BOTTOM OF WALL TO MEET SPECIFIC PRODUCT DESIGN CRITERIA AND WALL GEOMETRY AS NECESSARY TO ACHIEVE DESIRED FINISHED GRADES. THE HORIZONTAL WALL LOCATION AS SHOWN IS THE FINISHED LOCATION OF THE BOTTOM OF WALL. THE WALL DESIGNER SHALL COORDINATE WITH THE ENGINEER TO VERIFY WHETHER CONFLICTS EXIST. THE WALL DESIGNER SHALL NOTIFY THE ENGINEER IN CASE OF ANY CONFLICTS, INCLUDING BUT NOT LIMITED TO EXISTING OR PROPOSED UTILITIES, WALL BATTER, GEOGRID PLACEMENT, ETC., OR IF ANY ASPECT OF WALL PLACEMENT CANNOT BE ACCOMPLISHED. ALL WORK RELATED TO THE RETAINING WALL CONSTRUCTION SHALL BE ACCOMPLISHED WITHIN THE BOUNDARIES OF THE PROJECT PROPERTY, WITHOUT IMPACTING BUFFERS.
- IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND WALL DESIGNER TO ASSURE THAT THE REQUIRED SOIL BEARING PRESSURE, SUBSURFACE DRAINAGE AND SURFACE DRAINAGE ARE ACHIEVED AS RELATED TO THE RETAINING WALL DESIGN. THIS SHOULD BE VERIFIED BY A GEOTECHNICAL ENGINEER. SPECIAL ATTENTION IS REQUIRED TO ENSURE BEARING CAPACITY HAS BEEN ACHIEVED AT LOCATIONS WHERE PIPE PENETRATIONS ARE TO OCCUR. IT SHALL BE THE RESPONSIBILITY OF BOTH THE OWNER AND THE CONTRACTOR TO PROVIDE QUALITY CONTROL / QUALITY ASSURANCE TESTING ASSOCIATED WITH THE WALL CONSTRUCTION. THE WALL DESIGNER SHALL PROVIDE ANY CERTIFICATIONS AS MAY BE REQUIRED TO SHOW COMPLIANCE WITH ORIGINAL DESIGN DOCUMENTS AS RELATED TO THE WALL

FINAL GRADE ABOVE WALL

DRAINAGE SWALE, SEE DETAIL SHEET C12

UNIVERSAL CAP WITH CONTINUOUS ADHESIVE

HEIGHT VARIES

EMBEDMENT AS REQUIRED

GEOGRID LENGTH

GEOGRID

12 INCHES DRAINAGE AGGREGATE

4" DIA. DRAIN TILE, 40' MAX. SPACING

COMPACTED GRANULAR BASE OR OPTIONAL CONCRETE LEVELING PAD

PROVIDE A CONSTANT SLOPE ALONG BOTTOM OF WALL OF 9.36% BETWEEN SHOWN ELEVATIONS

PROVIDE A CONSTANT SLOPE ALONG TOP OF WALL OF 0.15% BETWEEN SHOWN ELEVATIONS

PROVIDE A CONSTANT SLOPE ALONG BOTTOM OF WALL OF 9.36% BETWEEN SHOWN ELEVATIONS

PROVIDE A CONSTANT SLOPE ALONG TOP OF WALL OF 20.51% BETWEEN SHOWN ELEVATIONS

SDMH-10
STA. 105+41.48 (29.29' R)
RIM=2102.15'
INV IN=2091.74'
INV OUT=2085.00'

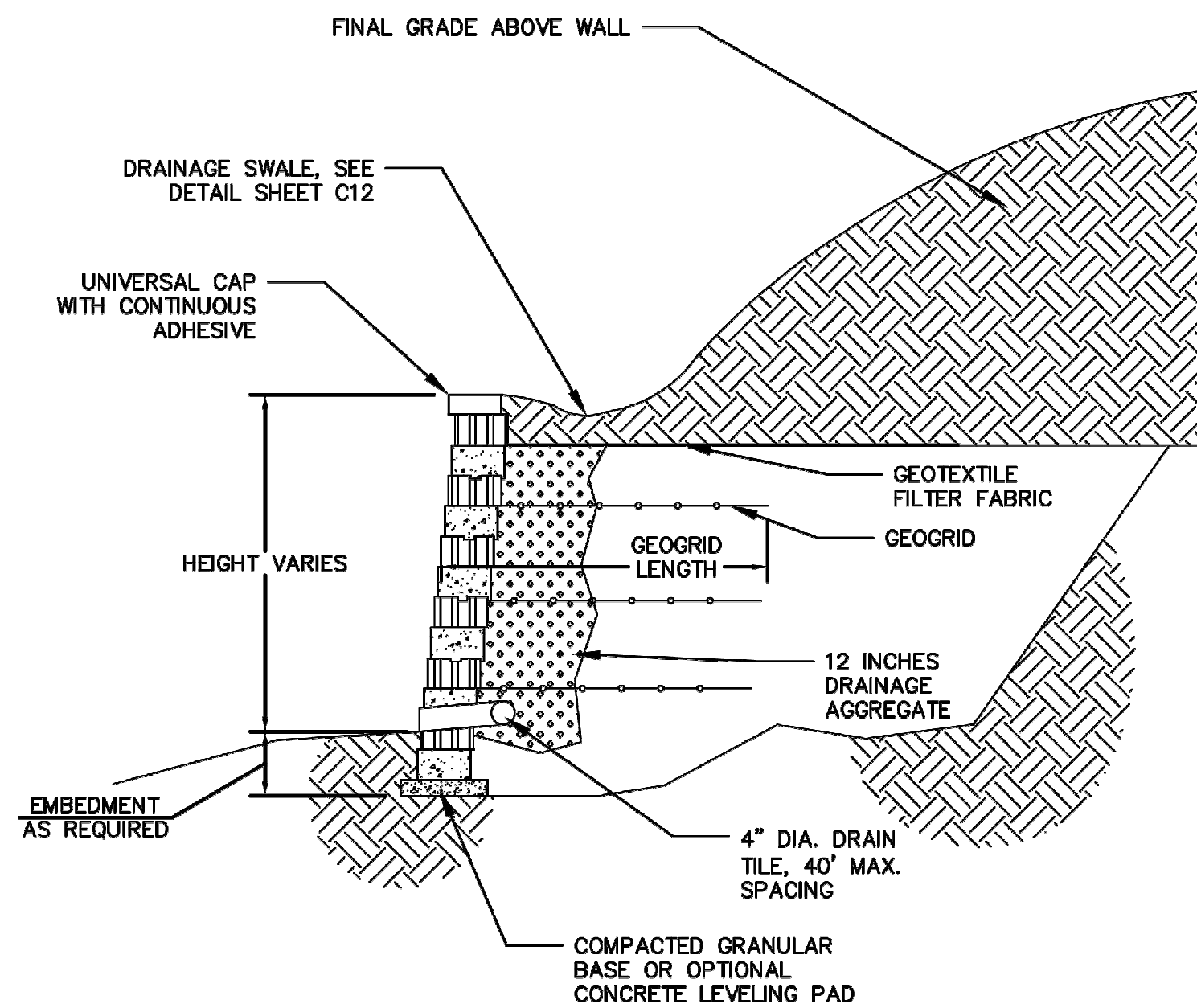
SDMH-10
STA. 106+35.62 (29.57' R)
RIM=2087.14'
INV IN=2082.49'
INV OUT=2085.26'

EX. SDMH
STA. 106+35.62 (29.57' R)
RIM=2087.14'
INV IN=2082.49'
INV OUT=2085.26'

PIN: 9642361779
QUALITY POINT, LLC
ADDRESS N/A
DB 4041 PG 469
BK 1996 SLIDE 2295

PIN: 9642471366
HENDERSON COUNTY
ADDRESS N/A
DB 930 PG 639
BK 1999 SLIDE 3143

1. SEGMENTAL BLOCK RETAINING WALL DESIGN SHALL BE PROVIDED BY THE CONTRACTOR AS PART OF THE BASE BID. CONTRACTOR SHALL PROCURE A QUALIFIED SEGMENTAL BLOCK RETAINING WALL DESIGNER FOR THE PROJECT. SEGMENTAL BLOCK RETAINING WALL INFORMATION SHALL BE PROVIDED TO THE OWNER FOR LOCATION AND GRADE INFORMATION ONLY. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING NECESSARY INFORMATION TO WALL DESIGNER AS REQUIRED FOR PROPER DESIGN OF RETAINING WALLS.
2. CONTRACTOR SHALL PROVIDE DETAILED SHOP DRAWINGS, SEALED BY A LICENSED PROFESSIONAL ENGINEER SPECIALIZING IN SEGMENTAL BLOCK RETAINING WALL DESIGN, FOR REVIEW AND APPROVAL PRIOR TO CONSTRUCTION AS PART OF THE SHOP DRAWING SUBMITTAL PROCESS.
3. TOP GRADE OF WALL AND BOTTOM GRADE OF WALL SPECIFIED IN PLANS ARE INTENDED TO BE THE FINISHED PAVEMENT OR EARTH GRADE. THE WALL DESIGNER SHALL ADJUST SHOP DRAWING WALL ELEVATIONS FOR THE TOP AND BOTTOM OF WALL TO MEET SPECIFIC PRODUCT DESIGN CRITERIA AND WALL GEOMETRY AS NECESSARY TO ACHIEVE DESIRED FINISHED GRADES. THE CONTRACTOR SHALL SUBMITTAL WALL ELEVATIONS TO THE FINISHER. LOCATION OF THE BOTTOM OF WALL. THE WALL DESIGNER SHALL COORDINATE WITH THE ENGINEER TO VERIFY WHETHER CONFLICTS EXIST. THE WALL DESIGNER SHALL NOTIFY THE ENGINEER IN CASE OF ANY CONFLICTS, INCLUDING BUT NOT LIMITED TO EXISTING OR PROPOSED UTILITIES, WATER, GEGRID PLACEMENT, ETC., OR IF ANY ASPECT OF WALL PLACEMENT CANNOT BE ACCOMPLISHED. ALL WORK RELATED TO THE RETAINING WALL CONSTRUCTION SHALL BE ACCOMPLISHED WITHIN THE BOUNDARIES OF THE PROJECT PROPERTY, WITHOUT IMPACTING BUFFERS.
4. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND WALL DESIGNER TO ASSURE THAT THE REQUIRED SOIL BEARING CAPACITY FOR THE SUBMITTAL OF SHOP DRAWINGS FOR WALL ELEVATIONS IS ACHIEVED AS RELATED TO THE RETAINING WALL DESIGN. THIS SHOULD BE VERIFIED BY A GEOTECHNICAL ENGINEER. SPECIAL ATTENTION IS REQUIRED TO ENSURE BEARING CAPACITY HAS BEEN ACHIEVED AT LOCATIONS WHERE PIPE PENETRATIONS ARE TO OCCUR. IT SHALL BE THE RESPONSIBILITY OF BOTH THE OWNER AND THE CONTRACTOR TO PROVIDE QUALITY CONTROL / QUALITY ASSURANCE TESTING ASSOCIATED WITH THE WALL CONSTRUCTION. THE WALL DESIGNER SHALL PROVIDE ANY COORDINATION WITH ORIGINAL DESIGN DOCUMENTS AS RELATED TO THE WALL DESIGN AND CONSTRUCTION.



SEGMENTAL BLOCK RETAINING WALL
N.T.S

GRADING PLAN

SDMH-10
STA. 105+41.48 (29.29' R)
RIM=2102.15'
INV IN=2091.74'
INV OUT=2085.00'

PIN: 9642361779
QUALITY POINT LLC
ADDRESS N/A
DB 4041 PG 469
BK 1996 SLIDE 2295

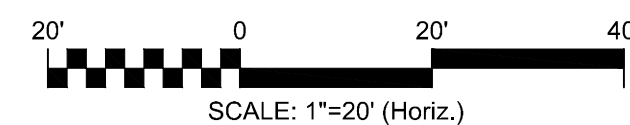
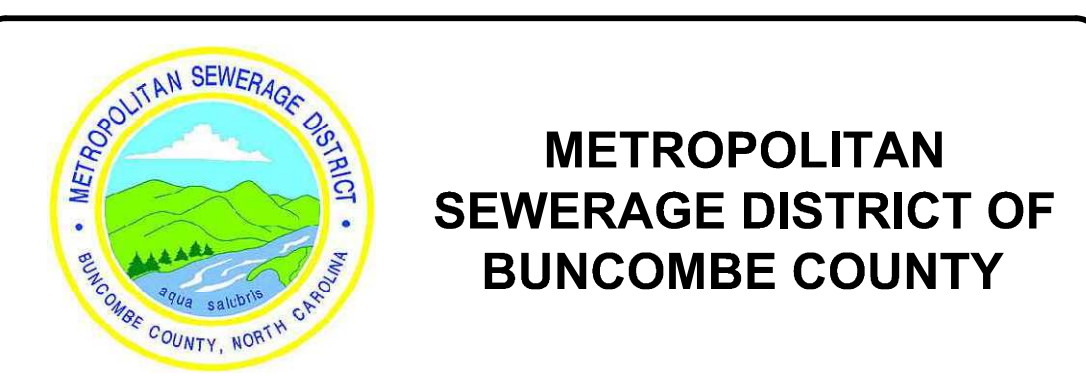
PROVIDE A CONSTANT
SLOPE ALONG BOTTOM OF
WALL OF 9.36% BETWEEN
SHOWN ELEVATIONS

PROVIDE A CONSTANT
SLOPE ALONG TOP OF
WALL OF 20.51% BETWEEN
SHOWN ELEVATIONS

TW: 2086.00
BW: 2086.00

EX. SDMH
STA. 106+35.62 (29.57' R)
RIM=2067.14'
INV IN=2062.49'
INV OUT=2055.26'

**PIN: 9642471366
HENDERSON COUNTY
ADDRESS N/A
DB 930 PG 639
BK 1999 SLIDE 3143**

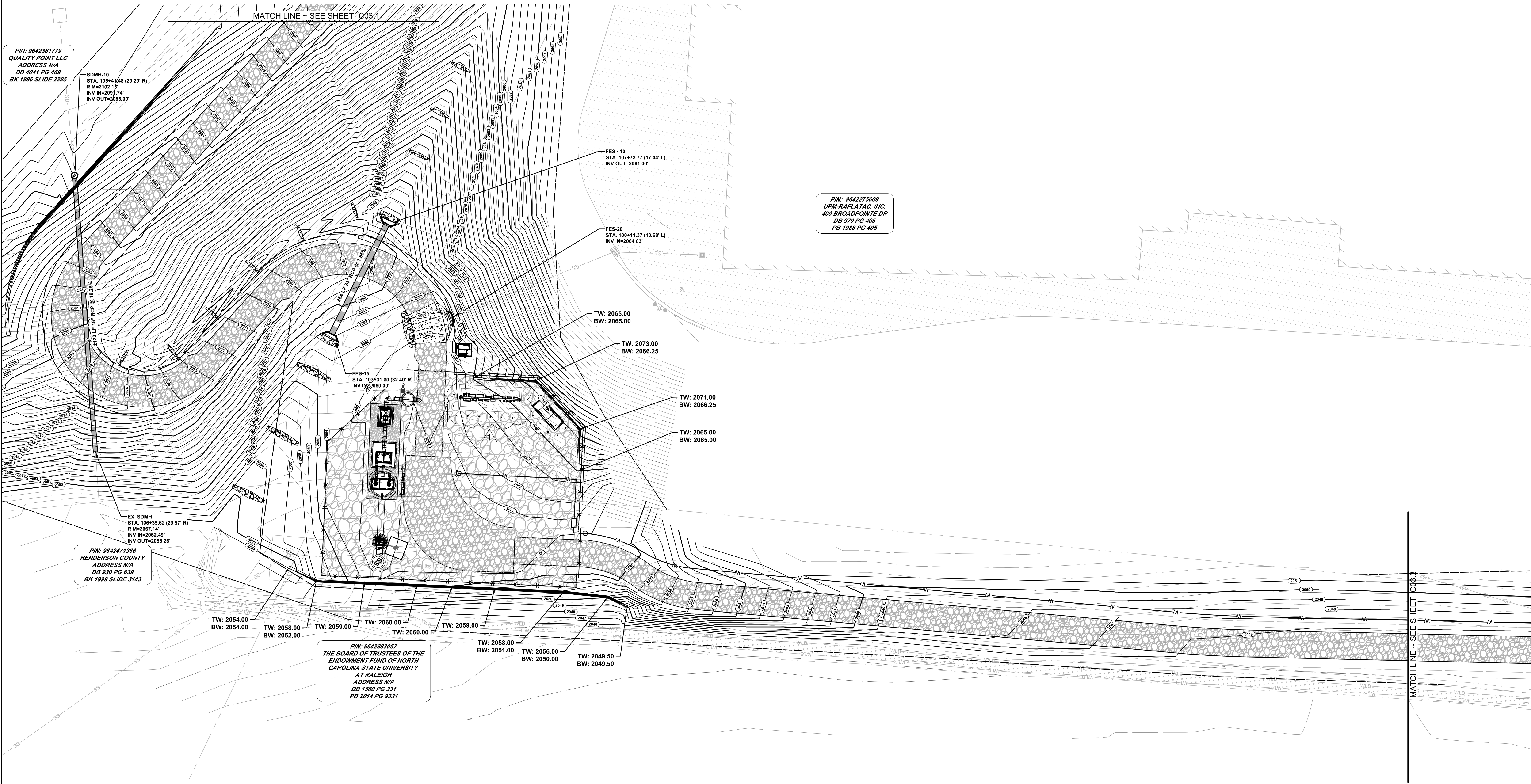
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ITT PUMP STATION REPLACEMENT

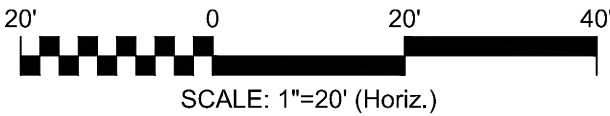
CIVIL

GRADING PLAN 1 OF 3

PROJ. START DATE: 2024 MAR MCE PROJ. # 09596-0001 ASD PROJ. # 2003881 DRAWN PNH DESIGNED PNH CHECKED PNH PROJ. MGR. MC	SCALE HORIZONTAL: 1"=20' VERTICAL: N/A	C03.1 DRAWING NUMBER 1 REVISION
STATUS: ISSUED FOR BID NOT RELEASED FOR CONSTRUCTION		



GRADING PLAN
HORIZ. SCALE: 1"=20'



REV. NO.	DESCRIPTION	DATE
1	ADDENDUM NO. 1	JULY 2026
2	ISSUED FOR BID - NOT RELEASED FOR CONSTRUCTION	JUNE 2026
REVISIONS		

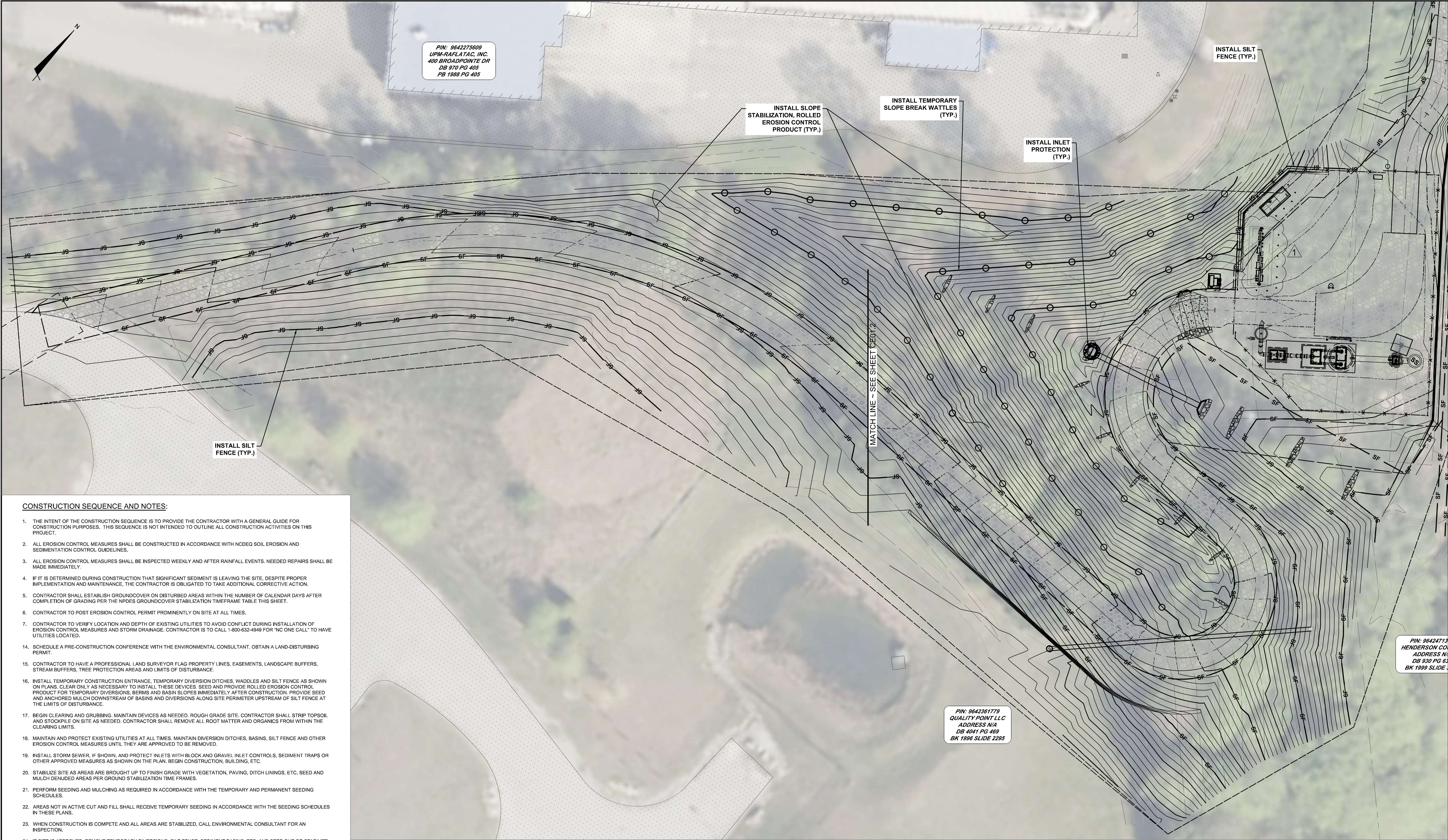


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METROPOLITAN SEWERAGE DISTRICT OF BUNCOMBE COUNTY

ITT PUMP STATION REPLACEMENT
CIVIL
GRADING PLAN 2 OF 3

PROJ. START DATE: 2024 MAR	SCALE	C03.2 DRAWING NUMBER 1 REVISION
DRAWN: PNH	HORIZONTAL: 1"=20'	
DESIGNED: PNH	VERTICAL: N/A	
CHECKED: PNH		
PROJ. MGR: MC	STATUS: NOT RELEASED FOR CONSTRUCTION	



CONSTRUCTION SEQUENCE AND NOTES:

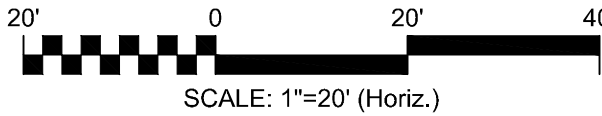
1. THE INTENT OF THE CONSTRUCTION SEQUENCE IS TO PROVIDE THE CONTRACTOR WITH A GENERAL GUIDE FOR CONSTRUCTION PURPOSES. THIS SEQUENCE IS NOT INTENDED TO OUTLINE ALL CONSTRUCTION ACTIVITIES ON THIS PROJECT.
2. ALL EROSION CONTROL MEASURES SHALL BE CONSTRUCTED IN ACCORDANCE WITH NCDEQ SOIL EROSION AND SEDIMENTATION CONTROL GUIDELINES.
3. ALL EROSION CONTROL MEASURES SHALL BE INSPECTED WEEKLY AND AFTER RAINFALL EVENTS. NEEDED REPAIRS SHALL BE MADE IMMEDIATELY.
4. IF IT IS DETERMINED DURING CONSTRUCTION THAT SIGNIFICANT SEDIMENT IS LEAVING THE SITE, DESPITE PROPER IMPLEMENTATION AND MAINTENANCE, THE CONTRACTOR IS OBLIGATED TO TAKE ADDITIONAL CORRECTIVE ACTION.
5. CONTRACTOR SHALL ESTABLISH GROUND COVER ON DISTURBED AREAS WITHIN THE NUMBER OF CALENDAR DAYS AFTER COMPLETION OF GRADING PER THE NPDES GROUND COVER STABILIZATION TIMEFRAME TABLE THIS SHEET.
6. CONTRACTOR TO POST EROSION CONTROL PERMIT PROMINENTLY ON SITE AT ALL TIMES.
7. CONTRACTOR TO VERIFY LOCATION AND DEPTH OF EXISTING UTILITIES TO AVOID CONFLICT DURING INSTALLATION OF EROSION CONTROL MEASURES AND STORM DRAINAGE. CONTRACTOR IS TO CALL 1-800-632-4949 FOR "NC ONE CALL" TO HAVE UTILITIES LOCATED.
14. SCHEDULE A PRE-CONSTRUCTION CONFERENCE WITH THE ENVIRONMENTAL CONSULTANT. OBTAIN A LAND-DISTURBING PERMIT.
15. CONTRACTOR TO HAVE A PROFESSIONAL LAND SURVEYOR FLAG PROPERTY LINES, EASEMENTS, LANDSCAPE BUFFERS, STREAM BUFFERS, TREE PROTECTION AREAS AND LIMITS OF DISTURBANCE.
16. INSTALL TEMPORARY CONSTRUCTION ENTRANCE, TEMPORARY DIVERSION DITCHES, WADDLES AND SILT FENCE AS SHOWN ON PLANS. CLEAR ONLY AS NECESSARY TO INSTALL THESE DEVICES. SEED AND PROVIDE ROLLED EROSION CONTROL PRODUCT FOR TEMPORARY DIVERSIONS, BERMS AND BASIN SLOPES IMMEDIATELY AFTER CONSTRUCTION. PROVIDE SEED AND ANCHORED MULCH DOWNSTREAM OF BASINS AND DIVERSIONS ALONG SITE PERIMETER UPSTREAM OF SILT FENCE AT THE LIMITS OF DISTURBANCE.
17. BEGIN CLEARING AND GRUBBING. MAINTAIN DEVICES AS NEEDED. ROUGH GRADE SITE. CONTRACTOR SHALL STRIP TOPSOIL AND STOCKPILE ON SITE AS NEEDED. CONTRACTOR SHALL REMOVE ALL ROOT MATTER AND ORGANICS FROM WITHIN THE CLEARING LIMITS.
18. MAINTAIN AND PROTECT EXISTING UTILITIES AT ALL TIMES. MAINTAIN DIVERSION DITCHES, BASINS, SILT FENCE AND OTHER EROSION CONTROL MEASURES UNTIL THEY ARE APPROVED TO BE REMOVED.
19. INSTALL STORM SEWER, IF SHOWN, AND PROTECT INLETS WITH BLOCK AND GRAVEL INLET CONTROLS, SEDIMENT TRAPS OR OTHER APPROVED MEASURES AS SHOWN ON THE PLAN. BEGIN CONSTRUCTION, BUILDING, ETC.
20. STABILIZE SITE AS AREAS ARE BROUGHT UP TO FINISH GRADE WITH VEGETATION, PAVING, DITCH LININGS, ETC. SEED AND MULCH DENUDED AREAS PER GROUND STABILIZATION TIME FRAMES.
21. PERFORM SEEDING AND MULCHING AS REQUIRED IN ACCORDANCE WITH THE TEMPORARY AND PERMANENT SEEDING SCHEDULES.
22. AREAS NOT IN ACTIVE CUT AND FILL SHALL RECEIVE TEMPORARY SEEDING IN ACCORDANCE WITH THE SEEDING SCHEDULES IN THESE PLANS.
23. WHEN CONSTRUCTION IS COMPLETE AND ALL AREAS ARE STABILIZED, CALL ENVIRONMENTAL CONSULTANT FOR AN INSPECTION.
24. IF SITE IS APPROVED, REMOVE TEMPORARY DIVERSIONS, SILT FENCE, SEDIMENT BASINS, ETC. AND SEED OUT OR STABILIZE ANY RESULTING BARE AREAS. ALL REMAINING PERMANENT EROSION CONTROLS DEVICES, SUCH AS VELOCITY DISSIPATORS, SHOULD NOW BE INSTALLED.
25. WHEN VEGETATION HAS BECOME ESTABLISHED, CALL FOR A FINAL SITE INSPECTION BY THE ENVIRONMENTAL CONSULTANT. OBTAIN A CERTIFICATE OF COMPLETION.

EROSION CONTROL NOTE:

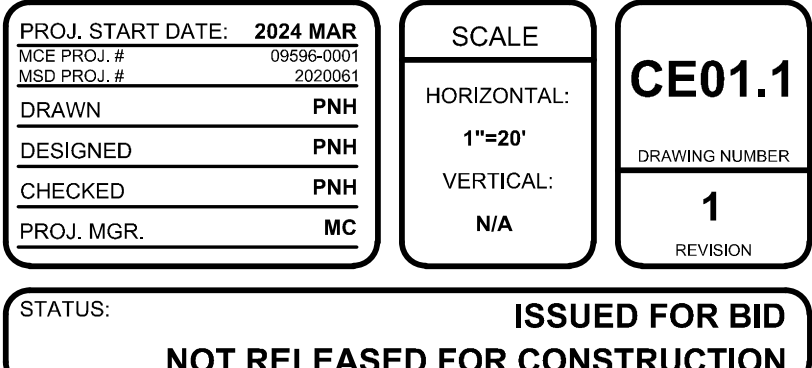
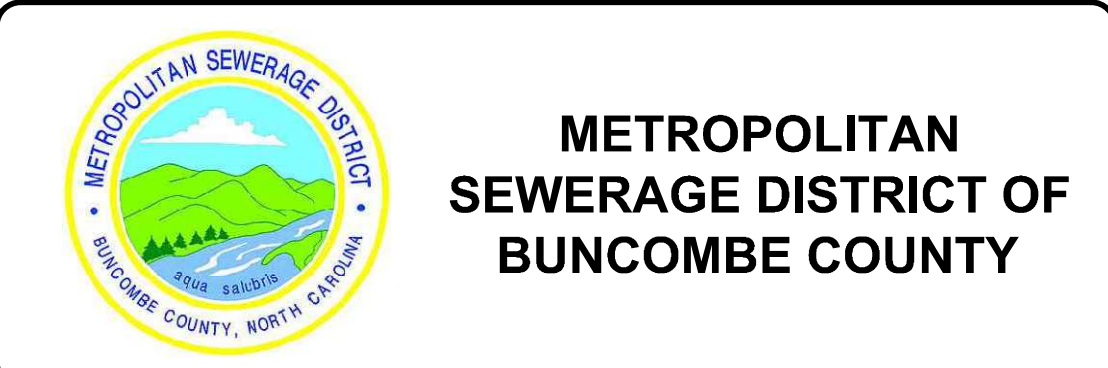
1. ROLLED EROSION CONTROL PRODUCT SHALL BE USED IN ALL AREAS WHERE GRADING EXCEEDS 5 FEET IN VERTICAL CHANGE AND 3:1 OR STEEPER SLOPE.

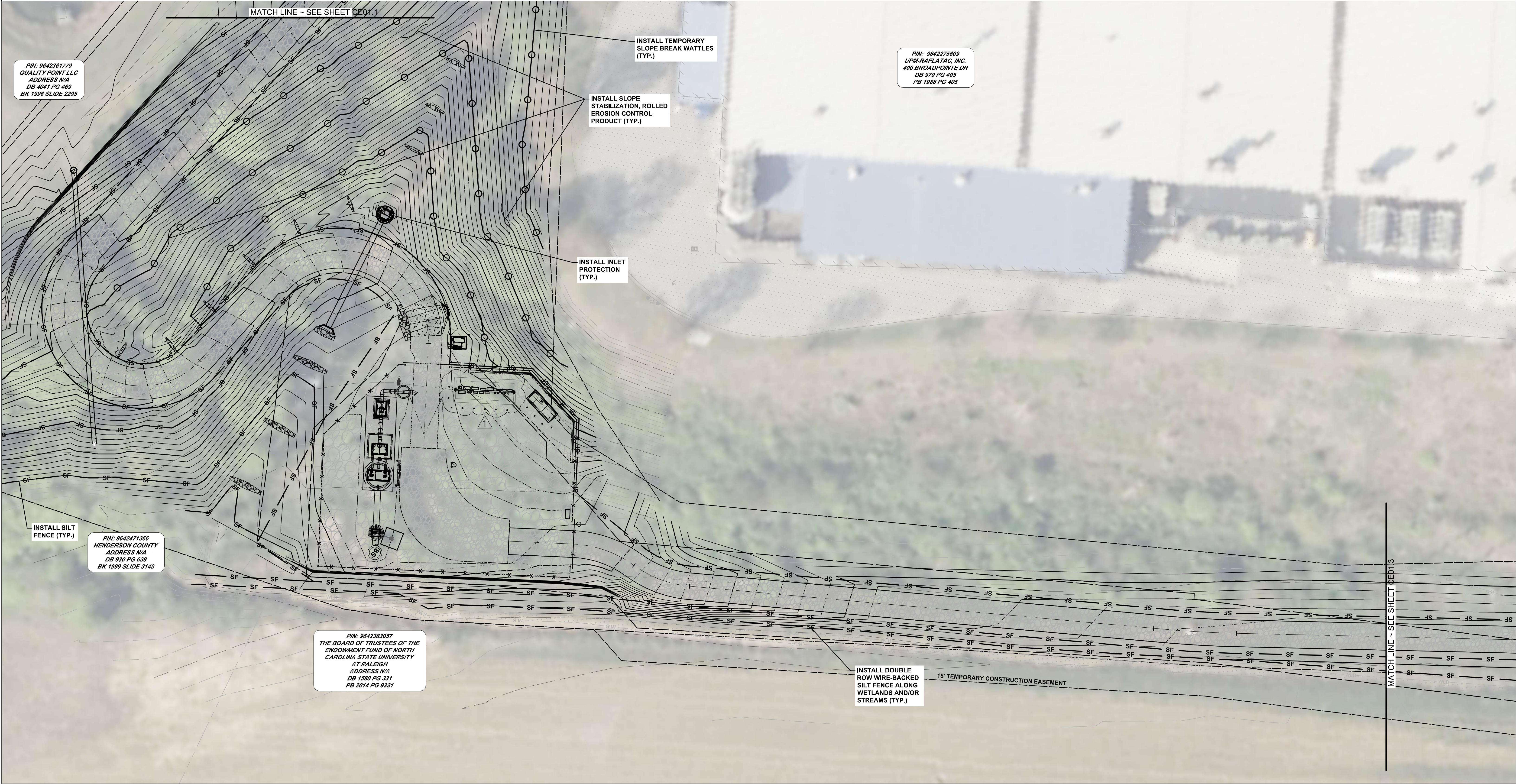
EROSION CONTROL PLAN

HORIZ. SCALE: 1"=20'



REV. NO.	DESCRIPTION	DATE
1	ADDENDUM NO. 1	JULY 2026
2	ISSUED FOR BID - NOT RELEASED FOR CONSTRUCTION	JUNE 2026
REVISIONS		



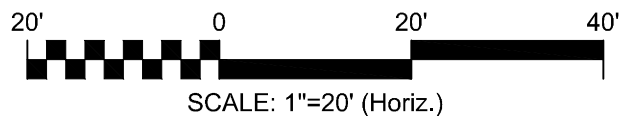


EROSION CONTROL NOTE:

1. ROLLED EROSION CONTROL PRODUCT SHALL BE USED IN ALL AREAS WHERE GRADING EXCEEDS 5 FEET IN VERTICAL CHANGE AND 3:1 OR STEEPER SLOPE.

EROSION CONTROL PLAN

HORIZ. SCALE: 1"=20'



REV. NO.	DESCRIPTION	DATE
1	ADDENDUM NO. 1	JULY 2026
2	ISSUED FOR BID - NOT RELEASED FOR CONSTRUCTION	JUNE 2026
REVISIONS		



**MCKIM & CREED**

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**METROPOLITAN
SEWERAGE DISTRICT OF
BUNCOMBE COUNTY**

ITT PUMP STATION REPLACEMENT

CIVIL

**EROSION CONTROL LOWER ACCESS ROAD
PLAN 1 OF 2**

PROJ. START DATE: 2024 MAR
DATE PROJ. # 08090001
MSD PROJ. # 2020061
DRAWN: PNH
DESIGNED: PNH
CHECKED: PNH
PROJ. MGR: MC

SCALE
HORIZONTAL: 1"=20'
VERTICAL: N/A

CE01.2
DRAWING NUMBER
1
REVISION

STATUS: **NOT RELEASED FOR CONSTRUCTION** ISSUED FOR BID

LOCATION: EQUIPMENT RACK

ENCLOSURE: NEMA-4X/SS MOUNTING: SURFACE
VOLTS: 480/270V 3 PHASE / 4 WIRE
BRACING: 35kAIC FULLY RATED

MAIN: 300AT / 300AF MCB
NEUTRAL: 100%
FEED: 3#350kcmil #350kcmilN #2G 3"C]

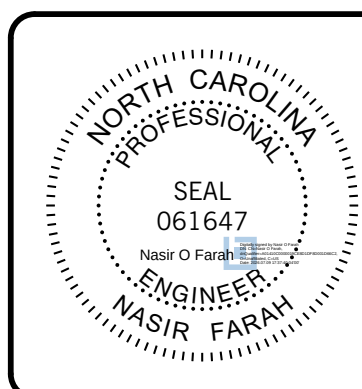
LOAD SERVED	LOAD (KVA)			BREAKER		FEEDER CIRCUIT CONDUIT & WIRING	CKT	PHASE	CKT	FEEDER CIRCUIT CONDUIT & WIRING	BREAKER		LOAD (KVA)			LOAD SERVED				
	A	B	C	AMP	POLE						POLE	AMP	C	B	A					
WASTEWATER PUMP No.1 'PMP-MTR-101'	9.42			70	3	3#8 #10G 1" C	1	A	2	PULL-STRING 1-1/2"C	3	70				9.42	WASTEWATER PUMP No.3 'PMP-MTR-103' (FUTURE)			
	9.42						3	B	4							9.42				
		9.42					5	C	6							9.42				
WASTEWATER PUMP No.2 'PMP-MTR-102'	9.42			70	3	3#8 #10G 1" C	7	A	8	3#10 #10G 1" C	3	30				3.917	GRINDER UNIT CONTROL PANEL 'GR.CP-100'			
	9.42						9	B	10							3.917			3.917	
		9.42					11	C	12							3.917				
UNIT SUBSTATION 'LP-100'	1.860			20	2	2#10 #10G 1" C	13	A	14	3#10 #10G 1" C	3	30				0.333	PUMP STATION CONTROL PANEL			
	2.050						15	B	16							0.333			0.333	
							17	C	18							0.333				
SPACE			0.000				19	A	20		3	30				0.000	SPARE BREAKER			
ELECTRIC HOIST MOTOR	1.330			20	3	3#12 #12G 3/4" C	21	B	22							0.000				
	1.330						23	C	24							0.000				
		1.330					25	A	26						0.000					
	0.000						27	B	28		3	30				0.000	SPARE BREAKER			
SPACE		0.000					29	C	30							0.000				
			0.000													0.000				
TOTAL(S):		20.170	20.170	20.170									13.670	13.670	13.670					
TOTAL BUS A LOAD:						33.840	KVA													
TOTAL BUS B LOAD:						33.840	KVA													
TOTAL BUS C LOAD:						33.840	KVA													
TOTAL CONNECTED KVA:		101.520																		
TOTAL CONNECTED AMPS:		122.113																		

1. REFERENCE ALL CONTRACT DOCUMENTS, SPECIFICATIONS AND DRAWINGS FOR ADDITIONAL REQUIREMENTS AND CONTRACT RESPONSIBILITIES PRIOR TO COMMENCING WORK.
2. CONTRACTOR SHALL REQUIRE AND IMPLEMENT ALL METROPOLITAN SEWERAGE DISTRICT OF BIRMINGHAM COUNTY CONSTRUCTION DETAILS AND STANDARDS.
3. ALL AC POWER CONDUCTORS, FOR CIRCUITS 100A AND GREATER SHALL BE STRANDED COPPER 600V TYPE XHHW-2 90°C.
4. ALL AC POWER CONDUCTORS FOR CIRCUITS LESS THAN 100A SHALL BE STRANDED COPPER 600V TYPE THHN/THWN 75°C

LOCATION: EQUIPMENT RACK

ENCLOSURE: NEMA-3R,SS
VOLTS: 240/120V 1 PHASE / 3 WIRE / 10KVA POWER UNIT
BRACING: 10,000A FULLY RATED

PANEL IN MINI POWER ZONE

[illegible][illegible]

**METROPOLITAN
SEWERAGE DISTRICT OF
BUNCOMBE COUNTY**

ELECTRICAL

PANELBOARD SCHEDULE AND LOAD TABLE

PROJ. START DATE: 2024 MAR	
MCE PROJ. #	09596-0001
MSD PROJ. #	2020061
DRAWN	LG
DESIGNED	LG
CHECKED	NF
PROJ. MGR.	MC

STATUS:

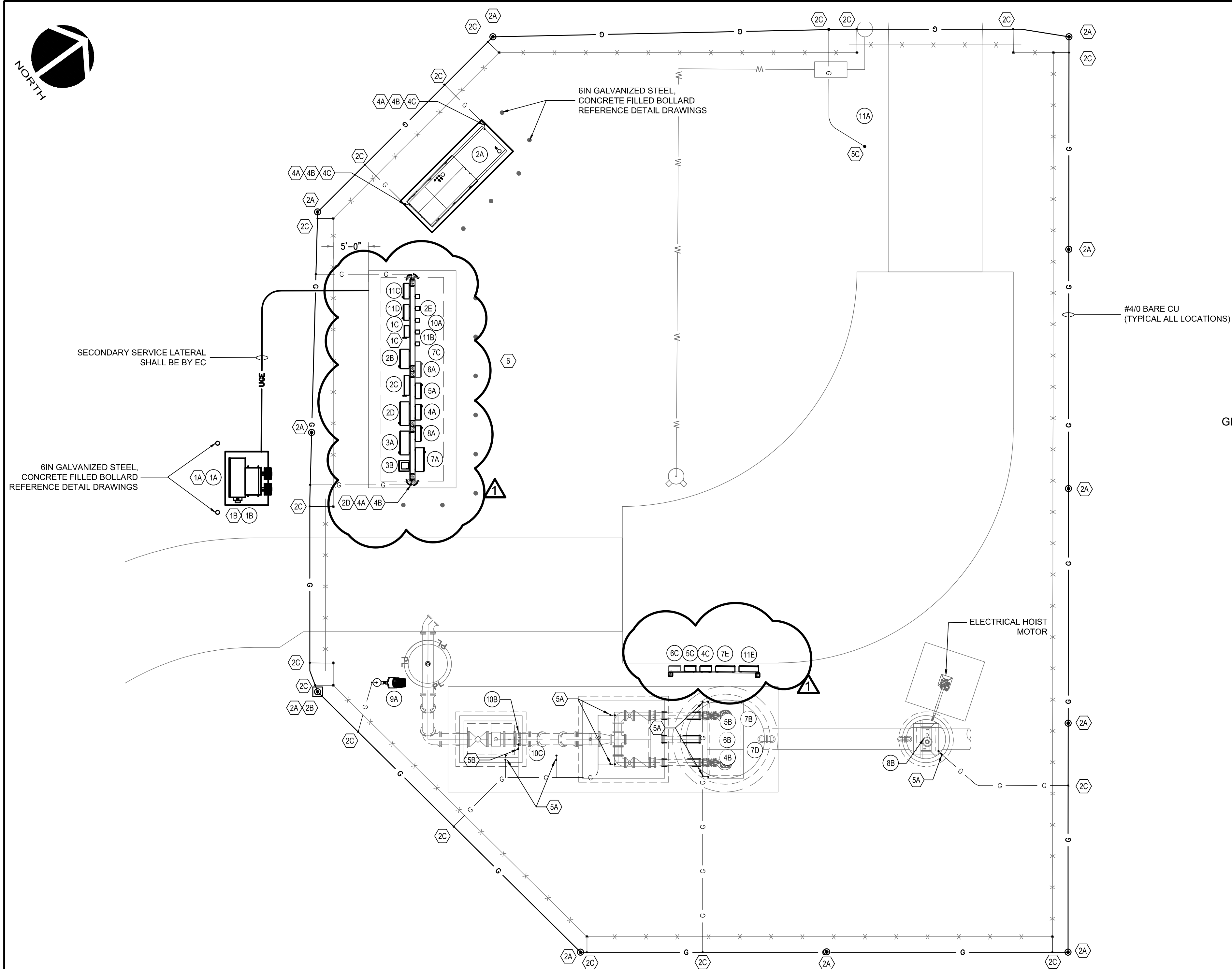
SCALE

HORIZONTAL:
N/A

VERTICAL:
N/A

1
REVISION

STATUS: **ISSUED FOR BID**
NOT RELEASED FOR CONSTRUCTION



1. ELECTRICAL EQUIPMENT AND ENCLOSURES ARE SHOWN APPROXIMATE TO INCLUDE RECOMMENDED LOCATIONS. CONTRACTOR SHALL REFERENCE ALL CONTRACT DOCUMENTS, APPROVED EQUIPMENT SUBMITTALS AND MANUFACTURER INSTALLATION INSTRUCTIONS PRIOR TO COMMENCING INSTALLATION.
2. MECHANICAL EQUIPMENT AND ASSOCIATIVE PIPING ARE SHOWN APPROXIMATE AND NOT ALL INCLUSIVE. CONTRACTOR SHALL REFERENCE CIVIL AND MECHANICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

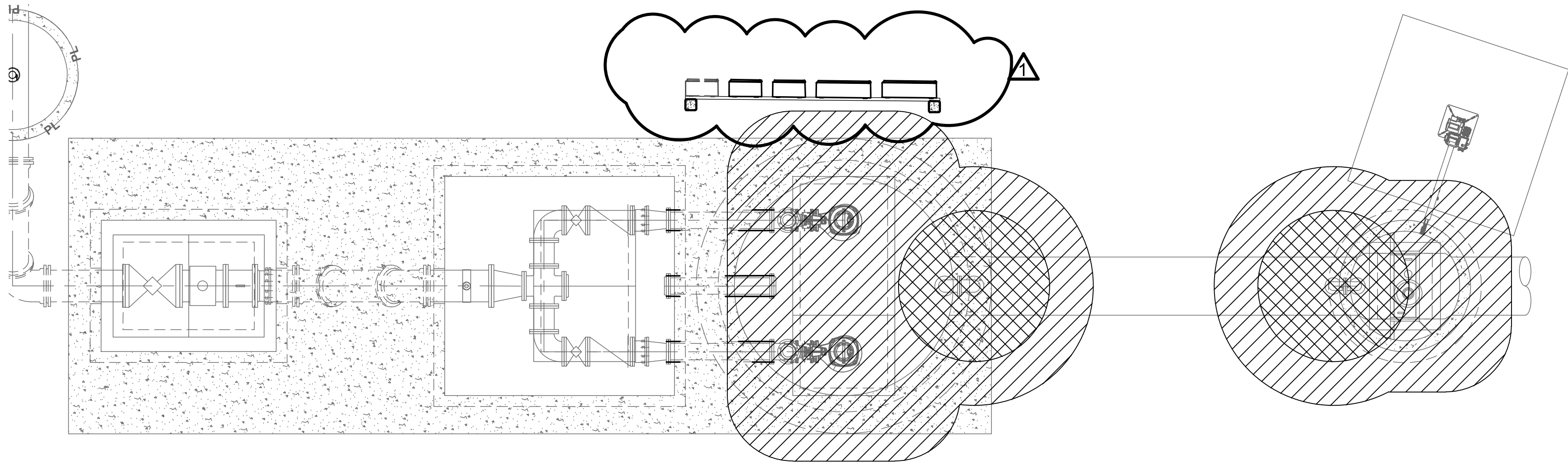
① $1^{\circ} = 8'-0"$

STATUS: ISSUED FOR BID
NOT RELEASED FOR CONSTRUCTION

1A	PROVIDE AND INSTALL CONCRETE FOUNDATION FOR PAD-MOUNT TRANSFORMER PER DUKE/PROGRESS ENERGY CONSTRUCTION STANDARDS. COORDINATE LOCATION WITH DUKE/PROGRESS ENERGY AND OWNER.
1B	PROVIDE AND INSTALL METERING CABINET AND METER SOCKET BASE PER DUKE/PROGRESS ENERGY CONSTRUCTION STANDARDS TO INCLUDE OWNER CONSTRUCTION STANDARDS. COORDINATE LOCATION WITH DUKE/PROGRESS ENERGY AND OWNER.
1C	INSTALL GROUNDING ELECTRODE CONDUCTOR TO MAIN CIRCUIT BREAKER AND BOND TO NEUTRAL PER APPLICABLE NEC ARTICLES
2A	PROVIDE AND INSTALL 3/4" x 120" CU-CLAD GROUND ROD GT-TYPE EXOTHERMIC WELDED TO #2AWG BARE COPPER TO FORM PERIMETER GROUND RING: HARGER P/N 3410C OR APPROVED EQUAL
2B	PROVIDE AND INSTALL CONCRETE GROUND WELL TEST BOX. REFERENCE DETAIL ON SHEET E03.0
2C	PROVIDE AND INSTALL EXOTHERMIC WELD 'A' TYPE CONNECTIONS FOR BONDING CABLE TO GROUND RING
2D	GROUND/BOND SCADA ANTENNA POLE ASSEMBLY (REFERENCE DETAIL ON SHEET E03.0)
3A	PROVIDE AND INSTALL (TYPICAL ALL) BONDING CONNECTIONS FROM FENCE POSTS TO PERIMETER GROUNDING RING WITH UL LISTED FENCE POST CLAMP: HARGER P/N CPC1-5/2TP OR APPROVED EQUAL
3B	PROVIDE AND INSTALL (TYPICAL ALL) FLEXIBLE BONDING CONNECTIONS FROM FENCE POSTS TO FENCE GATES WITH UL LISTED CLAMPS AND FLEXIBLE BRAIDED CONDUCTORS: HARGER P/N CPC1-5/2TP OR APPROVED EQUAL HARGER P/N MJ10-300-6 OR APPROVED EQUAL
4A	BOND ELECTRICAL EQUIPMENT AND/OR FRAMING SUPPORTS WITH BARE #2AWG BARE CU WIRE WITH HIGH-PRESS MECHANICAL LUG CONNECTIONS USING STAINLESS-STEEL ANTI-VIBRATION FASTENERS
4B	PROVIDE GROUND CABLE SLEEVE PER DETAIL SHOWN ON DRAWING E04.0
4C	PROVIDE 24IN MINIMUM GROUND CABLE FOR FUTURE CONNECTION
5A	BOND MAN-WAY HATCH COVERS WITH UL-LISTED MECHANICAL LUG CONNECTION (TYPICAL ONE (1) PER HATCH)
5B	BOND DISCHARGE PIPING WITH UL-LISTED MECHANICAL LUG CONNECTION
5C	BOND POTABLE WATER PIPE WITH HEAVY-DUTY GROUNDING CLAMP THOMAS & BETTS P/N 3902 OR APPROVED EQUAL
6	DUCTBANK TO CROSS ACCESS ROADS. ALL OTHER AREAS SHALL BE DIRECT BURIED. SEE DETAILS 2 & 3 ON E10.0 FOR DUCTBANK AND DIRECT BURIAL DETAIL. CONDUIT ROUTING TO BE FIELD ROUTED BY EC.

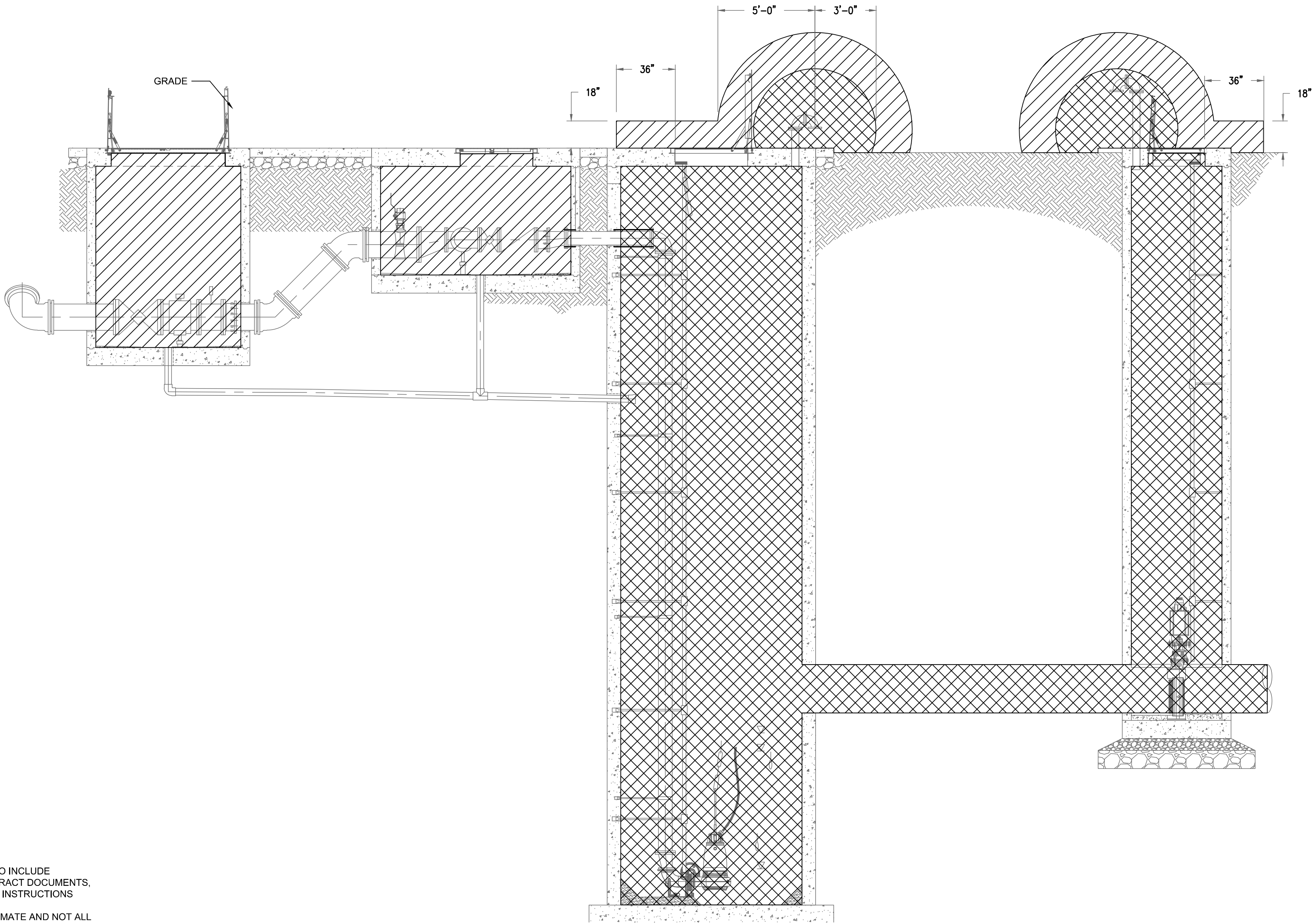
1A	UTILITY PAD-MOUNT TRANSFORMER 480/277V 3ø 4W
1B	UTILITY METER BASE
1C	MAIN ENCLOSED CIRCUIT BREAKER 'MCB1'
2A	STANDBY GENERATOR 'GEN' WITH ENCLOSURE AND SUB-BASE FUEL TANK
2B	AUTOMATIC TRANSFER SWITCH 'ATS'
2C	MANUAL TRANSFER SWITCH 'MTS'
2D	REMOTE TELEMETRY UNIT 'RTU-1'
2E	STANDBY GENERATOR EMERGENCY STOP BUTTON 'GEN E-STOP'
3A	MAIN PANELBOARD 'PBD-100'
3B	UNIT POWER SUBSTATION 'LP-100' (REFERENCE DRAWING E03.0)
4A	WASTEWATER PUMP MOTOR SOFT STARTER No.1 'RVSS-MTR-101'
4B	WASTEWATER PUMP MOTOR No.1 'PMP-MTR-101'
4C	FUTURE WASTEWATER PUMP MOTOR No.1 HOA SWITCH 'HOA-MTR-101'
5A	WASTEWATER PUMP MOTOR SOFT STARTER No.2 'RVSS-MTR-102'
5B	WASTEWATER PUMP MOTOR No.2 'PMP-MTR-102'
5C	FUTURE WASTEWATER PUMP MOTOR No.2 HOA SWITCH 'HOA-MTR-102'
6A	FUTURE WASTEWATER PUMP MOTOR SOFT STARTER No.3 'RVSS-MTR-103'
6B	FUTURE WASTEWATER PUMP MOTOR No.3 'PMP-MTR-103'
6C	FUTURE WASTEWATER PUMP MOTOR No.3 HOA SWITCH 'HOA-MTR-103'
7A	PUMP STATION CONTROL PANEL 'PS:CP-100'
7B	WET-WELL FLOAT SWITCHES 'LSHH-100, LSSL-100'
7C	WET-WELL LEVEL TRANSMITTER 'LIT-100A'
7D	WET-WELL LEVEL ELEMENT 'PE-100'
7E	WET-WELL POWER AND CONTROL TERMINATION ENCLOSURE
8A	INLINE GRINDER CONTROL PANEL 'GR:CP-100'
8B	INLINE GRINDER MOTOR ASSEMBLY 'GR-MTR-100'
9A	AREA LIGHT POLE ASSEMBLY
10A	FLOW TRANSMITTER 'FIT-100'
10B	FLOW ELEMENT 'FE-100'
10C	METER VAULT HIGH LEVEL FLOAT SWITCH 'LSHH-101'
11A	RPZ HOT BOX
11B	WET-WELL LEVEL TRANSMITTER 'LIT-100B'
11C	INTRINSICALLY SAFE PANEL 'ISP-100'
11D	INTRINSICALLY SAFE PANEL 'ISP-101'
11E	METER VAULT POWER AND CONTROL TERMINATION ENCLOSURE





PUMP STATION CLASSIFICATION PLAN

SCALE: 1/4" = 1' - 0"



PUMP STATION CLASSIFICATION ELEVATION

SCALE: 1/4" = 1' - 0"

PLAN NOTES:

- ELECTRICAL EQUIPMENT AND ENCLOSURES ARE SHOWN APPROXIMATE TO INCLUDE RECOMMENDED LOCATIONS. CONTRACTOR SHALL REFERENCE ALL CONTRACT DOCUMENTS, APPROVED EQUIPMENT SUBMITTALS AND MANUFACTURER INSTALLATION INSTRUCTIONS PRIOR TO COMMENCING INSTALLATION.
- MECHANICAL EQUIPMENT AND ASSOCIATIVE PIPING ARE SHOWN APPROXIMATE AND NOT ALL INCLUSIVE. CONTRACTOR SHALL REFERENCE CIVIL AND MECHANICAL DRAWINGS AND SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

GENERAL NOTES:

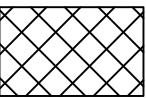
- REFERENCE ALL CONTRACT DOCUMENTS, SPECIFICATIONS AND DRAWINGS FOR ADDITIONAL REQUIREMENTS AND CONTRACT RESPONSIBILITIES PRIOR TO COMMENCING WORK.
- CONTRACTOR SHALL REFERENCE AND IMPLEMENT ALL CITY OF RALEIGH PUBLIC UTILITIES DEPARTMENT CONSTRUCTION DETAILS AND STANDARDS
- ALL AC POWER CONDUCTORS FOR CIRCUITS 100A AND GREATER SHALL BE STRANDED COPPER 600V TYPE XHHW-2 90°C
- ALL AC POWER CONDUCTORS FOR CIRCUITS LESS THAN 100A SHALL BE STRANDED COPPER 600V TYPE THHN/THWN 75°C
- ALL CONTROL CONDUCTORS RATED LESS THAN 120V SHALL BE STRANDED COPPER 600V TYPE THHN/THWN 75°C
- ALL UNDERGROUND RACEWAYS (THREE OR MORE) THAT LEAVE THE BUILDING OR STRUCTURAL ENVELOPE SHALL BE PVC-RAC PLACED IN REINFORCED CONCRETE DUCT-BANKS
- UNDERGROUND RACEWAYS (LESS THAN THREE) SHALL BE ALUMINUM CONDUIT DIRECT-BURIED WITH 24-INCH MINIMUM COVER FROM FINISHED GRADE
- RACEWAY TRANSITIONS OR PENETRATIONS THROUGH CEMENTITIOUS MATERIAL AND FINISHED GRADE SHALL BE PVC-RAC
- ALL NON CURRENT CARRYING EQUIPMENT WITHIN THE CLASSIFIED ZONE SHALL BE GROUNDED PER NEC 250.100

CLASSIFICATION NOTES:

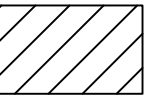
- IN ACCORDANCE WITH THE 2024 EDITION OF NFPA 820, TABLE 4.2.2, ROW 14(c), WASTEWATER PUMPING STATION WET WELLS:
 - INTERIOR AND AN ENVELOPE OF 3 FEET (0.9 METER) AROUND VENTS SHALL BE RATED CLASS I DIVISION 1.
 - AN ENVELOPE OF 5 FEET (1.5 METER) AROUND VENTS AND AN ENVELOPE 1.5 FEET (0.5 METER) HIGH EXTENDING 3 FEET (0.9 METER) FROM HATCHES SHALL BE RATED CLASS I DIVISION 2.
- IN ACCORDANCE WITH THE 2024 EDITION OF NFPA 820, TABLE 4.2.2, ROW 29(a), BELOWGRADE VALVE VAULT:
 - INTERIOR AND AN ENVELOPE OF 3 FEET (0.9 METER) AROUND VENTS SHALL BE RATED CLASS I DIVISION 2.
- IN ACCORDANCE WITH THE 2024 EDITION OF NFPA 820, TABLE 4.2.2, ROW 34(a), BELOWGRADE METERING VAULT:
 - INTERIOR AND AN ENVELOPE OF 3 FEET (0.9 METER) AROUND VENTS SHALL BE RATED CLASS I DIVISION 2.

CLASSIFICATION LEGEND:

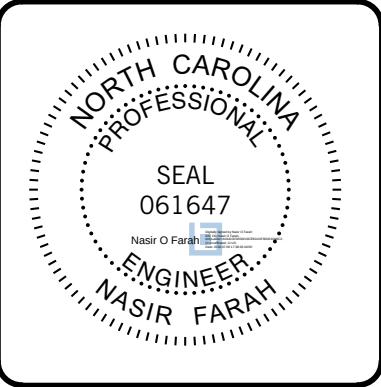
CLASS I, DIVISION 1:



CLASS I, DIVISION 2:



REV. NO.	DESCRIPTION	DATE
1	ADDENDUM NO.1	JULY 2026
0	ISSUED FOR BID - NOT RELEASED FOR CONSTRUCTION	JUNE 2026
REVISIONS		



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METROPOLITAN
SEWERAGE DISTRICT OF
BUNCOMBE COUNTY

ITT PUMP STATION REPLACEMENT

ELECTRICAL
CLASSIFICATION PLAN & ELEVATION

PROJ. START DATE: 2024 MAR
MCE PROJ. # 09596-0001
MSSD PROJ. # 20200001
DRAWN LG
DESIGNED LG
CHECKED NF
PROJ. MGR. MC

SCALE

HORIZONTAL:

AS NOTED

VERTICAL:

AS NOTED

E10.1

1

REVISION

STATUS: ISSUED FOR BID
NOT RELEASED FOR CONSTRUCTION

