Forsyth County Procurement
Greg Bridges, NIGP-CPP, Procurement Agent III

February 4, 2022

# ADDENDUM #2

## BID No. 22-001-3340

**For: Hurt Bridge and Keith Bridge Road Water Transmission Mains**

This addendum supersedes and supplements all portions of the bidding documents and becomes part of the contract documents for the above-referenced project.

Where any item called for in the specifications or indicated on the drawings is supplemented hereby, the original requirements shall remain in effect.

Where any original item is amended, voided or superseded hereby, the provision of such item not so specifically amended, voided or superseded shall remain in effect.

**Clarification on Bidder Questions, Updated Measurement of Payment section 01 29 77, Updated Trenching and Backfilling section 31 23 33, and Revised Bid Form:**

1. **Q: Will the project will require certified payroll and/or CDBG funded?**
   **A:** *No.*

2. **Q: I can't seem to locate the line item on the bid form for the jack and bore located at the fire station between STA 148+85 and 151+34 on Keith Bridge Rd. I just wanted to check if I was overlooking it or if it needed to be added to the bid sheet?**
   **A:** *The bid form and measurement of payment are updated and show the jack and bore at Sta. 148+85 and 151+34. Item 5.26 was added to the bid form and measurement and payment to show the jack and bore at this location*

3. **Q: Please confirm whether or not blasting will be allowed in order to deal with any trench rock that will be encountered during the installation. It would appear that in spec section 31 23 33 3-2.03 there is no blasting allowed. The geo tech does not show a lot of refusal but the nature of the area will offer rock risk. Confirming that the project is a "no blast" project will help in the cost estimating.**

**A:** *The specification section 31 23 33 3-2.03 is updated. Yes, blasting is allowed. Contractor must follow specification guidelines.*

4. **Q: The plans show pipe installed in several sections at the base of steep slopes near existing fences that appear to be on the ROW line. There is a plan note to remove and reinstall the fences as needed to allow for pipe installation. Has any temporary easement been obtained from these property Owners? Will the County obtain these easements or is that a Contractors responsibility?**
   **A:** *FCDWS does not anticipate any additional easements are needed. FCDWS obtained 3 easements that are indicated on the drawings CC-01-04 (around sta. 38+30, sta.38+81) and CC-02-04, CC-02-05 (around sta. 37+00 - 40+39).*
   *Please, refer to General Notes 23, 24 and 26 drw. G-01*

5. **Q: Please confirm that the referenced Geotechnical Investigation Report is not a Contract Document (its purpose was to support the design effort, and is not intended for construction).**
   **A:** *Please, refer to General Notes 10 drw. G-01*

6. **Q: Assuming the Geotechnical Investigation Report is not a Contract Document, can the Contractor rely upon the technical data in the reports?**
   **A:** *Please, refer to General Notes 10 drw. G-01*

7. **Q: There are at least ten different non-discrimination provisions in the Front End Documents. None are compliant with Executive Order 11246, as amended. All the provisions excluded protected classes under the Executive Order. Please modify the provisions to comply with Executive Order 11246.**
   **A:** *This is not a Federally Funded project, no modifications are necessary.*

8. **Q: There are numerous federal provisions incorporated by reference in the contract. Is this project federally-funded or federally-assisted?**
   **A:** *This is not a federally-funded project.*

9. **Q: The list of Contract Documents in the General Conditions (G.01) is different than the Contract Documents listed in Article 1.2 of the Agreement. Please clarify the Contract Documents for the project.**
   **A:** *The Contract Documents listed in Article 1.2 of the Agreement will be part of the Contract.*

10. **Q: General Conditions (G.19) implies an unlimited warranty period. Furthermore, there is no carve-out for equipment or mechanical failures due to normal wear-and-tear, or for improper user maintenance. Please clarify the project warranty requirements.**

**A:** *General Conditions (G.19) refer to DEFECTIVE WORK OR MATERIALS not the warranty. Warranty outlined in FCDWS standard specifications Division 1, 7.03 (18 months after final acceptance by the FCDWS)*

11. **Q: What are the provisions for undisclosed hazardous environmental conditions discovered on site?**
    **A:** *Refer to Contract Agreement, Article VIII, 8.2.3 Claims for Concealed and Unknown Condition*

12. **Q: Article 1.2.1 of the Agreement lists "Field Orders" as Contract Documents, but Field Orders are not defined or discussed in the front end documents. Please explain.**
    **A:** *The Contract Documents listed in Article 1.2 of the Agreement will be part of the Contract.*

13. **Q: Is the completion time in Article 3.3.1 of the Agreement "Substantial Completion" or "Final Acceptance"?**
    **A:** *Substantial Completion.*

14. **Q: Are the liquidated damages in Article 3.1.2 of the Agreement tied to Substantial Completion or Final Acceptance?**
    **A:** *Substantial Completion.*

15. **Q: When does the Warranty period begin?**
    **A:** *See Question 10.*

16. **Q: Please provide an objective, measurable definition for "first-class results" as used in Article 7.3.1 of the Agreement.**
    **A:** *FCDWS expect High Quality Work with good workmanship that meets Industry Standards*

17. **Q: Can you please define the limits of the proposed sod installations? Will sod installation be required in areas that are not currently considered maintained lawns?**
    **A:** *Contractor responsible to restore the excavated pipe trench area to original condition as a part of line item 5. PIPELINES. New sod will be installed on the project at the direction of FCDWS.*

18. **Q: The Measurement & Payment specification limits the pay width of sod to ten (10) feet. The area disturbed by the installation of a 36-Inch main will be much wider. Can the pay width be increased to include the width of the right-of-way?**
    **A:** *See Question 17.*

19. **Q: Can a payment item be added to provide payment for erosion control matting installed on slopes?**
    **A:** *No. Contractor should follow erosion control drawings. If additional erosion control measures are required contractor should submit RFI for review and approval. If it's approved FCDWS will create a Change Order.*

20. **Q: There are no construction exits shown on the erosion control plans. Will construction exits be required? If so, can a payment item be added to provide payment for construction exits?**
    **A:** *Because of the linear nature of the project being located along roadways, construction exits are not required. The contractor is still responsible for the prevention of sediment escape from the construction site.*

21. **Q: Driveway restoration will be measured & paid on a linear foot basis for driveways replaced. Will the contractor be required to replace the driveway from the right-of-way to the edge of pavement, or will a patch be an acceptable replacement?**
    **A:** *Driveway restoration will be measured & paid on a square yard basis. See detail 36. Drw. CC-29. Driveways and sidewalks shall be replaced to their full width from the edge of curb or road pavement to the nearest construction/control joint.*

22. **Q: Will Forsyth County provide water for flushing & testing the 36-Inch water main?**
    **A:** *Yes, water will be provided to test, flush, disinfect the pipe. However, if pipe pressure test failed second time then contractor will be required to obtain the water meter form the county and pay for the water.*

23. **Q: The blow-off detail, detail 14, on Sheet CC-24 requires the installation of an 8-Inch restrained mechanical joint plug. Detail 14 indicates that the valves & fittings used for blow-off assemblies are to the flanged. Please clarify if the blow-off components are to be mechanical joint or flanged?**
    **A:** *It is flanged connection. No MG restrain plug is required. Contractor should install blow off assemble D-14, Drw. CC-26*

24. **Q: The general notes on Sheet G-01 state that Type III bedding will be used unless otherwise noted on the drawings. The only call-out for Type IV bedding is shown on sheet CC-02-01. Will Type IV or V bedding be required at other locations such as restrained joint installations or wet areas?**
    **A:** *Contractor should follow project Drawing and Specifications. If type IV or V are required contractor should submit RFI for review and approval. If it's approved FCDWS will create a Change Order.*

25. **Q: The plan sheets call for, "Temporary Barrier Fence" to be installed throughout the project. Is orange "Tree Save" fence acceptable as Temporary Barrier Fence?**

**A:** *See note 14, Dwr. CC-01-02. We are anticipating orange woven fabric.*

26. **Q: The open cut steel casing installations on Keith Bridge Road at Stations 8+00 & 43+00 show the proposed 48-Inch Casings to be installed underneath the existing wingwalls. Detail 24 on page CC-28 indicates that proposed mains are to be installed around wingwalls. Please clarify that all open cut steel casings are to be installed around the existing wingwalls.**
**A:** *Yes, it is open cut. Detail 24 shows the pipe installation without steel casing. It is contractor responsibility to support wing wall while performing open cut and installing the steel casing.*

27. **Q: There are several areas throughout the project that have finished landscaping, trees, shrubs, etc. within the right-of-way. Is grassing acceptable within the right-of-way, or will the contractor be required to replace these items using reasonable sized replacement materials?**
**A:** *Contractor responsible to restore the excavated pipe trench area to original condition as a part of line item 5. PIPELINES. If unusual conditions exist contractor should submit RFI for review and approval. If it's approved FCDWS will create a Change Order.*

28. **Q: For bid items 5.07 Watson Road Crossing, 5.10 Leland Drive Crossing, and 5.14 Mayfield Drive Crossing the Measurement & Payment section 01 29 77 pages 3, 4 & 5 say that these items are Open Cut, however the plans say that these crossings are to be Jack and Bored. Can you clarify if these crossings are to be Open Cut or Jack & Bore?**
**A:** *These are jack and bore crossings. See updated Bid Form and Section 01 29 77 Measurement and Payment.*

29. **Q: Item 5.03 Fire Hydrants has Zero as a quantity. Is a unit price required for the bid even though it will not impact the total?**
**A:** *No, it is not required. See updated Bid Form and Section 01 29 77 Measurement and Payment.*

30. **Q: The measurement & Payment section items 5.06 and 5.22 involves Jack & bores and clearly state that only the excess cost of installing the pipe in casing above the amount bid for pipe laid in open trench is to be included. However, the remaining crossing items say "the LS bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe…" Please confirm ALL 36" DIP used in Crossings will be paid for under item 5.00.**
**A:** *Yes, ALL 36" DIP used in Crossings will be paid for under item 5.00. See updated Section 01 29 77 Measurement and Payment.*

31. **Q: The description for Leland Drive crossing in measurement & Payment indicates open cut, but the plans show jack & Bore. Please clarify.**
    **A:** *It is jack and bore crossings. See updated Bid Form and Section 01 29 77 Measurement and Payment.*

32. **Q: If additional Poly encasement is required beyond that shown on the plans how will this be paid?**
    **A:** *Contractor should install what is specified on the drawing. If additional poly-wrap is required contractor should submit RFI for review and approval. If it's approved FCDWS will create a Change Order*

33. **Q: How will item 5.25 be paid? Based on percent complete for Project or 25% on initial pay app like GDOT?**
    **A:** *It will be based on percent complete*

34. **Q: Will the owner pay for ALL sod installed or only particular limits?**
    **A:** *See Question 17.*

35. **Q: Which ARV detail is to be followed? 20.0 or 21.0?**
    **A:** *21.0*

36. **Q: How will additional fittings be paid for if required?**
    **A:** *If additional fitting is required contractor should submit RFI for review and approval. If it's approved FCDWS will create a Change Order.*

37. **Q: If Casing lengths must be increased to follow detail 24.0, how will the extra piping be paid?**
    **A:** *Detail 24 does not have casing. Contractor should follow the drawings. If additional piping is required contractor should submit RFI for review and approval. If it's approved FCDWS will create a Change Order.*

38. **Q: Type IV bedding is called out in some of the profiles. What are the limits of the areas this bedding is required?**
    **A:** *Limits shall be the same as length of restrained joints on proposed crossing.*

39. **Q: If a particular OPEN cut crossing goes under curb. Will replacing the curb be paid under item 8.00?**
    **A:** *Yes.*

40. **Q: Removal & Replacement of unsuitable material indicates compacted granular fill. Is Crusher Run or M-10s permitted for this type of fill?**

**A:** *Geotechnical Company hired by FCDWS will make determination if material is unsuitable also recommendation will be made what granular material to be use.*

41. **Q: Gravel, Asphalt & concrete replacement is measured in SY. Detail 36 & 37 do not indicate the allowable pay width for these situations. Several of these locations are deeper than min depth which will create a wider trench. Please clarify payment method.**
**A:** *Pipe backfill is a part of lump sum price for pipe installation, line item 5 PIPELINES. Gravel, Asphalt & Concrete driveway cut repair will be payed by measuring SY of replaced area. See Question 21.*

42. **Q: Is Restrained Joint pipe required in all the casing or just where called for on the plans? If additional RJ pipe is required how will it be paid?**
**A:** *All pipe within casing to be restrain joint. If additional RJ fitting is required contractor should submit RFI for review/approval. If it's approved FCDWS will create a Change Order.*

**Attachments:**

**Updated Measurement of Payment section 01 29 77**

**Updated Trenching and Backfilling section 31 23 33**

**Revised Bid Form**

Section 01 29 77

# MEASUREMENT AND PAYMENT

1. SCOPE. This section covers methods of measurement and payment for items of Work under this Contract.

When both inch-pound (English) and SI (metric) units of measurement are specified herein; the values expressed in inch-pound units shall govern.

2. GENERAL. The Contract Price 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 materials, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the prices bid.

3. ESTIMATED QUANTITIES. All estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) as a basis for estimating the probable cost of the Work and (b) for the purpose of comparing the Bids submitted for the Work. The actual amounts of work done and materials furnished under unit price items may differ from the estimated quantities. The basis of payment for work and materials will be the actual amount of work done and materials furnished. Contractor agrees that it will make no claim for damages, anticipated profits, or otherwise on account of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefore.

4. MOBILIZATION AND DEMOBILIZATION. Except where otherwise specified, the unit or lump sum price bid for each item of Work which involves moblization and demobilization shall include all costs for such Work, including all costs in fuel, rental or equipment transport fees. One mobilization and one demobilization will be allowed unless approved in writing by the Owner.

Payment will be lump sum not to exceed 3% of the total price of the project as estimated by the Contractor. Payment will constitute full compensation for all costs associated with mobilization and demobilization of equipment and Contractor’s field offices as directed by the Engineer for the project. No additional or separate payment will be made for mobilization or demobilization for the purposes of contract renewal or extension.

5. PIPELINES. Ductile iron pipelines which are to be paid for on a unit price basis shall be measured for payment on a horizontal plane after installation of the pipe. Where lines are laid to conform to stationed profiles, payment shall be made on linear quantities based on the pipeline stationing as determined by surveys made after installation.

The measurement of the length of each line or run of pipe of each size will begin and end at:

a. The end of the pipe where connected to an existing pipe, fitting, factory welded on outlet, or valve; or at the end of a dead-end run.

b. The center line intersection of run and branch on tees, crosses, or laterals where a branch line connecting therewith is constructed under this Contract. Where a branch fitting is installed under this Contract, and the branch or connecting line is to be constructed by others at some future date or under another contract, the pay measurement will include the entire laying length of the branch or branches of such fitting.

c. The measurement of each line of pipe of each size which is to be paid for on a unit price basis will be continuous through, and shall include the full laying lengths of, all fittings and valves installed between the ends of each line; except that the laying lengths of reducers and increasers will be divided equally between the connected pipe sizes.

d. The unit price bid for DIP shall also include and cover excavation or trenching, all costs for rock excavation, removal and disposal, and replacement with granular embedment shall be included in the unit price bid for such work. Unit price shall include protecting existing facilities adjacent to the Work, repairing or replacing those facilities encountered during these operations (i.e. mail boxes, culverts, house connections, existing fences, utilities, etc.) and shall be based on earth excavation throughout, from and below the ground surface to the trench bottom or concrete or structure subgrade as excavated, regardless of the location, extent, or quantity of rock which may be encountered. No separate payment shall be made for depths of trenching work required for pipelines. No separate payment shall be made for embedment, compaction of backfill or removal and disposal of excess material from excavation and trenching. All such work shall be considered a subsidiary obligation of Contractor and all costs in connection therewith shall be included in the unit price bid per linear foot of pipe in place.

e. Payment for restrained joints shall be based on the required length of restrained joints indicated on the Drawings. The costs for restrained joints shall be included in the overall unit price bid.

5.01. Connections to Existing Water Mains. Connections to existing water mains will be paid for at the lump sum prices bid. Each lump sum price named for a connection shall include all costs incurred for making the connection over and above the price of the connecting piping in place and concrete blocking which will be paid for separately. Each lump sum price shall include furnishing and installing the couplings and fittings; all excavation and backfilling work; cutting of existing main, disposing of excess materials, disinfection and cleaning; and all other costs not included under other bid items. Valves associated with connections to existing mains shall be paid for under item 5.02 Isolation Valves.

5.02. Isolation Valves. Isolation valves in water mains will be paid for at the unit price bid for each size. The valves will be gate valves with flex rings bell joints. The Owner will provide nine (9), 36-inch valves.The unit price shall include all costs incurred in completing the isolation valve installation over and above the amount paid for piping in place. The unit price shall include furnishing of valves not provided by Owner and installing the isolation valve, valve box,markers, and appurtenances; excavation and backfill not included under piping; and all other costs not included under other bid items.

No separate payment will be made for fire hydrant auxiliary gate valves or tapping valves.

5.03. Not Used

5.04. Combination Air Valve Assemblies. Combination Air Valve Assemblies will be paid for at the unit price bid. The unit price named for each Combination Air Valve Assembly installation shall include all costs incurred in furnishing and installing the Combination Air Valve Assembliy; air valve, accessories, manhole, cover, and appurtenances; drainage and vent facilities; and all other costs not included under other bid items.

5.05. Blowoffs. Blowoffs will be paid for at the unit price bid. The unit price named for each blowoff installation shall include all costs incurred in furnishing and installing the blowoff assembly; auxiliary gate valve (and valve box), accessories, and appurtenances; concrete blocking behind and under the blowoff; drainage facilities; and all other costs not included under other bid items.

5.06. Hurt Bridge Road Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the jack and bore installation including steel casing pipe, the excess cost of installing pipe in steel casing pipe above the amount bid for the pipe laid in open

trench, casing insulators or supports, jointing materials, boring and receiving pits, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.07. Watson Road Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the jack and bore installation including steel casing pipe, the excess cost of installing pipe in steel casing pipe above the amount bid for the pipe laid in open trench, casing insulators or supports, jointing materials, boring and receiving pits, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately. Carrier pipe is quantified in pipeline item.

5.08. Bridgeshaw Drive Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.09. Aaron Sosebee Road Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.10. Leland Drive Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the jack and bore installation including steel casing pipe, the excess cost of installing pipe in steel casing pipe above the amount bid for the pipe laid in open trench, casing insulators or supports, jointing materials, boring and receiving pits, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately. Carrier pipe is quantified in pipeline item.

5.11. English Drive Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.12. Cantrell Circle Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.13. Millwood Road Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.14. Mayfield Drive Crossing. The road crossing shall be paid for as a lump sum.
The lump sum bid for the crossing shall include all costs in connection with the jack and bore installation including steel casing pipe, the excess cost of installing pipe in steel casing pipe above the amount bid for the pipe laid in open trench, casing insulators or supports, jointing materials, boring and receiving pits, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately. Carrier pipe is quantified in pipeline item.

5.15. Grindle Crossing. The road crossing shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.16. Sixmile Creek Crossing at STA 8+00 +/- (Keith Bridge Road). The creek crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.17. Sixmile Creek Crossing at STA 43+00 +/- (Keith Bridge Road). The creek crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection

with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.18. Sixmile Creek Crossing at STA 62+50 +/- (Keith Bridge Road). The creek crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.19. Sixmile Creek Crossing at STA 77+00 +/- (Keith Bridge Road). The creek crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.20. Sixmile Creek Crossing at STA 93+00 +/- (Keith Bridge Road). The creek crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.21. Sixmile Creek Crossing at STA 106+50 +/- (Keith Bridge Road). The creek crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.22. Fourmile Creek Crossing at STA 123+00 +/- (Keith Bridge Road). The creek crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the jack and bore installation including steel casing pipe, the excess cost of installing pipe in steel casing pipe above the amount bid for the pipe laid in open trench, casing insulators or supports, jointing materials, boring and receiving pits, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately. Carrier pipe is quantified in pipeline item.

5.23. Fourmile Creek Crossing at STA 144+00 +/- (Keith Bridge Road). The creek crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the open trench installation the pipe including steel casing pipe, casing insulators or supports, jointing materials, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately.

5.24. Corrosion Protection. No separate payment shall be made in connection with corrosion protection or polyethylene tube protection as specified or required. All costs for corrosion protection and polyethylene tube protection shall be included in the unit cost of the pipeline work.

5.25. Traffic Control. Traffic Control for all pipelines as indicated on the drawings shall be paid for as a lump sum.

5.26. Fire Station Crossing at STA 148+85 +/- (Keith Bridge Road). The Fire Station crossing on Keith Bridge Road shall be paid for as a lump sum. The lump sum bid for the crossing shall include all costs in connection with the jack and bore installation including steel casing pipe, the excess cost of installing pipe in steel casing pipe above the amount bid for the pipe laid in open trench, casing insulators or supports, jointing materials, boring and receiving pits, end closures, vents, and all other work for and in connection with the crossing as indicated on the Drawings, in the Specifications, or required, not paid for separately. Carrier pipe is quantified in pipeline item.

6. EROSION CONTROL. Except where otherwise specified, the unit or lump sum price bid for each item of work which involves excavation, trenching, or any activity that disturbs existing site conditions shall include all costs for erosion and sedimentation control work. No separate payment shall be made for erosion control, other than silt fence and sodding.

6.01. Silt Fence. The unit price for silt fence bid shall include all costs of materials and labor involved in furnishing and installation of the silt fence in accordance with the Drawings.

6.02. Sodding. The unit price for sodding shall include all costs in connection with sodding in acordance to the drawings. Payment for Work completed may be withheld if sodding is not keeping pace with the progress of the Work.

7. PAVEMENT REMOVAL AND REPLACEMENT. Pavement removal and replacement shall be measured for payment horizontally along the center line of the pipe, through manholes, and to the edge of the existing pavement; or, where the edge of the existing pavement is not clearly defined, to the edge of the pavement replacement. The width of pavement replacement will not be

measured or taken into account in payment. Refer to Forsyth County Standards Detail No 35 on the Drawings.

The unit prices bid for pavement removal and replacement shall include all costs in connection therewith, including cutting, removal, and disposal of old pavement; construction of new pavement; and all extra compaction effort required for backfill beneath pavement.

8. DRIVEWAY, SIDEWALK, CURB AND GUTTER REMOVAL AND REPLACEMENT. The unit price per square yard bid for driveway, sidewalk, curb and gutter removal and replacement shall include all costs involved in cutting and removing the driveways, sidewalks, curbs and gutters and all labor and materials required to replace the driveways, sidewalks, curbs and gutters and concrete culvert pipe, where required. Refer to Details No 36 and 37 on the Drawings.

Measurement for payment of driveway and, sidewalk removal and replacement shall be on a square yard basis and shall include only the area actually removed and replaced, between joints, over the pipeline trench. Measurement for payment of curb and gutter removal and replacement shall be on linear foot basis and shall include only the area actually removed and replaced over the pipeline trench.

Gravel driveway replacement thickness shall match the original driveway thickness unless the existing driveway thickness is less than 6 inches. In that case, the driveway replacements shall be 6 inches thick.

All costs for repairing or removal and replacement of existing driveways, sidewalks, curbs and gutters outside the specified pay limits, where damaged by construction operations, shall be considered a subsidiary obligation of Contractor and shall be borne by him.

9. MISCELLANEOUS CONCRETE. Concrete for encasement or blocking of pipe and fittings not included as parts of manholes and other structures will be measured for payment as the actual volume of concrete placed within the limits as indicated or specified.

Concrete for total encasement shall be computed using the maximum allowable trench width (or pipe OD plus 24 inches where no maximum is specified), the minimum clear depth below the pipe, and the minimum cover over the pipe, less the volume occupied by the pipe itself.

Concrete for thrust blocks, except blocking behind and under fire hydrants, shall be computed using the dimensions indicated on the drawings for such blocking, unless otherwise authorized by Engineer. Direct payment shall not be made for blocking behind and under fire hydrants.

Unless otherwise authorized by Engineer, all additional concrete for encasement or blocking required outside the specified pay limits will be considered a subsidiary obligation of Contractor and no direct payment shall be made therefor.

All concrete which is required in connection with manholes or structures, pavement or sidewalk replacement, and other pay items shall be included in the lump sum or unit price bid for the pay item.

The unit price bid for miscellaneous concrete shall include concrete, reinforcing steel, forms, finishing, curing, and all other work or materials required to complete the concrete work.

10. REMOVAL AND REPLACEMENT OF UNSUITABLE MATERIAL. If adequate subgrade material is not encountered at the elevations indicated on the Drawings, that material shall be deemed unsuitable and shall be removed. The unit price bid per cubic yard for removal and replacement of unsuitable material shall include cost of the removal of the unsuitable material to a depth of at least 2 feet below the trench bottom times the full width of the trench and replacement with compacted granular fill as specified, as directed by the Engineer. The unit price bid per cubic yard shall also include disposal of the unsuitable material offsite. All pay quantities shall be based on the volume of the unsuitable material in its original and undisturbed condition.

11. EIGHT OUNCE FILTER FABRIC. The unit price per square yard shall include all costs for furnishing and placement of eight ounce filter fabric in areas where unsuitable material is encountered, as directed by Engineer.

12. *PIPELINE MARKER BALLS. The unit price* shall include all costs for furnishing and placement of *markers, installation*, *assembly, and marker locator.*
13. Temporary Barrier Fence. The unit price for temporary barrier fence bid shall include all costs of materials and labor involved in furnishing and installation of the temporary barrier fence in accordance with the Drawings.

End of Section

Section 31 23 33

TRENCHING AND BACKFILLING

## PART 1 - GENERAL

1-1. SCOPE. This section covers clearing, grubbing, and preparation of the site; removal and disposal of all debris; excavation and trenching; tunneled (trenchless construction) crossings; the handling, storage, transportation, and disposal of all excavated material; all necessary sheeting, shoring, and protection work; preparation of subgrades; pumping and dewatering as necessary; protection of adjacent property; backfilling; pipe embedment; surfacing and grading; and other appurtenant work.

1-2. GENERAL. With reference to the terms and conditions of the construction standards for excavations set forth in OSHA "Safety and Health Regulations for Construction", Chapter XVII of Title 29, CFR, Part 1926, Contractor shall employ a competent person and, when necessary based on the regulations, a licensed or registered professional engineer, to act upon all pertinent matters of the work of this section.

1-3. SUBMITTALS. Drawings, specifications, and data covering the proposed materials shall be submitted in accordance with the Submittals Procedures section.

At least 30 days before starting construction on the sheeting and shoring, and in accordance with the OSHA requirements identified above, the Contractor shall ensure that the sheeting and shoring design engineer shall complete and submit to Engineer the Protection System Design Certificate (Figure 1-31 23 33) and the Contractor shall use the sheeting and shoring design. If required by the OSHA requirements identified above or to protect existing facilities, the Contractor shall submit a separate certificate for each unique design. If required for protection of existing facilities or as required by the OSHA regulations identified above, the certificate(s) shall be signed and sealed by the registered professional engineer that designed the protection system.

1-3.01. Filter Fabric Data. Complete descriptive and engineering data for the fabric shall be submitted. Data submitted shall include:

A 12 inch square sample of fabric.

Manufacturer's descriptive product data.

Installation instructions.

1-3.02 Embedment and Backfill Materials. Complete test results covering tests performed by an independent commercial testing laboratory retained by the

Contractor for all materials described in the Materials Testing Section shall be submitted.

1-3.03. Dewatering Subcontractor. Submit project experience for dewatering Subcontractor. Provide name of project and contact information for owner and general contractor.

1-4. BASIS FOR PAYMENT.

1-4.01. Trench Sheeting. No additional payment above the Contract Price will be made for trench sheeting left in place.

1-5. INSURANCE. Professional liability insurance shall be provided as specified in the Supplementary Conditions section.

## PART 2 - PRODUCTS

2-1. MATERIALS.

2-1.01. Filter Fabric. The fabric shall be provided in rolls wrapped with covering for protection from mud, dirt, dust, and debris.

2-1.01.01. Filter Fabric Type A. Filter fabric Type A shall be provided for installation at locations indicated on the Drawings and as specified herein. Filter Fabric Type A shall be a nonwoven fabric consisting of only continuous chains of polymeric filaments or yarns of polyester formed into a stable network by needle punching. The fabric shall be inert to commonly encountered chemicals; shall be resistant to mildew, rot, ultraviolet light, insects, and rodents; and shall have the indicated properties:

| Property | Test Method | Unit | Minimum Average Roll Value * |
|---|---|---|---|
| Fabric Weight | ASTM D3776 | oz/yd2 [g/m2] | 5.7 [193] |
| Grab Strength | ASTM D4632 | lb [N] | 155 [689] |
| Grab Elongation | ASTM D4632 | percent | 50 |
| Mullen Burst Strength | ASTM D3786 | psi [MPa] | 190 [1.3] |
| Apparent Opening Size | CW-02215 | U.S. Standard Sieve Size | 70 [212 µm] |

* Minimum average roll value in weakest principal direction.

2-1.01.02. Filter Fabric Type B. Not used.

2-1.02. Polyethylene Film. Polyethylene film beneath concrete slabs or slab base course material shall be Product Standard PS17, 6 mil [150 mm] minimum thickness.

2-1.03. Tunnel Materials. Not Used.

2-1.04. Backfill Materials.

2-1.04.01. Job Excavated Material. Job excavated material may be used for either uncompacted or compacted trench backfill when the job excavated material is finely divided and free from debris, organic material, cinders, corrosive material, and stones larger than 3 inches in greatest dimension. Masses of moist, stiff clay shall not be used.

2-1.04.02. Inundated Sand Fill. Not Used.

2-1.04.03 Graded Gravel Fill. Graded gravel for compacted trench backfill shall conform to the following gradation:

| Sieve Size | Percent Passing by Weight |
|---|---|
| 1 inch | 100 |
| 3/4 inch | 85 – 100 |
| 3/8 inch | 50 – 80 |
| No. 4 | 35 – 60 |
| No. 40 | 15 – 30 |
| No. 200 | 5 – 10 |

The gravel mixture shall contain no clay lumps or organic matter. The fraction passing the No. 4 sieve shall have a liquid limit not greater than 25 and a plasticity index not greater than 5.

2-1.04.04. Granular Fill. Granular fill material shall be crushed rock or gravel. Granular fill shall be free from dust, clay, and trash; shall be hard, durable, and non-friable; and shall be graded 3/4 inch to No. 4 as defined in ASTM C33 for No. 67 coarse aggregate. Granular fill shall meet the quality requirements for ASTM C33 coarse aggregate.

2-1.05. Controlled Low Strength Material (CLSM) Fill. Not used.

2-1.06. Pipe Embedment Material. Pipe embedment material shall be placed as indicated in Detail 33 on the Drawings.

2-1.06.01. Granular Embedment. Granular embedment shall consist of crushed rock and crushed gravel, meeting the quality and gradation requirements of coarse aggregate size number 7 of ASTM C33.

2-1.06.02. Hand Placed Embedment. Hand placed embedment shall be finely divided job excavated or imported material, free from organic materials, debris, and stones.

2-1.06.03. Compacted Embedment. Compacted embedment shall be finely divided job excavated material free from debris, organic material, and stones. Graded gravel may be substituted for compacted embedment. Granular embedment may be substituted for all or part of the compacted embedment at the option of the Contractor.

2-2. MATERIALS TESTING.

2-2.01. Preliminary Review of Materials. As stipulated in the Quality Control section, all tests required for preliminary review of materials shall be made by an acceptable independent testing laboratory at the expense of Contractor. Two initial gradation tests shall be made for each type of embedment, fill, backfill, or other material, and one additional gradation test shall be made for each additional 500 tons [450 Mg] of each material delivered to the site. In addition, one set of initial Atterberg Limits test shall be made for each fill materials containing more than 20 percent by weight passing the No. 200 sieve [75 :m]. One additional Atterberg Limits test shall be made for each additional 500 tons [450 Mg] of each material delivered to the site.

All material testing on CLSM shall be made by an independent testing laboratory at the expense of Contractor.

2-2.02. Field Testing Expense. All moisture-density (Proctor) tests and relative density tests on the materials, and all in-place field density tests, shall be made by an independent testing laboratory at the expense of Owner. Contractor shall provide access to the materials and work area and shall assist the laboratory as needed in obtaining representative samples.

2-2.03. Required Tests. For planning purposes, the following guidelines shall be used for frequency of field tests. Additional tests shall be performed as necessary for job conditions and number of failed tests. Test results shall be submitted as specified in the Submittals Procedures section.

a. Two moisture density (Proctor) tests in accordance with ASTM D698 (or, when required, ASTM D1557), or two relative density tests in accordance with ASTM D4253 and D4254 for each type of general fill, designated fill, backfill, or other material proposed.
b. In-place field density and moisture tests (ASTM D2922 and ASTM

D3017) at intervals of 1000 feet [300 m] maximum along the trench.

c. One in-place field density and moisture test (ASTM D2922 and ASTM D3017) for every 200 cubic yards [153 $m^3$] of backfill.

d. One in-place density and moisture test (ASTM D2922 and ASTM D3017) whenever there is a suspicion of a change in the quality of moisture control or effectiveness of compaction.

e. Additional gradation, Proctor, and relative density tests whenever the source or quality of material changes.

## PART 3 - EXECUTION

3-1. CLEARING. All clearing shall be performed as necessary for access, stringing of pipeline materials, and construction of the pipeline and appurtenant structures.

3-2. EXCAVATION. Excavations shall provide adequate working space and clearances for the work to be performed therein and for installation and removal of concrete forms. In no case shall excavation faces be undercut for extended footings.

Subgrade surfaces shall be clean and free of loose material of any kind when concrete is placed thereon.

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 that extend beyond the outside face of exterior walls, may be placed directly against excavation faces without the use of outer forms, provided that such faces are stable and also provided that a layer of polyethylene film is placed between the earth and the concrete.

Excavations for manholes and similar structures constructed of masonry units shall have such horizontal dimensions that not less than 6 inches [150 mm] clearance is provided for outside plastering.

3-2.01. Classification of Excavated Materials. Classification of excavated materials shall be made as follows:

a. Rock. Rock is defined as being sandstone, limestone, flint, granite, quartzite, slate, hard shale, or similar material in masses more than 1 cubic yard [1 $m^3$] in volume or in ledges 4 inches [100 mm] or more in thickness.

   Should rock be encountered in two or more ledges, each ledge being not less than 3 inches [75 mm] thick and with interlying strata of earth, clay, or gravel not more than 12 inches thick in each stratum, the

entire volume between the top of the top ledge and the bottom of the bottom ledge will be classified as rock.

b. Earth. All material not classified as rock.

3-2.02. Preservation of Trees. No trees shall be removed outside excavated or filled areas, unless their removal is authorized by Owner. Trees left standing shall be adequately protected from permanent damage by construction operations.

For limits of tree removal along pipeline routes, see the Temporary Facilities section under “Protection of Public and Private Property”.

3-2.03. Blasting. Blasting will be permitted when approved by Owner, utilities, and all other appropriate agencies and authorities where the Work is to be performed. Blasting shall be performed in accordance with all laws, regulations, and ordinances in effect at the time of blasting and required by the authority having jurisdiction thereover. Contractor shall engage the services of a qualified blasting engineer to develop blasting procedures and of an independent firm to perform pre-blast and post-blast surveys and assist in monitoring blasting operations.

Contractor shall notify all affected adjacent property occupants at least 24 hours prior to any blasting. Contractor shall be responsible for all damage caused by blasting operations and shall be responsible for responding to and resolving all complaints. Suitable methods shall be employed to confine all materials lifted by blasting within the limits of the excavation or trench.

All rock which cannot be handled, crushed, processed, and compacted as earth shall be kept separate from other excavated materials and shall not be mixed with backfill or embankment materials except as specified or directed.

Blasting or other use of explosives for excavation adjacent to existing utilities, structures, and other facilities shall be in conformity with the requirements of the local ordinance and the authority having jurisdiction thereover and shall not cause damage to any adjacent structures. Contractor shall consult with and obtain written approval for blasting procedures from the appropriate utility or agency before blasting adjacent to their utilities, structures, or other facilities. Certain utilities, including gas pipelines and fiber optics, and agencies have requirements that will not permit blasting adjacent to or within a minimum distance from their utilities or structures, including utilities and structures outside the construction easements or on the opposite side of the street, if applicable. The blasting procedures shall be in conformity with the requirements of the utility, if applicable. Prior to blasting, Contractor shall submit to Owner, through Engineer, a copy of the blasting procedures sealed by the licensed blasting engineer for record purposes.

Contractor shall be responsible for obtaining all required blasting permits from the city, county, state and federal agencies and shall provide sufficient prior notice as specified by code, ordinance or other regulation to the county engineer, county sheriff, fire districts, police departments, and all other appropriate agencies and authorities where the blasting is to be performed. A copy of the blasting permit shall be on the site before and during the blasting operations. Contractor shall furnish to Owner a copy of all blasting permits at least 7 days prior to blasting.

3-2.03.01. Pre-blast Survey. Contractor shall perform a pre-blast survey of all utilities, structures, and other facilities adjacent to the blast sites to determine the conditions of each utility, house, building, bridge, overpass, and other structures and facilities susceptible to damage from blasting operations. The preblast survey shall include all structures and utilities within a minimum of 500 feet [152 m] radius of the area to be blasted. The survey notification to all property owners, tenants, utilities, and other agencies and the area of survey shall be in conformity with the requirements of the authority having jurisdiction thereover or as determined by Contractor's insurance company if no local ordinance applies. Contractor shall submit the pre-blast survey report for record purposes, to Owner at least 30 days prior to blasting.

3-2.03.02. Blast Monitoring. Prior to the start of Contractor's blasting, Contractor shall measure background ground vibrations.

Seismographs shall be placed on the ground adjacent to structures subjected to ground shock to measure peak particle velocity components in three mutually perpendicular directions during blasting operations.

The peak particle velocity, defined as the maximum of the three velocity components of vibration, at any location shall not exceed values that will cause damage to the adjacent structures. Air overpressure shall be measured at adjacent structures. Air overpressure at adjacent structures shall not exceed values that will cause damage to the adjacent structures or personnel. The maximum peak particle velocity and air overpressure values that will not cause damage shall be determined by the blasting engineer retained by Contractor and shall be stated in the blasting procedures.

Contractor shall submit measurement records of the blast monitoring to Owner for record purposes within 24 hours after each blast.

3-2.03.03. Post-blast Survey. Contractor shall perform a post-blast survey of the same utilities, structures, and other facilities surveyed in the pre-blast survey to determine the effect of the blasting operations. Contractor shall submit the post-blast survey report to Owner for record purposes within 14 days after completion of blasting.

3-2.04. Dewatering. Dewatering equipment shall be provided to remove and dispose of all surface water and groundwater entering excavations, trenches, or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure or tunnel 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.

The Contractor shall retain an experienced dewatering Subcontractor to design, install, and operate the dewatering system. The dewatering Subcontractor shall have experience on at least 5 pipeline projects with similar soil and groundwater conditions to the soil and groundwater conditions on this Project

All excavations for concrete structures or trenches which extend down to or below groundwater shall be dewatered by lowering and keeping the groundwater level to the minimum depth of 36 inches beneath such excavations. The specified dewatering depth shall be maintained below the prevailing bottom of excavation at all times.

Surface water shall be diverted or otherwise prevented from entering excavations or trenches to the greatest extent possible without causing damage to adjacent property.

Contractor shall be responsible for the condition of any pipe or conduit which he may use for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

Contractor shall obtain from the appropriate agencies and authorities, the dewatering and stormwater discharge permits required to remove and dispose of groundwater, surface water, and any other water used in Contractor's operations. The permits shall be obtained prior to start of construction.

3-2.05. Sheeting and Shoring. Except where banks are cut back on a stable slope, excavations for structures and trenches shall be supported with steel sheet piling and shoring as necessary to prevent caving or sliding.

Sheet piling or other excavation support systems shall be installed as necessary to limit the extent of excavations for deeper structures and to protect adjacent structures and facilities from damage due to excavation and subsequent construction. Contractor shall assume complete responsibility for, and shall install adequate protection systems for prevention of damage to existing facilities.

Sheeting, shoring and excavation support systems shall be designed by a professional engineer registered in the state where the project is located.

Trench sheeting may be removed if the pipe strength is sufficient to carry trench loads based on trench width to the back of sheeting. Trench sheeting shall not be pulled after backfilling. Where trench sheeting is left in place, it shall not be braced against the pipe, but shall be supported in a manner which will preclude concentrated loads or horizontal thrusts on the pipe. Cross braces installed above the pipe to support sheeting may be removed after pipe embedment has been completed. Trench sheeting shall be removed unless otherwise permitted by Engineer. Trench sheeting will not be removed, if in the opinion of Engineer, removal of the sheeting will cause damage to the facility it is protecting. If left in place, the sheeting shall cut off 12 inches below finished grade. The design of the support system shall be such as to permit complete removal while maintaining safety and stability at all times.

A movable trench support may be used, provided care is exercised in placing and moving the trench box or support bracing to prevent movement of the pipe or disturbance of the pipe bedding and backfill. Any voids left in the trench wall or embedment material by support removal shall be carefully filled with granular embedment material compacted as specified herein.

3-2.06. Stabilization. Sub-grades for concrete structures and trench bottoms shall be firm, dense, and thoroughly compacted and consolidated; shall be free from mud and muck; and shall be sufficiently stable to remain firm and intact under the feet of the workers.

Sub-grades for concrete structures or trench bottoms which are otherwise solid, but which become mucky on top due to construction operations, shall be reinforced with crushed rock or gravel as specified for granular fills. The stabilizing material shall be placed in a manner that no voids remain in the granular fill. All excess granular fill with unfilled void space shall be removed. The finished elevation of stabilized sub-grades shall not be above sub-grade elevations indicated on the Drawings.

3-3. TRENCH EXCAVATION. No more trench shall be opened in advance of pipe laying than is necessary to expedite the work. One block or 400 feet [120 m], whichever is the shorter, shall be the maximum length of open trench on any line under construction.

Except where tunneling is indicated on the Drawings, is specified, or is permitted by Engineer, all trench excavation shall be open cut from the surface.

Prior to excavation, Contractor shall contact local underground alert hotlines, “Dig Safe” and/or individual utility owners for marking underground utilities. Once utilities are marked, Contractor shall hand dig or pothole to expose the existing utilities. A survey shall be made of the utility size, material, location, and elevation prior to trench excavation and information shall be recorded on the record Drawings maintained by the Contractor.

3-3.01. Alignment, Grade, and Minimum Cover. 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.

Where pipe grades or elevations are not definitely fixed by the Drawings, 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 over pipes below paved and graded streets and, of 48 inches over pipes in other locations. Greater pipe cover depths may be necessary on vertical curves or to provide adequate 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.

3-3.02. Maximum Trench Widths. Not used.

3-3.03. Minimum Trench Widths. Except when maximum trench width is required for certain conduits, trenches shall be excavated to the minimum trench widths indicated in the following table. Trenches shall be excavated to a width which will provide adequate working space and sidewall clearances for proper pipe installation, jointing, and embedment.

| Nominal Pipe Size | Minimum Trench Width | Clearance |
|---|---|---|
| Less than 27 in [700 mm] | Pipe OD plus 24 in [600 mm] | 12 in |
| 27 in through 60 in [700 mm through 1,500 mm] | Pipe OD plus nominal pipe size | ID/2 |
| Greater than 60 in [1,500 mm] | Pipe OD plus 70 in [1800 mm] | 30 in |

Clearance = Minimum sidewall clearance
OD = Outside diameter (or span) of conduit
ID = Inside diameter (or span) of conduit.

Specified minimum sidewall clearances are not minimum average clearances but are minimum clear distances which will be required to the trench excavation or the trench protective system.

Cutting trench banks on slopes to reduce earth load to prevent sliding and caving shall be used only in areas where the increased trench width will not interfere with surface features or encroach on right-of-way limits.

3-3.04. Mechanical Excavation. The use of mechanical equipment will not be permitted in locations where its operation would cause damage to trees, buildings, culverts, or other existing property, utilities, or structures above or below ground. In all such locations, hand excavating methods shall be used.

Mechanical equipment used for trench excavation shall be of a type, design, and construction, and shall be so operated, that the rough trench excavation bottom elevation can be controlled, and that trench alignment is such that pipe, when accurately laid to specified alignment, will be centered in the trench with adequate sidewall clearance. Undercutting the trench sidewall to obtain sidewall clearance will not be permitted.

In locations where maximum trench widths are required for designated rigid conduits, mechanical equipment shall be operated so that uniform trench widths and vertical sidewalls are obtained at least from an elevation 12 inches above the top of the installed pipe to the bottom of the trench.

3-3.05. Cutting Concrete Surface Construction. Cuts in concrete pavement and concrete base 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 [40 mm] deep along each side of the trench and along the perimeter of cuts for structures.

Concrete pavement and concrete base pavement over trenches excavated for pipelines shall be removed so that a shoulder not less than 6 inches [150 mm] 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 center line of the trench.

Pavement removal for connections to existing lines or structures shall not exceed the extent necessary for the installation.

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 subsequently replaced between existing joints or between saw cuts as specified for pavement.

3-3.06. Excavation Below Pipe Sub-grade. Except where otherwise required, pipe trenches shall be excavated below the underside of the pipe, as indicated on Detail 33 on the Drawings, to provide for the installation of granular embedment.

Bell holes shall provide adequate clearance for tools and methods used for 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.

3-3.07. Artificial Foundations in Trenches. Whenever unsuitable or unstable soil conditions are encountered, Contractor shall notify Engineer immediately. When authorized by the Engineer, trenches shall be excavated below grade and the trench bottom shall be brought to grade with suitable material. In such cases, adjustments will be made in the Contract Price in accordance with the provisions of the General Conditions.

3-3.08. Over-Excavation. Over-excavation carried below the grade, unless authorized by the Engineer, shall be backfilled to the required grade with material acceptable to the Engineer and compacted to the satisfaction of the Engineer, at no additional cost to the Owner.

3-4. PIPE EMBEDMENT. Embedment materials both below and above the bottom of the pipe, classes of embedment to be used, and placement and compaction of embedment materials shall conform to the requirements indicated on Detail 33 in the Drawings and to the following supplementary requirements.

Embedment material shall contain no cinders, clay lumps, or other material which may cause pipe corrosion.

3-4.01. Embedment for Ductile Iron, Steel, FRP, and PVC Pipelines. Granular embedment for ductile iron, coal tar coated steel, FRP, and PVC pipelines shall be crushed rock or crushed gravel with rounded or subrounded particles. Crushed rock or gravel with sharp edges which could cause significant scratching or abrasion of the pipe or damage to the polyethylene tube protection shall not be used unless otherwise approved by Engineer and all damage is repaired to the satisfaction of Engineer.

3-4.03. Placement and Compaction.

3-4.03.01. Granular Embedment. Granular embedment material shall be spread and the surface graded to provide a uniform and continuous support beneath the pipe at all points between bell holes or pipe joints. It will be permissible to slightly disturb the finished subgrade surface by withdrawal of pipe slings or other lifting tackle.

After each pipe has been graded, aligned, and placed in final position on the bedding material, and shoved home, sufficient pipe embedment material shall be deposited and compacted under and around each side of the pipe and back of the bell or end thereof by shovel slicing or other suitable methods to hold the pipe in proper position and alignment during subsequent pipe jointing and embedment operations.

Placing and compaction of embedment material shall not damage the pipe coating or polyethylene encasement. Embedment material shall not be dumped directly on the pipe or polyethylene encasement unless a suitable temporary isolation layer such as a 60 mil HDPE sheeting, is used to cover the pipe and polyethylene encasement.

Embedment material shall be deposited and compacted uniformly and simultaneously on each side of the pipe to prevent lateral displacement. Granular embedment shall be placed in layers not more than 6 inches (150 mm) deep and compacted as specified.

Each lift of granular embedment material shall be vibrated with a mechanical probe type vibrator or shovel sliced during placement to ensure that all spaces beneath the pipe are filled. Granular embedment shall be placed in maximum lift thickness of 6 inches [150 mm] and compacted. Each lift of embedment material shall be compacted with three passes (round trip) of a platform type vibrating compactor and to at least 70 percent relative density as determined by ASTM D4253 and D4254.

Where indicated on the Drawings or where silt, fine sand, or soft clay soils are encountered below groundwater, migration of soil into the embedment material shall be prevented by installing filter fabric Type A, or by using graded gravel in place of granular embedment. Filter fabric shall be placed on the trench surfaces so that it completely surrounds the embedment material. Joints shall be lapped 12 inches.

3-4.03.02. Compacted Embedment. Compacted embedment shall be placed in uniform layers not more than 8 inches (203 mm) thick and compacted to not less than 85% maximum density as determined by ASTM D698.

3-4.03.03 Hand Placed Embedment. Hand placed embedment shall be placed by hand shovels or using methods that prevent dropping the material for more than 24 inches above the pipe. Hand placed embedment shall be lightly tamped using hand equipment. Care shall be taken so as to not damage the pipe or coating.

3-4.04. Groundwater Barrier. Continuity of granular embedment material shall be interrupted by low permeability groundwater barriers to impede passage of water through the embedment. Groundwater barriers shall be compacted soil,

extending through any granular material, and meeting ASTM D2487 soil classification GC, SC, CL, or ML-CL and shall be compacted to at least 85 percent of maximum density with moisture content within 3 percent of the optimum moisture content (ASTM D698). Material may be finely divided, suitable job excavated material, free from stones, organic matter, and debris.

3-5. TRENCH BACKFILL. All trench backfill above pipe embedment shall conform to the following requirements.

A layer of backfill material not more than 8 inches [200 mm] deep may be placed over concrete arch encasement or concrete thrust blocking after the concrete has reached its initial set, to aid curing. No additional backfill shall be placed over arch encasement or blocking until the concrete has been in place for at least 3 days.

3-5.01. Compacted Backfill. Compacted backfill will be required for the full depth of the trench above the embedment in the following locations:

Where beneath pavements, surfacings, driveways, curbs, gutters, walks, or other surface construction or structures.

Where in street, road, or highway shoulders and right-of-way.

In established lawn areas.

The top portion of backfill beneath established lawn areas shall be finished with at least 12 inches of topsoil corresponding to, or better than that which is underlying adjoining lawn areas.

Trench backfill material shall be suitable job excavated material or graded gravel and shall be as specified herein.

3-5.01.01. Job Excavated Material. Job excavated materials shall be placed in uniform layers not exceeding 8 inches in uncompacted thickness. Each layer of material shall have the best possible moisture content for satisfactory compaction. The material in each layer shall be wetted or dried as needed and thoroughly mixed to ensure uniform moisture content and adequate compaction. Increased layer thickness may be permitted for noncohesive material if Contractor demonstrates to the satisfaction of Engineer that the specified compacted density will be obtained. The method of compaction and the equipment used shall be appropriate for the material to be compacted and shall not transmit damaging shocks to the pipe. Job excavated material shall be compacted to 95 percent of maximum density at a moisture content within 3 percent of the optimum moisture content as determined by ASTM D698 when that test is appropriate, or to 70 percent relative density as determined by ASTM D4253 and D4254 when those tests are appropriate.

3-5.01.02. Inundated Sand. Not Used.

3-5.01.03. Graded Gravel. Gravel backfill shall be deposited in uniform layers not exceeding 12 inches in uncompacted thickness. The backfill shall be compacted with a suitable vibratory roller or platform vibrator to at least 70 percent relative density as determined by ASTM D4253 and D4254. Groundwater barriers specified under pipe embedment shall extend to the top of the graded gravel backfill.

3-5.02. Ordinary Backfill. Compaction of trench backfill above pipe embedment in locations other than those specified will not be required except to the extent necessary to prevent future settlement. Contractor shall be responsible for backfill settlement as specified.

Ordinary earth backfill material to be placed above embedments shall be free of brush, roots more than 2 inches [50 mm] in diameter, debris, cinders, and any corrosive material, but may contain rubble and detritus from rock excavation, stones, and boulders in certain portions of the trench depth.

Backfill material above embedments shall be placed by methods which will not impose excessive concentrated or unbalanced loads, shock, or impact on installed pipe, and which will not result in displacement of the pipe.

Compact masses of stiff clay or other consolidated material more than 1 cubic foot [0.03 $m^3$] in volume shall not be permitted to fall more than 5 feet [1.5 m] into the trench, unless cushioned by at least 2 feet [600 mm] of loose backfill above pipe embedment.

No trench backfill material containing rocks or rock excavation detritus shall be placed in the upper 18 inches [450 mm] of the trench, nor shall any stone larger than 8 inches [200 mm] in its greatest dimension be placed within 3 feet [900 mm] of the top of pipe. Large stones may be placed in the remainder of the trench backfill only if well separated and so arranged that no interference with backfill settlement will result.

3-5.03. Water-Settled Earth Backfill. Settlement or consolidation of trench backfill using water jetting or ponding shall not be performed.

3-5.04. Structure Backfill. Backfill around manholes and small concrete vaults shall meet the requirements specified for compacted trench backfill.

3-5.05. Controlled Low Strength Material (CLSM). Not used.

3-6. TUNNEL EXCAVATION. Not used.

3-7. DRAINAGE MAINTENANCE. Trenches across roadways, driveways, walks, or other trafficways adjacent to drainage ditches or watercourses shall not be backfilled prior to completion of backfilling the trench 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 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 watercourses crossed by the line of trench shall be removed immediately after backfilling is completed, and the original section, grades, and contours of ditches or watercourses shall be restored. Surface drainage shall not be obstructed longer than necessary.

3-8. PROTECTION OF TRENCH BACKFILL IN DRAINAGE COURSES. Not used.

3-9. FINAL GRADING AND PLACEMENT OF TOPSOIL. After other outside work has been finished, and backfilling and embankments completed and settled, all areas which are to be graded shall be brought to grade at the indicated elevations, slopes, and contours. All cuts, fills, embankments, and other areas which have been disturbed or damaged by construction operations shall be surfaced with topsoil to a depth of at least 4 inches [100 mm]. Topsoil shall be of a quality at least equal to the existing topsoil in adjacent areas, free from trash, stones, and debris, and well suited to support plant growth. Topsoil required to provide the minimum thickness shall be imported and placed at no additional cost to the Owner.

Use of graders or other power equipment will be permitted for final grading and dressing of slopes, provided the result is uniform and equivalent to manual methods. All surfaces shall be graded to secure effective drainage. Unless otherwise indicated, a slope of at least 1 percent shall be provided.

Final grades and surfaces shall be smooth, even, and free from clods and stones, weeds, brush, and other debris.

3-10. DISPOSAL OF EXCESS EXCAVATED MATERIALS. Disposal of excess material from trench excavation sites shall be as follows. Except as otherwise permitted, all excess excavated materials shall be disposed of away from the site.

Broken concrete and other debris resulting from pavement or sidewalk removal, excavated rock in excess of the amount permitted to be installed in trench backfill, debris encountered in excavation work, and other similar waste materials shall be disposed of away from the site.

Excess earth from excavations located in unimproved property may be distributed directly over the pipe trench and within the pipeline right-of-way to a

maximum depth of 6 inches [150 mm] above the original ground surface elevation at and across the trench and sloping uniformly each way. Material thus wasted shall be carefully finished with a drag, blade machine, or other suitable tool to a smooth, uniform surface without obstructing drainage at any point. Wasting of excess excavated material in the above manner will not be permitted where the line of trench crosses or is within a railroad, public road, or highway right-of-way. The disposal of waste and excess excavated materials, including hauling, handling, grading, and surfacing, shall be a subsidiary obligation of Contractor and no separate payment will be made therefore.

3-11. RESODDING. All established lawn areas cut by the line of trench or damaged during the work shall be re-sodded, after completion of construction, to the complete satisfaction of the property owner and Owner. All sod used shall be the same type as removed or damaged, shall be best quality, and, when placed, shall be live fresh growing grass with at least 1-1/2 inches [40 mm] of soil adhering to the roots.

All sod shall be procured from areas where soil is fertile and contains a high percentage of loamy topsoil and from areas that have been grazed or mowed sufficiently to form a dense turf.

Sod shall be transplanted within 24 hours from the time it is harvested, unless stacked at its destination in a suitable manner. All sod in stacks shall be kept moist and protected from exposure to the sun and from freezing. In no event shall more than 1 week elapse between cutting and planting.

Before placing sod, all shaping and dressing of the areas shall have been completed. After shaping and dressing, commercial fertilizer of a type acceptable to Owner shall be applied uniformly in the manner and amounts recommended by the manufacturer, and harrowed lightly. Sodding shall follow immediately.

All sodding shall be done during the period from March 15 to October 1, unless written permission is given by Owner to extend the planting season.

3-12. SETTLEMENT. Contractor shall be responsible for all settlement of trench backfill which may occur within the correction period stipulated in the General Conditions.

Contractor shall make, or cause to be made, all repairs or replacements made necessary by settlement within 30 days after notice from Engineer or Owner.

End of Section

## UNIT PRICE SCHEDULE

| No. | Item | Unit | Quantity | Unit Price | Total Price |
|---|---|---|---|---|---|
| 4.00 | Mobilization and Demobilization | LS | 1 | $_____ | $_____ |
| 5.00 | Ductile Iron Pipelines | | | | |
| | 36 inch DIP | LF | 19,350 | $_____ | $_____ |
| 5.01 | Connections to Existing Water Mains | LS | 4 | $_____ | $_____ |
| 5.02 | Isolation Valves | | | | |
| | 36 inch Gate Valve (Installation Only) | LS | 9 | $_____ | $_____ |
| | 8 inch Gate Valve | LS | 2 | $_____ | $_____ |
| 5.03 | Not Used | | | | |
| 5.04 | Combination Air Valves | LS | 9 | $_____ | $_____ |
| 5.05 | Blowoffs | LS | 9 | $_____ | $_____ |
| 5.06 | Hurt Bridge Road Crossing | LS | 1 | $_____ | $_____ |
| 5.07 | Watson Road Crossing | LS | 1 | $_____ | $_____ |
| 5.08 | Bridgeshaw Drive Crossing | LS | 1 | $_____ | $_____ |
| 5.09 | Aaron Sosebee Road Crossing | LS | 1 | $_____ | $_____ |
| 5.10 | Leland Drive Crossing | LS | 1 | $_____ | $_____ |
| 5.11 | English Drive Crossing | LS | 1 | $_____ | $_____ |
| 5.12 | Cantrell Circle Crossing | LS | 2 | $_____ | $_____ |
| 5.13 | Millwood Road Crossing | LS | 1 | $_____ | $_____ |
| 5.14 | Mayfield Drive Crossing | LS | 1 | $_____ | $_____ |
| 5.15 | Grindle Crossing | LS | 1 | $_____ | $_____ |
| 5.16 | Sixmile Creek Crossing at STA 8+00 | LS | 1 | $_____ | $_____ |
| 5.17 | Sixmile Creek Crossing at STA 43+00 | LS | 1 | $_____ | $_____ |
| 5.18 | Sixmile Creek Crossing at STA 62+50 | LS | 1 | $_____ | $_____ |

| | | | | | |
|---|---|---|---|---|---|
| 5.19 | Sixmile Creek Crossing at STA 77+00 | LS | 1 | $_____ | $_____ |
| 5.20 | Sixmile Creek Crossing at STA 93+00 | LS | 1 | $_____ | $_____ |
| 5.21 | Sixmile Creek Crossing at STA 106+50 | LS | 1 | $_____ | $_____ |
| 5.22 | Fourmile Creek Crossing at STA 123+00 | LS | 1 | $_____ | $_____ |
| 5.23 | Fourmile Creek Crossing at STA 144+00 | LS | 1 | $_____ | $_____ |
| 5.25 | Traffic Control | LS | 1 | $_____ | $_____ |
| 5.26 | Fire Station Crossing at STA 148+85 | LS | 1 | $_____ | $_____ |
| 6.01 | Silt Fence | LF | 39,000 | $_____ | $_____ |
| 6.02 | Sodding | SY | 21,000 | $_____ | $_____ |
| 7.00 | Pavement Removal and Replacement | LF | 270 | $_____ | $_____ |
| 8.00 | Driveway, Sidewalk, Curb and Gutter Removal and Replacement | | | | |
| | Gravel Drive | SY | 10 | $_____ | $_____ |
| | Asphalt Drive | SY | 85 | $_____ | $_____ |
| | Concrete Drive | SY | 350 | $_____ | $_____ |
| | Curb and Gutter | LF | 300 | $_____ | $_____ |
| 9.00 | Miscellaneous Concrete | CY | 565 | $_____ | $_____ |
| 10.00 | Removal and Replacement of Unsuitable Material | CY | 1750 | $_____ | $_____ |
| 11.00 | Eight Ounce Filter Fabric | SY | 365 | $_____ | $_____ |
| 12.00 | Marker Balls | EA | 150 | $_____ | $_____ |
| 13.00 | Temporary Barrier Fence | LF | 20,000 | $_____ | $_____ |

**Total sum amount to complete all work as detailed (sum of items 4.00 through 13.00): $_____**

Total bid (in written form): _____

_____

Authorized Signature: _____

Company Name: _____