Brunswick Regional H2GO Water and Sewer

General Provisions

Revised 1.2025

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1 DEFINITIONS

Except as specifically defined herein, all words used in these standards have their customary dictionary definitions. For the purposes of this policy, certain words or terms used herein are defined as follows:

1.1 Words used in the present tense include the future tense. Words used in the singular include the plural and words used in the plural include the singular.

1.2 The word "shall" is always mandatory.

1.3 The word "may" is permissive.

1.4 The word "lot" includes the words "plat" or "parcel".

1.5 The word "person" includes a firm, association, organization, partnership, trust company, or corporation as well as an individual.

1.6 BRWS H2GO – Brunswick Regional Water & Sewer H2GO. Formerly known as the North Brunswick Sanitary District (NBSD).

1.7 NC DEQ – North Carolina Department of Environmental Quality.

1.8 Lot – A part of a subdivision, or parcel of land used as a building site or intended for such use, immediate or future.

1.9 Utility Right-of-Way/Easement. Private rights-of-way or easements for BRWS H2GO utilities shall not be deemed dedicated to BRWS H2GO but for use of BRWS H2GO's utilities.

1.10 Public Right-of-Way/Easement-Public rights-of-way or easements are considered to mean street rights-of-way or any other public right-of-way.

1.11 Engineer – A person registered as a Professional Engineer in good standing with the North Carolina Board of Examiners For Engineers and Surveyors.

1.12 Land Surveyor – A person registered as a Land Surveyor by the North Carolina Board of Examiners For Engineers and Surveyors.

1.13 Subdivision – The division of a tract of land into two or more lots for the purpose, whether immediate or future, of sale, legacy or development. This includes all division of land involving a new street or a change in the arrangement of streets and includes any re-subdivision of land. Subdivision shall also refer to uses of land not ordinarily considered a subdivision uses are mobile home parks, multifamily projects, townhouses, and planned unit developments.

1.14 Developer – Any person, firm, corporation, or other legal entity improving property for commercial, industrial, or residential purposes.

1.15 Plat – A map or drawing upon which the development plan is presented for approval.

1.16 Contractor – A person or entity authorized to perform construction by the State of North Carolina Licensing Board for contractors. A Contractor may not perform work outside of their licensed capacity. This includes well drillers, water and sewer lines, pump station, and electrical contractors. Where required, all subcontractors must be certified. BRWS H2GO reserves the right to accept or reject any contractor or subcontractor selected to perform work on the system to be conveyed to BRWS H2GO.

1.17 Design – The design of sewer systems shall be done only by persons properly registered under the Professional Engineers Act of the Business and Professions Code of North Carolina.

1.18 Customer – Customer means any person, firm, association, or governmental agency supplied or entitled to be supplied with utility service.

1.19 Paved Surface – Paved surface includes any pavement used on any street in the counties, whether such pavement is composed of concrete, asphalt, oil, gravel, crushed rock or any combination of said forms of pavement.

1.20 P.S.I.G. – P.S.I.G means pounds per square inch, gage.

1.21 Drawings – Drawings mean all plans, profiles, maps, or drawings which show the location, character, dimensions, and details of the work which has been approved for construction by the Engineer.

1.22 Service Lateral – Service lateral means a connection between a utility main and user house service.

1.23 Lift Station – Lift station means a structure and/or pumping facility to facilitate the further transmission of sewer through the use of pumps and periodic minimal storage.

1.24 These Standards – These standards shall mean the standards contained herein.

1.25 User Connection – User connection means the point of connection of a user's piping to BRWS H2GO's service lateral.

1.26 Water Main – Water main means any pipe or conduit that is part of a transmission system and is used to transport or is intended to be able to transport water flow to more than one user connection.

1.27 Utility System – Utility system means the source, facilities, and collection and/or transmission system and shall include all those facilities of the utility system under the control of BRWS H2GO up to the customer's connection.

1.28 Owner – Developer

2 GENERAL

2.1 In case of conflict between construction plans, Standard Drawings, or these Standards & Specifications, precedence shall be given in the following order: (1) These Standards & Specifications (2) Standard Details, and (3) construction plans. However, a deviation from these Standards & Specifications or the Standard Details will be approved if a specific note regarding the particular deviation is included on the Plans and Specifications. Any discrepancy found between the drawings and the specifications, and the site conditions or any inconsistencies or ambiguities shall be immediately reported to the Engineer, in writing, who shall promptly correct such inconsistencies or ambiguities in writing. Work done by the Contractor after discovery of such discrepancies, inconsistencies, or ambiguities shall be done at the Contractor’s risk.

2.2 Whenever other specifications are mentioned in these Standards & Specifications, it shall be understood that the materials or methods mentioned shall conform to all requirements of the latest revision of the specifications so mentioned.

2.3 Connection of house service laterals and subsequent use of water, either temporarily or permanently, shall not be allowed prior to acceptance of the water system by BRWS H2GO.

2.4 Standard drawings approved by BRWS H2GO for utility construction purposes shall be considered a part of these Standards & Specifications and shall be used in conjunction with these Standards & Specifications for

all subdivision and extension of utility installations. Construction by methods differing from the Standard Drawings which will give equivalent or better results may be approved by BRWS H2GO if prior approval of such methods is obtained.

2.5 SCOPE OF DRAWINGS AND SPECIFICATIONS:

2.5.1 Any provisions contained in the specifications or shown on standard drawings which are not applicable to the work under this contract shall be disregarded.

2.5.2 The Developer will be responsible for the adequacy of the general design of the finished work. The design of standard products used in the work, temporary work required to protect existing work or adjoining property, and temporary work required keeping existing or new facilities in operation shall be the sole responsibility of the Contractor.

2.5.3 Reference to standard specifications (ASTM, AWWA, ANSI, et cetera), national codes, local or state codes, and laws and ordinances shall mean the latest edition of said document in effect at the time of taking bids, unless specifically stated otherwise.

2.5.4 It is the intent that the work under this contract shall result in a complete, properly usable and fully operational installation, structure or plant; and that workmanship shall be of the best quality consistent with the materials and construction methods shown on the drawings and as specified.

2.5.5 The words "furnish", "furnish and install", "install" and "provide" or similar words, shall mean, unless otherwise specifically stated, "furnish and install complete in place and ready for service".

2.5.6 Incidental work and miscellaneous accessories not specifically mentioned or shown, but necessary for the proper completion of the work, shall be provided without change in the contract price. Such incidental work and accessories shall be of the same quality as specified for the major component of which the incidental work or accessory is an essential part.

2.5.7 The work of all trades under this contract shall be coordinated by the Contractor in such a manner as to obtain the best workmanship possible for the entire project. All components of the work shall be installed or erected in accordance with the best practices of the particular trade.

2.5.8 The Contractor shall be responsible for making the construction of habitable structures completely weatherproof, and for making equipment and utility installation properly perform the specified function. If the Contractor is prevented from so doing by any limitations of the drawing or specifications, the Contractor shall immediately notify the Engineer and BRWS H2GO in writing of such limitations before proceeding with construction in the area where the problem or limitation exists.

2.5.9 Materials or methods described by words which have a well-known technical or trade meaning shall in fact refer to that recognized standard. Standard specifications or manufacturer's literature, when referenced, are intended to establish the minimum acceptable requirements.

2.5.10 Any reference to manufacturer's brand or trade names or model numbers is intended merely to establish the standard of quality required for the particular product or material. Products or materials of other manufacturers which, in the opinion of BRWS H2GO, are equivalent to that specified with respect to quality, workmanship and economy of operation, and are suitable for the purpose intended, must be approved BRWS H2GO prior to installation.

2.5.11 The Contractor shall be responsible for making all necessary arrangements with governmental departments, public utilities, public carriers, service companies and corporations owning or controlling roadways, railways, water, sewer, gas, electrical, telephone and telegraph facilities, such as pavements, tract, piping, wires, cables, conduits, poles, guys, et cetera, including incidental structures connected therewith that are encountered in the work in order that such items may be properly shored, supported, protected or relocated. The Contractor shall give all proper notices, shall comply with the requirements of such parties in the performance of their work, shall permit entrance of such parties on the project in order that they may perform their necessary work, and shall pay all charges and fees made by such parties for this work.

2.5.12 The Contractor's attention is called to the fact that there may be delays on the project due to work to be done by governmental agencies, public utilities and others in repairing or moving poles, conduits, et cetera. The Contractor shall cooperate with the above parties in every way possible so that the construction can be completed in the least possible time.

2.5.13 Unless otherwise specified, the Contractor shall provide, at their expense, all tests and testing services required by the contract documents.

2.6 PERMITS:

2.6.1 The Contractor shall be responsible for procuring any permits for the use of property beyond the limits of the Developer's property or of permanent rights-of-way as necessary for working or storage space during the prosecution of the work.

2.7 SUBMISSIONS, REPORTS, RECORDS AND DATA:

2.7.1 The Contractor shall submit all schedules, quantities, costs, payrolls, reports, estimates, records, shop drawings, details and other data as required by the contract documents or as may be specifically requested.

2.7.2 The apparent successful bidder shall furnish to the Engineer for approval a complete cost breakdown of his bid within 10 days after submission of bids. The breakdown shall include all items for each unit of construction, and shall show the cost of labor, materials and equipment, other necessary costs and the total cost for each unit of work. Bidders shall consult with the Engineer prior to submitting the breakdown to ensure a complete understanding of the requirements. Names of the project superintendent and others responsible for the work shall be included.

2.7.3 The Contractor shall furnish periodic itemized estimates of work done for the purpose of making partial payments thereon. The costs employed in making up these estimates will be used only for determining the basis of partial payments and will not be considered as a basis for changes in the contract price.

2.7.4 The Contractor shall notify the Engineer of the source of all material and equipment required for the work and shall supply samples of materials as specified in the technical sections, or at the Engineer's request. Samples shall be submitted for approval by the Engineer and BRWS H2GO prior to purchase and delivery to the job. Unless otherwise specified three samples of each type or grade of material showing construction, color, finish, et cetera shall be submitted.

2.7.5 Prior to submittal of any shop drawings, the Contractor shall prepare a list of all materials, equipment and items required for the installation and submit this list to the Engineer. The list shall include each specific item, along with the applicable specification section. For items specified, the Contractor shall provide for review by the Engineer and BRWS H2GO three (3) sets of shop drawings on all items to be installed in the project.

2.8 JOB SITE DRAWINGS AND SPECIFICATIONS:

2.8.1 The Contractor shall maintain, in good and legible condition at the job site, one complete set of working drawings and specifications for the work, including all shop drawings. Such drawings and specifications shall be available for use by BRWS H2GO or their representative at all times.

2.8.2 The drawings and specifications shall be marked, or notes acceptable to the BRWS H2GO provided, in order to reflect as-built conditions. Changes indicating such conditions shall be kept current at all times. Contractor or Developer is responsible for supplying as-builts of the utilities installed to BRWS H2GO on a quarterly basis. These may be provided at the progress meeting that aligns with the quarterly contract month. Upon completion of the project, this complete set of drawings and specifications or notes showing as-built conditions shall be returned to the Engineer. The Engineer shall modify the construction drawings to reflect as-built conditions and provide RECORD DRAWINGS per as-built standards.

2.9 MUTUAL RESPONSIBILITY OF CONTRACTORS:

2.9.1 If, through acts of neglect on the part of the Contractor, any other Contractor or subcontractor suffers loss or damage on the work, the Contractor agrees to settle with the other Contractor or subcontractor by agreement if the other Contractor or subcontractor agrees. If any other Contractor or subcontractor asserts any claim against BRWS H2GO on account of damage alleged to have been sustained, BRWS H2GO will notify the Contractor, who shall indemnify and hold harmless BRWS H2GO against such claim.

2.10 ORDER AND PROSECUTION OF WORK:

2.10.1 The Contractor shall not begin any work on the project without first notifying BRWS H2GO and the Engineer. The notice shall be in writing and shall be received by BRWS H2GO and Engineer at least seven days prior to the beginning of work. Any work done without prior notice will not be accepted. The Contractor shall notify BRWS H2GO and Engineer prior to beginning work in order to schedule a pre-construction conference to discuss and clarify all phases of the work. The contractor shall supply BRWS H2GO one (1) hard copy Issued for Construction (IFC) plan set at the pre-construction conference. A copy of the applicable permits may be requested by BRWS H2GO.

2.10.2 The Contractor shall be solely responsible for the means, methods, and sequence of construction, for the safety of workers and other persons on the construction site and of all materials and equipment to be incorporated in the work. The work shall be prosecuted at as many different points, at such times, in such sections and with such force as may be necessary to secure its completion within the contract time. The Contractor shall not suspend work without the prior approval of the Developer, BRWS H2GO or Engineer.

2.10.3 Pipeline work shall be prosecuted in such a manner that completed portions of the work can be properly dressed off as work progresses. In case of work on streets and highways, two or more crews shall not work on contiguous areas at the same time. Streets and roads shall be dressed off as

soon as work is completed therein. No open trenches shall be left unattended without proper barricades.

2.11 PUBLIC CONVENIENCE AND PROTECTION:

2.11.1 During progress of the work, the convenience and protection of the public must be provided for and interferences held to a minimum. All service interruptions shall be coordinated with BRWS H2GO. At no time shall service to existing customers be interrupted without prior notice. Customer notice should be no less than 48 hours. Service interruptions should be conveyed to BRWS H2GO inspection staff who will contact the appropriate utility superintendent.

2.11.2 The Contractor shall conduct the work in a manner that will minimize inconvenience to traffic. Notice shall be given to the NCDOT prior to commencing work. Reasonable notice shall be given to the NCDOT and all residents affected by the work before interfering with private driveways. Access to businesses, industries, fire departments and other essential services shall be maintained in a passable condition at all times. Access to fire hydrants and other firefighting equipment shall be kept open at all times.

2.11.3 When necessary to close streets to traffic, suitable detours, signs and barriers and other traffic control devices shall be provided as required to minimize inconvenience to traffic. The Contractor shall notify the Owner, law enforcement agencies, fire departments and ambulance services whenever a street is closed and again when it is opened.

2.11.4 When necessary, the Contractor shall provide watchmen and lights to burn between twilight and sunrise and shall erect and maintain barriers and all other necessary protection about the work at his own expense. He shall also take other precautions necessary to protect life, limb and property. The Owner reserves the right to remedy any neglect on the part of the Contractor in connection with protection of the work after 24 hours' notice in writing; and in cases of emergency, the Owner will have the right to remedy any neglect without previous notice; and in either case, deduct the cost of such remedy from money due to the Contractor.

2.12 SANITARY PROVISIONS:

2.12.1 The Contractor shall provide temporary toilet facilities for the use of construction personnel. These facilities shall be maintained in a clean and sanitary condition and shall comply with all applicable codes and regulations. Temporary sanitary facilities shall be removed upon completion of the work and the premises left clean. Construction personnel shall not use permanent washroom facilities in existing facilities or new work except by written permission of BRWS H2GO.

2.13 EXISTING FACILITIES:

2.13.1 Dimensions and elevations indicated on the drawings in reference to existing structures, location of utilities, sewer inverts or other information on existing facilities are based on the best available data but are not guaranteed by BRWS H2GO. BRWS H2GO will not be responsible for their accuracy. Before proceeding with any work dependent upon such data, the Contractor shall field check and verify all dimensions, grades, inverts, lines, elevations or other conditions or limitations at the site of the work to avoid construction errors or damage to existing facilities. If work is performed by the Contractor or any subcontractors prior to adequate verification of applicable data any resultant extra cost for adjustment of work necessary to conform to existing conditions, or to repair damage to existing facilities, shall be assumed by the Contractor without additional cost to BRWS H2GO. All

contractors are to be responsible for photo and video imagery of existing site conditions. This should include both on and off-site conditions prior to site disturbance. All documentation should be made available to H2GO upon request.

2.13.2 In executing the work, the Contractor shall exert every effort not to damage existing facilities or to break into them. The damage that is done thereto shall be promptly repaired by the Contractor at his own expense. He shall not interrupt or interfere with the operation of the existing facilities during construction except when absolutely necessary. Whenever existing facilities or utilities must be taken out of service, the Contractor shall consult with BRWS H2GO and the Developer as to procedure and shall be governed by their decision.

2.13.3 The Owner does not guarantee that all existing buildings, structures, fences, pipelines, electrical lines, conduit, telephone cable, service connections or other facilities are shown on the drawings. It shall be the Contractor's responsibility to locate and protect all such existing facilities prior to beginning construction.

2.13.4 Existing surface or subsurface improvements, such as pavement, curbs, sidewalks, pipes, utilities, footings, structures (including portions thereof), trees and shrubbery not indicated on the drawings or specified to be removed or altered, shall be protected from damage at all times during construction.

2.13.5 All such improvements damaged during construction shall be restored to a condition equal to that existing at the time of the award of contract.

2.13.6 The Contractor shall connect his work to each part of the existing work or work previously installed in accordance with the drawings and specifications to provide a complete installation.

2.13.7 The Contractor shall do all cutting and patching of the work required to make the several parts fit together properly and to receive the work of others. The Contractor shall not endanger the work of others by cutting, excavating, or otherwise altering their work and shall not cut or alter the work of others without the written consent of the Engineer. All cut and patched work shall be restored to the satisfaction of the Engineer.

2.13.8 The Contractor shall be responsible for removing and disposing of obstructions or obstacles at the job site or along the right-of-way to the satisfaction of the Engineer. Minor obstructions shall be removed and properly disposed of or protected and re-erected in as good condition as existing, at the same or other locations, as directed by the Engineer.

2.13.9 Fences at the site or along the right-of-way which interfere with construction operations shall be maintained by the Contractor until completion of the work, unless written permission is obtained from the Owner to leave the fence dismantled until construction is completed. The Contractor shall remove, rebuild, and extend fences as necessary to keep livestock away from the construction area or from straying away. Upon completion of work, all fences shall be restored to their original location and condition unless otherwise noted. The Contractor shall purchase new material, if necessary, to replace all materials damaged, lost, or destroyed.

2.14 WORK DURING INCLEMENT WEATHER:

2.14.1 No work shall be done except by permission of the Engineer when the weather is unfit for good and careful work to be performed. If the severity of the weather continues the Contractor, upon the

direction of the Engineer, shall suspend all work until instructed to resume operations by the Engineer. The contract time will be extended as required to cover the duration of the order. Work damaged during periods of suspension due to inclement weather shall be repaired and/or replaced by the Contractor at his own expense.

2.15 RIGHTS-OF-WAY:

2.15.1 The Developer will obtain all land and rights-of-way necessary for all work under this contract. If all land and rights-of-way are not obtained before construction begins the Contractor shall start work only upon such land and rights-of-way previously obtained by the Developer. If the Owner is unable, for any reason, to obtain the land and rights-of-way necessary for the work, the contract time will be extended as required to cover the time lost by such delay.

2.15.2 The Contractor shall confine construction operations to the immediate vicinity of the locations shown on the drawings, and in no case shall he encroach beyond the limits of the Developer's property or rights-of-way. Contractors shall place materials, equipment, supplies, et cetera so as to cause the least possible damage to property and interference with traffic.

2.15.3 The Contractor shall locate the limits of the rights-of-ways or property lines prior to beginning construction. He shall be responsible for damage to trees, crops, or other property outside the limits of the right-of-way and shall make satisfactory settlement for damage directly with the property owner involved.

2.15.4 Where timber is located on the property or right-of-way, the Contractor shall preserve and protect from damage all trees that do not directly interfere with the prosecution of the work. The Contractor shall not cut any tree greater than 6 inches in diameter and located more than 8 feet from the centerline of the ditch or structure without first consulting the Engineer.

2.15.5 Except where specifically directed otherwise by the property owner, the entire construction right-of-way shall be provided with a permanent grass cover within 30 days after backfilling. Topsoil shall be replaced and seed planted, fertilized, and watered until a grass cover satisfactory to the Engineer and property owner is obtained. If necessary, a temporary grass cover shall be provided until a permanent cover can be established. Grassing shall be as specified in the technical sections. If required by the property owner, shrubbery shall be replaced to the satisfaction of the Engineer and property owner.

2.16 WORK ON HIGHWAY RIGHT-OF-WAY:

2.16.1 The Contractor shall not begin work in the right-of-way of any State, County or City Department of Transportation until he has secured a copy of the necessary permits from the Developer. He shall conform to all requirements of the Department of Transportation in the prosecution of this portion of the work. Each bidder shall contact the local Department of Transportation representative to determine the exact requirements for work to be done.

2.16.2 The Contractor shall provide full time flag men with appropriate red flags at all times when work is in progress along highways. Suitable warning and descriptive signs shall be 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 work so that ample warning is given to approaching traffic. Signs shall be adequately lit at night. Signage and flag men distances and placement shall be in accordance with NCDOT encroachment agreement.

2.16.3 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. The Contractor shall keep at least one full lane open for traffic at all times. Approval for lane closings shall be obtained from the appropriate agency. Any subsequent settlement in open cuts shall be immediately corrected and repaired.

2.16.4 Where a pipeline crossing under a highway is installed within encasement pipe, the encasement pipe shall be provided as specified in the technical sections and in accordance with applicable NCDOT encroachment agreement.

2.16.5 Unless otherwise indicated, no excavated material shall be placed on the pavement side of the trench along highways. The least possible amount of trench shall be left open when work is not in progress, and equipment shall be removed from the pavement and shoulders during shutdown periods. Shoulders of roadways shall be left in good acceptable conditions, and all disturbed topsoil and grass shall be replaced.

2.17 WORK ON RAILROAD RIGHT-OF-WAY:

2.17.1 The Contractor shall not begin work on railroad property until he has secured a copy of the necessary permits from the railroad agent. He shall conform to all requirements of the railroad in the prosecution of this portion of the work.

2.17.2 Where a pipeline crosses under a railroad, a larger encasement pipe shall first be installed and the pipe laid in it. The work shall be done in accordance with the requirements of the railroad company policy. Encasement pipe shall be provided as specified in the technical sections and shall be of the size shown on the drawings.

2.17.3 The Contractor shall pay the cost of flag men, inspectors, and other expenses of the railroad in protecting the traffic. He shall notify the railroad of the time the work will be done and shall not begin work until authorized by railroad officials.

2.18 USE OF PREMISES:

2.18.1 The Contractor shall confine equipment, the storage of materials and equipment, and operations to areas permitted by law, ordinances, permits, the requirements of the contract documents, and as directed by the Developer and Engineer, and shall not unreasonably encumber the premises with materials or equipment.

2.18.2 The Contractor shall not overload any part of any structure with weights that will endanger its safety, nor shall he subject any part of the work to stresses or pressures that will endanger it.

2.18.3 The Contractor shall comply with and enforce the Developer's rules and instructions in connection with signs, advertisements, fires, smoking, and the routing and parking of vehicles on the premises.

2.19 LINES AND GRADES:

2.19.1 The Engineer will establish control points and base lines for control of the work and will establish benchmarks and determine their elevation. The Contractor shall provide such stakes and non-technical assistance as the Engineer may require for the work.

2.19.2 The Contractor shall have on the job, at all times, a person who is capable of setting stakes, replacing damaged stakes, and who understands the value and use of stakes and cut sheets, to whom the Engineer may deliver information. The Contractor shall furnish and set necessary batter

boards and other means of control and shall be fully responsible for their accuracy. Lines and grades will be established as follows:

A. For sewers and storm drains the Contractor shall stake all offset lines with tack centers. These shall be set sufficiently off from the centerline to allow for construction, and not over 50 feet apart when using batter boards. The Contractor shall be responsible for protecting all stakes and shall make necessary replacements. After stakes have been set, the Contractor shall determine necessary elevations and furnish necessary cut sheets for field use. Copies of all cut sheets shall be furnished to the Engineer.

B. For water mains the Engineer will indicate on the plan the necessary control points to establish the centerline of the main, which is to be located by the Contractor. The Engineer will also indicate locations of fire hydrants and valves.

C. For plant or building work the Engineer will stake a construction base line, establish a benchmark, and give its elevation to the Contractor. The Contractor shall stake all individual structures, provide batter boards, and set elevations for the work.

2.20 SITE DATA:

2.20.1 The Developer and Engineer will make available to all prospective bidders, prior the receipt of bids, information they may have as to subsurface conditions in the vicinity of the work, topographical maps or other information that may assist the bidder in properly evaluating the amount and character of the work required for construction. Such information is given, however, as being the best information available to the Developer and Engineer at the specific location without the assumption of responsibility for its accuracy or for any conclusions the Contractor might draw there from. The Contractor shall satisfy themself as to the nature of the work, shall investigate all other matters which may in any way affect the work under this contract and shall determine the character of equipment and facilities needed preliminary to, and during, the execution of the work. No verbal agreement or conversation with any officer, agent, or employee of the Developer or the Engineer, either before or after the execution of this contract, shall affect or modify any of the terms or obligations contained herein.

2.21 EQUIPMENT INSTALLATION:

2.21.1 When equipment of any kind is to be installed in a building or structure, and minor changes are necessary in the building or structure to accommodate the equipment, such changes shall be considered incidental to the proper completion of the work and shall be made by the Contractor without additional compensation.

2.22 QUANTITIES OF ESTIMATES:

2.22.1 The estimated quantities of work to be done and materials to be furnished under this contract shown in any of the documents, including the bid, are given for use in comparing bids and to indicate approximately the total amount of the contract. BRWS H2GO reserves the right to increase or decrease the amount of work under this contract as specified elsewhere in these contract documents.

2.23 INSPECTION CERTIFICATES, BONDS AND GUARANTEES:

2.23.1 Upon completion of the work and prior to submission of certificate for final payment, the Contractor shall have had all work, as applicable, inspected by the proper authorities as required by the technical sections of the specifications and all applicable codes, laws, and ordinances. Before final payment is made, the Contractor shall submit all inspection certificates to the Engineer covering such work, signed by the proper authorities, together with all required bonds, guarantees, certificate of no litigation, cost certificate, and record drawings. The Engineer will provide for inspection by a qualified representative of the engineering firm, in order to ensure that the compliance of the plans and specifications is adhered to. The inspector will report the work activities performed, shall file reports and any discrepancies found in the work. Photos may also be required. Subsequent to the newly constructed facilities being placed into service, should any discrepancies be found in the materials and workmanship, the Contractor and the Engineer will be responsible for restoring the defective work or material to compliance conditions. The cost associated for this will not be the responsibility of BRWS H2GO.

2.24 ESTIMATES NOT TO PREVENT FINAL REJECTION:

2.24.1 Final inspection and acceptance of the work will take place at completion of the work under this contract. Any inspection or acceptance of materials and workmanship at mills, shops or elsewhere to facilitate the progress of the work or to allow inclusion in a pay request will not preclude rejection of such materials or workmanship thereafter if the same is found unsuitable, or not in complete accordance with the contract documents.

2.25 FINAL INSPECTION:

2.25.1 Upon written notice from the Contractor that the work is complete, the Engineer, Owner and applicable jurisdiction agencies will make a final inspection, and will notify the Contractor in writing of all defective, incomplete or otherwise unacceptable work revealed by the inspection. The Contractor shall immediately correct all such deficiencies to the satisfaction of the Engineer. Verification by BRWS H2GO shall occur prior to final acceptance. If a project has not met all requirements for final acceptance by BRWS H2GO but has been substantially completed as to be considered eligible to receive a Permit to Operate from NCDEQ, then the Owner may bond the project per BRWS H2GO's requirements.

2.26 GUARANTEES:

2.26.1 If, in fulfilling the requirements of this contract, the Contractor disturbs any work guaranteed under another contract; he shall restore such disturbed work to a condition satisfactory to the Engineer and shall guarantee such restored work to the same extent as it was guaranteed under the other contract.

2.26.2 All special guarantees applicable to specific parts of the work that may be stipulated in the contract documents shall be subject to the terms of the general one-year guaranty (see General Conditions) during the first year of the life of such special guarantee.

2.27 TEMPORARY UTILITIES:

2.27.1 During construction the Contractor shall provide all interim electrical power and wiring required for operation of power tools, equipment, and machinery and for temporary lighting. Lighting shall be provided where necessary for proper workmanship, inspection, and safety. Temporary electrical

service shall be installed and maintained by a licensed electrical Contractor. The Contractor shall pay all charges for electrical service required for temporary power and lighting.

2.28 UNAUTHORIZED DISCHARGES AND BYPASSES:

2.28.1 During construction, the Contractor will be held responsible for unauthorized discharges of wastewater and sludge and unauthorized bypasses of treatment units which may result in fish kills, contaminated water supplies, the interruption of the intended use of certain stream segments and other environmental problems cause by such violations. Such violations will be strictly enforced in accordance with all applicable laws and regulations. The Contractor will be liable for all civil penalty assessments as prescribed for such violations.

2.29 PARTIAL PAYMENTS TO CONTRACTORS:

2.29.1 The Contractor shall make the following certification on each request for payment:

"I hereby certify that the labor and materials listed on this request for payment have been used in the construction of this work, or that all materials included in this request for payment and not yet incorporated into the construction are now on the site or stored at an approved location; and that all lawful charges for labor, materials, et cetera covered by previous Certificates of Payment have been paid and that all other lawful charges on which this request for payment is based have been paid for in full, or will paid for in full from the funds received in payment of this request within ten (10) calendar days from receipt of this partial payment from the Owner."

3 SUBMITTALS

3.1 Submittals are defined as shop drawings, manufacturer's catalog sheets, brochures, diagrams, illustrations, schedules, performance charts, technical specification sheets, sewer pump curves, brochures, and other data prepared and submitted by the utility contractor for review and approval for the project.

3.2 The Contractor shall review all submittals/shop drawings for accuracy and conformance with the contract documents. Prior to submission to the Engineer, all submittals shall be marked, stamped, or otherwise certified as approved by the Contractor, dated and signed or initialed. Any submittals not so marked will be returned to the Contractor without the Engineer’s review.

3.3 All Contractor approved submittals shall be submitted to the Engineer by the utility contractor for review and approval. The Engineer’s review of submittals/shop drawings will be only for conformance with the general design concept of the project and for general compliance with the contract documents and will not include a detailed quantity check or verification of dimensions. The Engineer’s review will not extend to means, methods, techniques, sequences, or procedures of construction (except where a specific means, method, technique, sequence or procedure of construction is required by the contract documents) or to safety precautions or programs incident thereto. The review and acceptance of a separate item as such will not indicate acceptance of the assembly in which the item functions. The Engineer’s review of submittals will not relieve the Contractor from responsibility for errors or omissions, or for deviations from the contract documents, unless written acceptance is obtained from the Engineer and BRWS H2GO for specific deviations. The Contractor shall notify the Engineer and BRWS H2GO in writing of all deviations from the contract documents at the time of submission. The Engineer will review submittals with reasonable promptness. The Engineer will stamp each shop drawing indicating acceptance or otherwise, along with the data and signature or initials. The number of required copies to be submitted will be determined by the Engineer.

3.4 One copy of all submittals/shop drawings marked 'Approved by the Engineer' shall be submitted to BRWS H2GO clearly indicating the project for which they are to be used. BRWS H2GO shall have a period of ten (10) business days to accept or reject the submittals after receipt of same. After the 10-business day period, no comment shall be deemed approval. BRWS H2GO reserves the right to reject any submittals it determines are not acceptable.

3.5 The Contractor shall revise and re-submit shop drawings as required until acceptance by the Engineer and BRWS H2GO. Re-submissions shall be made as specified for the initial submission. Additional changes made on shop drawings other than those requested by the Engineer shall be clearly indicated.

3.6 The Contractor shall schedule the submission of shop drawings to allow sufficient time for review and approval by the Engineer and BRWS H2GO. Each shop drawing submitted to the Engineer or BRWS H2GO shall be accompanied by a transmittal form supplied by the Engineer; all information requested on the form shall be completed by the Contractor.

3.7 Submittals shall be clearly marked to identify specific materials, finishes, products or models, required dimensions, clearances, performance characteristics and capacities, wiring diagrams and controls, etc., depending on the subject of the drawing.

3.8 If considered by the Engineer and BRWS H2GO to be acceptable, manufacturer's publications in the form of catalogs, brochures, illustrations, or other data sheets may be submitted for review in place of shop drawings and working drawings. Submittals showing only general information shall not be acceptable.

3.9 No material shall be ordered, fabricated, or shipped, or any work performed until the required shop drawings and associated submittals have been submitted, reviewed, and approved by the Engineer and BRWS H2GO.

4 ACCESSIBILITY AND EASEMENTS

4.1 All utility lines and appurtenances shall be readily accessible to BRWS H2GO personnel by two (2) wheel drive pickup truck for future operation and maintenance.

4.2 Where public utility lines are installed outside of public rights-of-way, utility lines shall be centered within a minimum 20-foot-wide easement. BRWS H2GO may require larger easements for large transmission mains. No plantings or structures are allowed within utility easements. Easements shall be coordinated with BRWS H2GO.

5 SITE CLEARING

5.1 SCOPE: Work consists of all necessary clearing and grubbing as shown on the plans and specified herein.

5.2 CLEARING AND GRUBBING:

5.2.1 General: The Contractor shall consult with the Owner and Engineer prior to beginning 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.

A. The Contractor's operations shall be conducted with full consideration of all proper and legal rights of the Owner, adjacent property owner's and the public, and with the least possible amount of inconvenience to them.

5.2.2 Construction Sites: The work shall consist of clearing and grubbing within the limits of construction sites, road rights-of-way and elsewhere as indicated or necessary to complete the work, except

pipelines. All trees, stumps, roots, shrubs, and brush shall be removed as required for construction. Stumps and roots shall be grubbed and completely removed. The resulting depressions shall be filled with suitable material placed and compacted in accordance with Chapter 3. Sound trees and shrubs which do not interfere with construction shall remain in place and shall be adequately protected from damage. Cleared and grubbed material, including debris and rubbish, shall be completely burned or otherwise disposed of as directed by the Engineer.

5.2.3 Pipelines: Clearing and grubbing along pipelines shall be done prior to pipe installation and shall be confined to the right-of-way limits as specified below. Adjacent property outside the right-of-way limits shall be protected against damage. All trees, stumps, roots, shrubs, and brush shall be removed as required for construction. Stumps and roots shall be grubbed and completely removed. Sound trees and shrubs which do not interfere with construction shall remain in place and shall be adequately protected from damage. Cleared and grubbed material, including debris and rubbish, shall be disposed of as directed by the Engineer; burning within pipeline rights-of-way will not be allowed.

A. Trees 6-inches and larger in diameter shall be trimmed into normal 63-inch lengths, unless otherwise directed by the Owner or BRWS H2GO. The logs shall be neatly stacked along the edge of the right-of-way in accessible locations for the Owner's use.

B. Limits of the pipe-laying operation shall be confined to the right-of-way. The width of clearing shall be held to a minimum and shall be no more than specified on the plans, without written consent of the Engineer.

5.2.4 Minor Structures: Minor Structures shall be removed and disposed of as directed by the Engineer.

5.2.5 Burning: Burning of Cleared Material shall be accomplished in strict compliance with all applicable local, state, and federal regulations pertaining to open burning and smoke abatement.

6 EARTHWORK

6.1 SCOPE: Earthwork shall consist of all necessary site grading, structure excavation and backfill, trench excavation and backfill, and related work as shown on the plans and as specified herein.

6.2 GENERAL: All earthwork shall be confined to the construction area as shown on the plans, and shall be done in an approved manner with proper equipment. Earthwork shall be suspended during rain and inclement weather, or when unsatisfactory field conditions are encountered, unless otherwise directed by the Engineer. At all times during construction, the Contractor shall maintain proper drainage in the construction area and shall take all measures necessary for erosion and sediment control.

6.2.1 Classification of Earth Work: All excavation will be unclassified, for payment purposes, unless otherwise specified.

6.2.2 Existing Utilities: Contractor shall take every precaution to protect existing utility services from damage during construction operations. If damage occurs, the Owner of the utility shall be notified immediately, and repairs shall be made promptly at the Contractor's expense. All repair work shall be satisfactory to the Engineer and the Owner of the utility. When interruptions of existing utilities occur, temporary service shall be provided as approved by the Engineer and Owner of the utility.

6.3 STRUCTURE EXCAVATION AND BACKFILL:

6.3.1 All excavations shall be in compliance with current OSHA regulations. Structure Excavation shall be made to the elevations, slopes and limits shown on the plans. Bottom of excavations shall be level and in firm, solid material; where soft or otherwise unsuitable material is encountered, such material shall be removed and replaced with properly compacted earth material, stone, or Flowable Fill, as directed by the Engineer. Topsoil and other excavated material suitable for fill or backfill shall be stockpiled on the site for future use. Excess material and material unsuitable for fill or backfill shall be disposed of by the Contractor. Excavated areas shall be kept free of water during construction. Where necessary, excavations shall be protected by shoring, sheeting, cofferdams or other suitable methods. Where earth will stand, footing trenches may be cut to the exact size of the footings; otherwise, forms shall be used.

A. Unauthorized or excessive excavation shall be corrected by providing properly compacted earth backfill, stone or Class C concrete, as directed by the Engineer, at the Contractor's expense.

B. Wherever excavation for a foundation extends below the water table or where specifically indicated on the plans, a 12-inch layer (unless otherwise noted) of crushed stone or gravel shall be spread and compacted in the excavation bottom prior to placing the foundation. Crushed stone or gravel shall conform to ASTM C33, Size 57. A non-woven filter fabric, Mirafi 140N or equivalent shall be placed beneath the stone layer.

C. An adequate dewatering system shall be provided at all structure excavations and elsewhere as directed by the Engineer. The system shall be capable of removing any water that accumulates in the excavation and maintaining the excavation in a dry condition while construction is in progress. The surface of the ground shall be sloped away from the excavation or piping provided to prevent surface water from entering the excavation. Disposal of water resulting from the dewatering operation shall be done in a manner that does not interfere with normal drainage and does not cause damage to any portion of the work or adjacent property. All drains, culverts, storm sewers and inlets subject to the dewatering operation shall be kept clean and open for normal surface drainage. The dewatering system shall be maintained until backfilling is complete or as otherwise directed by the Engineer. All damage resulting from the dewatering operation shall be repaired by the Contractor to the satisfaction of the Engineer and at no cost to the Owner.

D. Limit of structure excavation, for payment purposes, shall be 3 feet from the outside wall line of structures. Material removed beyond this limit to facilitate work shall be at the Contractor's expense.

6.3.2 Backfill around structures shall be placed as soon as possible, but not until construction below finish grade has been completed and accepted, underground piping and other utilities have been properly installed and tested, forms have been removed, and the excavation cleaned of trash and debris. Foundations and walls shall be braced and supported as required to withstand the forces imposed by the backfilling operation. Care shall be taken to protect piping and other utilities during backfill.

A. Backfill shall consist of suitable material from the excavation free of roots, wood, other vegetable matter, trash, debris, frozen material, rocks larger than 4 inches in any dimension, and other objectionable material. Backfill shall be brought to the indicated finish grade and sloped to drain away from walls. Backfill shall be placed in 8-inch layers and thoroughly compacted as

specified below. Any subsequent settlement that may occur during the construction period shall be corrected.

B. Excessively wet, porous, spongy, or mucky material shall be removed from around structures prior to placing backfill. No such material shall be used for backfilling.

C. Unless otherwise directed by the Engineer, liquid-retaining structures shall not be backfilled until tested for leakage and accepted. All structures shall be protected against damage or flotation prior to placing backfill.

6.4 SITE GRADING: Site grading shall conform to the lines and grades indicated by the finish contours on the plans. Where topsoil, pavement, aggregate surfacing and other items are shown, rough grade shall be finished to such depth below finish grade as necessary to accommodate these items. All areas where structures are to be built on fill shall be stripped to such depth as necessary to remove turf, roots, organic matter and other objectionable materials.

6.4.1 Excavation: Excavation shall be made to the exact elevations, slopes and limits shown on the plans.

6.4.2 Fill: Material to be used for fill shall be classified as "ML" (low plasticity silts), "SM"(silty sands), or better, in accordance with the Unified Soil Classification System. Fill material shall exhibit a plasticity index of less than 20 and a standard Proctor maximum dry density greater than 90 pounds per cubic foot. Fill shall not contain organic material, debris, or rock larger than 6 inches in any dimension.

A. Where fill is to be placed, all existing vegetation, roots, and other organic matter down to 12 inches below grade shall be stripped and disposed of as directed.

B. Fill shall be placed in successive layers of not more than 8 inches loose thickness. Each layer shall be spread evenly and compacted as specified below before the next layer is placed.

C. Rock shall not be incorporated in fill sections supporting pavement or structures. Rock shall be evenly distributed. Rock larger than 4 inches in any dimension will not be allowed in the top 12 inches of fills or slopes. Voids between rock and material shall be well filled with suitable fill material, and all rock shall be covered with at least 6 inches of fill material.

D. Where natural slopes exceed 3:1, horizontal benches shall be cut to receive fill material. Slopes of less than 3:1 and other areas shall be scarified prior to placing fill material.

E. Borrow material, as required, shall be obtained from the work site or other acceptable source, at the Contractor’s expense.

6.4.3 Compaction: Unless otherwise noted, each layer of fill and backfill and the top 12 inches of existing subgrade material in cuts shall be compacted by approved equipment as specified below. The degree of compaction and the density shall be determined by the Standard Proctor test (ASTM D698) or by the Modified Proctor test (ASTM D1557, Method A).

Min. Compaction of Max. Dry Density at Optimum Moisture Content

Fill or cut under structures and backfill adjacent to structures----------95%

Top 8 inches of fill or cut under pavement or aggregate surfacing-------98%

Fill and backfill for highways or shoulders---------- 95%

Fill and backfill in other areas----------90%

A. Material too dry for proper compaction shall be moistened by suitable watering devices, turned and harrowed to distribute moisture, and then properly compacted. When material is too wet for proper compaction, operations shall stop until such material has sufficiently dried.

B. Compaction Tests: All compaction tests, including additional tests required due to failure of materials and work to conform to the specified requirements shall be done at the Contractor's expense. Compaction tests shall be conducted by an independent testing agency acceptable to the Engineer. The Contractor shall be responsible for correcting all deficiencies in the work at his expense. Compaction testing shall continue until test results are satisfactory to the Engineer. Copies of all test results shall be promptly submitted to the Engineer.

1. Tests shall be made in randomly selected locations as follows:
2. Material Frequency
3. Fill and backfill---------- 1 per layer (lift) per 1000 sq. ft.
4. Subgrade (cuts)---------- 1 per layer (lift) per 2500 sq. ft.

6.4.4 Dressing Off: All cuts, fills and slopes shall be neatly dressed off to the required grade or subgrade, as indicated on the plans.

6.4.5 Cleanup: Cleanup of the site shall be made upon completion of grading work, or any major part thereof. Unless otherwise noted, excess or surplus material shall be wasted and dressed off on the site, or adjacent thereto, to the Engineer's satisfaction. Excess or surplus material wasted in off-site spoil areas shall be spread and leveled as directed.

6.4.6 Topsoil Placement: Topsoil shall consist of a natural friable loam, occurring usually in a surface layer 6 to 18 inches thick, and free of roots, grass, weeds, stone, and other foreign matter. Topsoil may be obtained from the graded area, if available, and stockpiled for future use. Otherwise, the Contractor shall provide topsoil from other sources at his own expense. All topsoil shall be acceptable to the Engineer. Topsoil shall be placed on the entire graded area as shown on the plans, or as directed by the Engineer. Topsoil shall be distributed to a depth of 4 inches, measured loose, and dressed off neatly to finish grade, with all debris removed.

7 TRENCH EXCAVATION AND BACKFILL

7.1 General: Use soils free of organic matter, refuse, rocks, and lumps greater than 4 inches in diameter and other deleterious matter.

7.2 DEFINITIONS:

7.2.1 Backfill

A. Materials: Materials listed herein include processed materials plus the soil classifications listed under the Unified Soil Classification System, (USCS) (Method D2487 and Practice D2488). The soil materials are grouped into five broad categories according to their suitability for this application.

1. Class I: Angular, 6 to 40-mm (1/4 to 1-1/2-in), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shell. For the purposes of these specifications, Class I material shall be NCDOT #57 or #67 stone.

2. Class II: Coarse sands and gravels with maximum particle size of 40 mm (1-1/2 in.), including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, 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 shall not be used 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, rock larger than 40 mm (1-1/2 in.) in diameter, and other foreign materials. These materials shall not be used for bedding, haunching, or initial backfill.

B. Backfill Zones: Each backfill zone shall extend the full width of the trench bottom.

1. Foundation: Extending down from the bottom of bedding zone as defined below.

2. Pipe Embedment

a. Bedding: Extending from 4 inches below the pipe bottom to the pipe bottom for 30-inch diameter and smaller and 6 inches below the pipe for pipes larger than 30 inches in diameter.

b. Haunching: Extending from the bedding (bottom of the pipe) to the pipe spring line.

c. Initial Backfill: Extending from the haunching (pipe spring line) to 1 foot above the top of the pipe.

3. Final Backfill: Extending from the initial backfill to the finish ground elevation.

7.2.2 Laying Conditions:

A. Type 1: Flat bottom trench with loose backfill.

B. Type 2: Flat bottom trench with backfill lightly consolidated to centerline of pipe.

C. Type 3: Pipe bedded in 4 inches minimum of loose soil and backfill lightly consolidated to top of pipe.

D. Type 4: Pipe bedded on Class I material to 1/8 pipe diameter (4 inch minimum) Backfill compacted to top of pipe a minimum of 80 percent of standard proctor.

E. Type 5: Pipe bedded in compacted Class I material to pipe centerline with 4-inch minimum under pipe. Backfill to top of pipe with Class I, II, or III and compact to 90 percent of standard proctor.

7.2.3 Compaction: Process of mechanically stabilizing a material by increasing its density at a controlled moisture condition. "Degree of compaction" shall be expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D698 (Standard Proctor).

7.2.4 Excavation: The removal of soil or rock to obtain a specified depth or elevation.

7.2.5 Pipe Springline: A line running horizontally through the center of the pipe.

7.2.6 Topsoil: Natural, friable soil free of subsoil, stumps, rocks larger than 1 inch in diameter, weeds and other material detrimental to plant growth.

7.3 Granular Fill: Granular fill under floor slabs shall be Class I material.

7.4 Structural Fill: Fill material placed inside the line of the building foundation or slab shall be Class I or II.

7.5 Fill Beneath Pavement: Fill material used beneath pavement and for road shoulders shall be Class I, II or III.

7.6 General Fill: General fill material not otherwise specified shall be Class I, II or III.

7.7 EXECUTION:

7.7.1 Project Safety:

A. Contractor is responsible for Project safety.

B. Perform work in conformance with applicable State and Federal safety regulations including, but not limited to, the following:

1. North Carolina Safety and Health Standards for the Construction Industry (29CFR 1926 Subpart P).

2. NC OSHA Industry Guide No. 14, Excavations.

3. NC OSHA Industry Guide No. 20, Crane Safety.

C. Provide barriers, warning lights, and other protective devices at excavations as necessary for safety of workers and the public.

D. Provide sloping of bank, shoring, sheeting, or other means of maintaining the stability of the trench in accordance with the requirements of the Associated Contractor's Manual of Accident Prevention OSHA, Part 1926.P.

7.7.2 Trenches shall be kept free of water during pipe installation. Water shall be removed from trenches and disposed of by the Contractor to the satisfaction of the Engineer.

7.7.3 Trench Excavation:

A. All excavation shall be in compliance with current OSHA requirements. Trenches for pipe and other utilities shall be excavated true to line and grade. Unless otherwise indicated or specified, trenches shall be of a depth to provide a minimum cover of 3 feet over the top of pressure lines, 2 feet over the top of casing piping, 3 feet over the top of pipe buried in a roadside ditch, and 5 feet over the top of pipe buried under a channel or stream.

B. Excavation shall be by open cut, unless otherwise indicated on the Drawings or specified herein.

C. Stockpile excavated material in such a manner that it will not obstruct the flow of runoff, streams, endanger Work, impair the use or appearance of existing facilities, or be detrimental to the completed Work.

D. Contractor shall segregate excavated material so as to maintain material suitable for backfill separate from material that is unsuitable.

E. Unless otherwise specified, trenches shall be between 12 and 18 inches wider at the top of the pipe than the outside diameter of the pipe, plus sheeting where necessary. Pavement shall be cut 12 inches wider than the required trench width on each side. For gravity sewer lines, maximum trench width up to a level 12 inches above the top of the pipe or shall be as noted on the plans. Sheeting shall be used where necessary.

F. Where soil conditions preclude vertical walls, the trench width shall be as specified above with the upper part of the trench limited to the least possible width greater than that specified. Where excessive trench widths are necessary, or were directed by the Engineer, sheeting shall be used to support trench walls.

G. Shape trench bedding to provide uniform bearing for the full pipe length. Bottom shall be free of protrusions that could cause point loading on pipe. Provide bell holes as required for properly making pipe joint.

H. Do not over excavate. Excavation below grade without approval of Engineer shall be backfilled with Class I material at no additional cost.

I. Undercut soils that become unsatisfactory by construction activity or by being left exposed to the weather and backfill with Class I material at no additional cost.

J. Correct unstable soil conditions encountered at trench foundation by one of the following methods:

    1. Excavate below grade as approved by Engineer and backfill with Class I material or approved substitute material.

    2. Provide piling and / or timber cradles in a manner approved by the Engineer.

    3. Provide concrete cradle or encasement of concrete.

K. Rock and Hard Material

    1. Excavate rock and hard material to a minimum depth of 4 inches below the pipe for pipes smaller than 30 inches and 6 inches for pipes 30 inches and larger.

L. Pressure Lines: For pressure pipelines, trench bottoms shall be prepared as follows:

    1. Excavate trenches to provide vertical curve chords that will not exceed the pipe manufacturer's recommended joint deflection.

    2. Provide concrete thrust blocks having a compressive strength of 3,000 psi at 28 days at change in horizontal and vertical direction and reduction in the pipe size, unless other restraint systems are indicated otherwise on the Drawings. Cut trench sides vertical and square to receive concrete. Provide bearing area against trench wall as indicated on the Drawings.

M. Gravity Lines:

    1. Excavate trench to the alignment and grade indicated on the Drawings. Trenches shall be excavated below the established subgrade as required to provide for preparation of flat trench bottoms in strict accordance with the trench bedding details as shown.

N. Utility Structures:

1. Provide a minimum of 12 inches below subgrade and backfill with Class I compacted to 95 percent maximum density. If the soil conditions are found to be unsuitable for structural stability of the manhole, Engineer may require additional depth of Class I material.

7.7.4 Trench Backfill: Trench Backfill shall progress as rapidly as pipe-laying and testing will permit. Remove shoring, bracing, and sheeting, unless otherwise noted, as the trench is backfilled. Engineer shall have the authority to require that the sheeting be left in place.

A. General:

1. Backfill trench to existing ground surface with select excavated material at the specified compaction. All ponding areas and settlement below finished grade during the construction period shall be promptly corrected by the Contractor. Trenches shall be protected against scour due to surface drainage.

2. If excavated material is unsuitable to obtain specified compaction, provide suitable off-site borrow material for backfill.

3. Re-excavate trenches improperly compacted. Backfill and compact as specified.

4. Provide appropriate tamping equipment, and water to obtain proper moisture content, to achieve specified compaction of backfill.

5. Install warning / identification tape over utilities as specified in the Pipeline Identification and Marking Section.

6. Install tracer wire as specified in the Pipeline Identification and Marking Section.

B. Backfill in pipe embedment zone (bedding, haunching, and initial backfill).

1. General:

a. Backfill with material as specified below. Select material shall be free from objects larger than 2 inches.

b. Where rock and hard material has been excavated below pipe bottom, backfill and compact bedding with Class I material. Class II or III material may be used for bedding with Engineer's approval.

c. Place backfill material with a shovel to assure placement of material under pipe haunches.

d. Take care during placement and compacting of material to avoid movement of pipe.

2. Place backfill in bedding and haunching zones in 6 inch maximum lifts and compact to 90 percent density. Place initial backfill in one lift, do not compact. Provide backfill material in pipe embedment zone as specified below.

a. Pressure Lines (Flexible and Rigid Pipe)

1. Excavation in Class I, Class II, Class III, and stable Class IV soils suitable for bedding, the bedding surface shall provide a firm foundation of uniform density. Backfill with select excavated material.

2. Excavation in Class V, unstable Class IV soils, running water, and other unstable soil conditions, excavate a minimum of 4 inches below pipe bottom and provide Class I material for bedding and haunch zone. Backfill with Class I, II, or III material in initial backfill.

b. Gravity Sewer Lines, Rigid pipe (concrete and ductile iron)

1. Excavation in Class I, Class II, Class III, and stable Class IV soils suitable for bedding, the bedding surface shall provide a firm foundation of uniform density. Backfill with select excavated material.

2. Excavation in Class V, unstable Class IV soils, running water, and other unstable soil conditions, excavate a minimum of 4 inches below pipe bottom and provide Class I material for bedding and haunch zone. Backfill with Class I, II, or III material in initial backfill.

3. Ductile Iron over 16 inch

i Depth 0 - 12 feet: Type 2 laying conditions same as for pressure pipe.

ii Depth over 12 feet: Provide Class I material for bedding and 4 inches up from bottom of pipe.

c. Gravity Sewer Lines, Flexible (PVC C900)

1. Depth 0 to 14 ft: Provide Class I material for bedding and haunching. Backfill with Class I, II, or III material in initial backfill.

2. Depth over 14 ft: Provide Class I material for bedding, haunching, and initial backfill.

d. Gravity Sewer Lines, Semi-rigid pipe (PVC and ABS Truss Pipe)

1. Depth 0 to 14 ft: Provide Class I material for bedding and haunching. Backfill with Class I, II, or III material in initial backfill.

2. Depth over 14 ft: Provide Class I material for bedding, haunching, and initial backfill.

C. Final Backfill:

1. Backfill with materials free of stones and free of debris larger than 6 inches in dimension. Place backfill in lifts not exceeding the thickness and compacted to the minimum density specified below.

2. Trench backfilled with noncohesive materials may be compacted with water flooding; except under roadways, shoulders of roadways, and other areas subject to vehicular movement, provided the method of compaction is approved by the Engineer and provides the degree of compaction required.

3. Under pavement, compaction by rolling with rubber-tired vehicles or track type equipment will not be allowed. The contractor shall correct any future settlement within the guarantee period.

4. Backfill under pavement cuts shall be tested for proper compaction at the Contractor's expense. At least one test shall be performed for each pavement cut; longitudinal pavement cuts shall be tested at increments of 100 linear feet or fraction thereof. Testing shall be performed by an independent laboratory acceptable to BRWS H2GO. If compaction does not meet the specified requirements, the Contractor shall remove and replace backfill and retest at no additional cost to BRWS H2GO. Testing shall be done until test results are satisfactory to the Engineer. Copies of all test results shall be promptly submitted to the Engineer.
5. Lifts and density:
    a. Undeveloped areas (i.e., forests, fields, and croplands): Trench may be filled with bulldozer blade provided material fall will not damage pipe. Mound soil over the trench area sufficiently to settle level over time. Degree of compaction shall be 85 percent.
    b. Lawns: Backfill in 12-inch lifts and compact to 90 percent. Top 12 inches shall be free of material with a dimension over 2 inches.
    c. Roads (including Rights-of-way), drives, parking areas (including areas within 20 feet), and adjacent to existing utilities: Backfill in 6-inch lifts compact to 95 percent.
    d. Within 20 feet of foundations: Backfill in 6-inch lifts compacted to 95 percent.
6. Utility Structures: Bring backfill to grade in even lifts on all sides. Lift depths and compaction densities shall be as specified according to area of installation for pipe above. Backfill against cast-in-place concrete structure only after concrete has attained the specified 28-day compressive strength.

8 GENERAL PIPELINE CONSTRUCTION REQUIREMENTS

8.1 SCOPE

This section describes general requirements applicable to piped utilities.

8.2 CONCRETE

Concrete for piers, blocking, protection, and other uses shall be composed of Portland cement, sand, coarse aggregate, water and approved admixtures, and shall be designed to provide a compressive strength of 3000 psi at 28 days unless otherwise noted. Steel reinforcing bars shall conform to ASTM A615, Grade 60.

8.2.1 Piers: All piers shall be of concrete unless otherwise noted or directed by the Engineer. Concrete piers shall be provided as detailed on the plans. Pier foundations shall be of depths as required to reach firm, solid material. Foundation for piers shall be adequate to support the intended load and will be subject to the Engineer's approval prior to pouring concrete.

NOTE: Concrete Thrust Blocking shall be included where mechanical restraints are used. Prior approval must be obtained from BRWS H2GO before using thrust blocking.

8.2.2 Thrust Blocking: All fittings, ends, dead ends, hydrants, etc., shall be blocked with concrete having bearing on the undisturbed earth in the side and/or bottom of the trench. Where utilized, the bearing area shall be equal to that shown on the plans, or greater if deemed necessary by BRWS H2GO. A minimum of four (4) mil plastic shall cover the fittings to ensure that no concrete will interfere with removal of the fittings.

8.2.3 Protection: Concrete supports, encasement and other protective work shall be provided at locations as shown on the plans or as directed by the Engineer. Protection concrete shall be Class C or 2000 psi concrete.

8.3 MISCELLANEOUS PLANT PIPING

Miscellaneous plant piping shall consist of yard piping, pipe work in structures (except plumbing), equipment piping and other utility piping, fittings, valves and appurtenances at various structures and facilities. Shop drawings of yard piping, pipe work in structures, equipment piping, chemical piping and air piping shall be submitted to BRWS H2GO and the Engineer for review.

8.3.1 Materials: All materials and products under this section shall meet Made in America Criteria. Pipe shall be of the type, size and class as shown on the plans. Except where specified in this section, pipe, fittings, valves, and appurtenances shall be as specified in other sections.

8.3.2 Yard Piping: Yard piping shall include all waste, water, drainage, sludge, chemical, air and other utility piping and appurtenances from points 3 feet outside structures or buildings to other units of the facility, to points of discharge, to other work, or to the limits shown. Yard piping shall be installed at the locations shown on the plans, and to the position, alignment and grade indicated thereon. Trench excavation and backfill for underground piping shall be as specified in Section 7 of this specification.

A. Waste piping (including sludge piping) shall be installed in accordance all requirements of the Wastewater System Standards & Specifications and Sections herein, including successfully meeting the infiltration or exfiltration test for gravity lines and pressure and leakage tests for pressure lines. All waste piping shall be ductile iron pipe, unless otherwise noted.

B. Water piping shall be installed in accordance with all requirements of BRWS H2GO's "Water System Standards and Specifications", latest revision, including successfully meeting pressure and leakage tests, and disinfection of potable water lines.

8.3.3 Equipment Piping: Equipment piping shall be installed as shown on the plans and shall fit the equipment provided. Piping shall be assembled and installed so as not to put strain on equipment connections. Pipe supports shall be provided as required to prevent vibration and excessive sway. Work shall be done in a neat, substantial, and workmanlike manner. All joints shall be watertight and airtight.

8.3.4 Chemical Piping: Chemical piping shall be provided complete with all fittings, valves, and accessories. All joints in piping shall be watertight and airtight. Pipe sleeves shall be provided where piping passes through walls and floors, with the space between the pipe and sleeve sealed watertight. Piping in structures shall be adequately anchored and supported. A surge suppressor or other suitable device shall be provided on each metering pump discharge line 30 feet or more in length to minimize surge and water hammer.

A. All exposed chemical piping shall be provided with identification and arrows showing direction of flow. The identification shall be either paint or remanufactured pipe markers suitable for the exposed conditions of each location. The identification shall state the material being handled and pipe service; i.e. "non-potable water, caustic, sludge, etc.".

B. All chemical piping shall be tested with clear water, and all leaks and other defects repaired prior to introduction of chemicals into the system. Testing of insulated piping shall be done prior to installation of heating tape and insulation. Tests may be run concurrently with leakage tests on chemical storage tanks.

8.3.5 Air Piping: Air Piping shall be provided with all fittings, valves and accessories required for a complete installation. All joints shall be airtight. Pipe sleeves shall be provided where piping passes through walls and floors, with the space between the pipe and sleeve sealed watertight. Piping shall be adequately anchored and supported and shall be provided with remanufactured pipe markers identifying the service.

A. Air Piping shall be tested to 150% of its working pressure, with this pressure maintained for at least 30 minutes. Testing shall be done prior to installation of insulation. All leaks shall be repaired to the satisfaction of the Engineer. After testing, piping shall be cleaned, flushed, and drained prior to being placed in service.

9 PIPELINE IDENTIFICATION AND MARKING

9.1 General: Detectable marking tape and tracer wire for identification, location, protection, and detection of utility pipelines shall be installed over all water lines, force mains, gravity sewers, and reclaimed lines. The contractor shall request the most recent list of approved manufacturers from BRWS H2GO. Shop drawings and related data shall be submitted to the Engineer and BRWS H2GO for review and approval.

9.1.1 Marking Tape: Underground detectable marking tape shall be a minimum of 3-inches wide, with a minimum 5.0 mil overall thickness, and manufactured specifically for identification of buried utilities. Detectable marking tape shall be the type capable of being detected/located by any standard electronic pipe locator. Detectable marking tape shall consist of a metalized foil laminated between two layers of inert plastic film suitable for lasting as long as the pipe and shall be resistant to alkalis, acids, and other destructive agents found in the soil. Tape shall be color coded and continuously imprinted, in permanent ink, with warning and identification markings in bold black letters to read “CAUTION – BURIED (utility) LINE BELOW”. Color and printing shall be permanent and shall be as follows:

Utility	Color	Marking
Water	Blue	CAUTION – BURIED WATER LINE BELOW
Gravity Sewer	Green	CAUTION – BURIED SEWER LINE BELOW
Force Main	Green	CAUTION – BURIED FORCE MAIN BELOW
Reclaimed	Purple	CAUTION – BURIED RECLAIMED WATER LINE BELOW (or approved equivalent wording)

9.1.2 Tracer Wire: Tracer wire shall be 12-gauge solid copper coated steel wire with insulation rated for underground service. Underground splice connections shall be rated for buried service. Tracer wire installed on new construction shall be tested prior to acceptance by BRWS H2GO. Insulation shall be colored as follows:

Water Main – Blue

Sewer Force Main – Green

9.1.3 Surface Markers: Valve and pipeline markers shall be installed on all valve installations and along force main lines every 800 feet and every 1000 feet for water transmission mains, or as directed by BRWS H2GO. Pipeline marker poles shall identify the line and shall have an emergency contact/ call before dig number for BRWS H2GO applied to the pole. Markers shall be color coded to indicate the type of utility; however, some exceptions may be considered in residential neighborhoods where HOA rules and regulation apply. Fire hydrant isolation valves are not required to have a valve marker.

9.2 Installation:

9.2.1 Marking tape shall be buried continuously directly above utility at a depth of 18 inches below final grade. Burial depth shall not exceed 36 inches below final grade nor be at an elevation of less than 12 inches above the utility line. The tape may be plowed in, placed during backfill or installed in any other manner acceptable to BRWS H2GO.

9.2.2 Tracer wire shall be installed on all pressure pipelines including pressure service lines. Tracer wire shall be installed in a continuous fashion within 6 inches of the pipe, secured to the pipe every 20 feet, be looped up in all valve boxes, and tied off on fire hydrant legs. Services shall have tracer wire installed from the main line connection to the meter box. DO NOT WRAP TRACER WIRE AROUND VALVE STEM. Tracer wire on new construction shall be tested and passed prior to acceptance.

9.2.3 Markers shall be installed over the pipe and to a minimum depth as specified by the manufacturer.

10 CLEANUP REQUIREMENTS

10.1 General:

10.1.1 All pipeline rights-of-way and work areas shall be cleaned up and left in a satisfactory condition in accordance with the requirements in the Specifications.

10.1.2 During construction, the Contractor shall maintain the site and adjacent public and private property, including streets and highways, free from accumulations of waste, debris, rubbish, and dirt caused by construction operations. Dry materials and rubbish shall be wet down as necessary to prevent blowing dust.

10.1.3 At completion of the work the Contractor shall remove all waste materials, rubbish, tools, construction equipment and machinery, surplus materials, and temporary facilities.

10.1.4 Cleaning and disposal operations shall be conducted in accordance with local ordinances and anti-pollution laws. Waste shall not be disposed of into streams or waterways.

10.2 Public Right-of-Ways: Cleanup of Work along Highways and Roads shall be made immediately upon completion of the backfill operation. Trenching and pipe laying shall be stopped at any time that cleanup work lags and shall not be resumed until cleanup progress is satisfactory to BRWS H2GO. Final cleanup and condition of the work area shall be subject to approval of the NCDOT Representative, Developer and BRWS H2GO.

10.3 Cross-Country Pipeline Routes: Cleanup of Work for Cross-Country Locations shall follow immediately upon completion of any major part of the work or when directed by BRWS H2GO. Topsoil shall be replaced on all areas disturbed by pipeline work throughout the length of the pipeline. Topsoil may be removed from the line of work and stockpiled for future use or may be obtained from other approved sources. The right-of-way shall be provided with a grass cover as specified in Section 13 of this Specification. The entire right-of-

way shall be left in a condition acceptable to BRWS H2GO and property Owner and be accessible by a standard 2-wheel drive truck.

10.4 Final Cleanup: Final Cleanup will meet approval of BRWS H2GO and property Owner where applicable, with all defects in trench settlement, pavement patches and other deficiencies being promptly corrected.

11 BORING AND JACKING

11.1 SCOPE: Boring and jacking of utility pipelines under highways and railroads shall be as shown on the plans and as specified herein.

11.2 GENERAL REQUIREMENTS: Boring and tunneling operations shall be performed in accordance with all requirements of the state department of transportation or the railroad, as applicable, including insurance, inspection, temporary work, watchmen, flagmen, protection of personnel and property, work restrictions, and work scheduling. Unless otherwise specified or directed, the Contractor shall pay for all costs in connection with meeting these requirements. The Contractor shall be responsible for repair or replacement of all existing structures and facilities, including settlement of roadways, damaged or disturbed as a result of the work, at no additional cost to the Owner and department of transportation or railroad, within a period of one year after completion of boring and tunneling operations. All work shall be completed to the full satisfaction of the department of transportation or railroad. The Contractor shall bore and jack water meters under paved roads in lieu of cutting pavement. Water mains two (2) inches and larger shall be installed in steel casings. Where dry boring pipe under highways or railroads is indicated, the bore diameter shall be essentially the same as the outside diameter of the encasement pipe to prevent settlement or caving. If voids develop or if the bore diameter is greater than the outside diameter of the pipe by more than 1 inch, the voids shall be pressure grouted or other remedial measures as approved by the Engineer shall be taken at the Contractor's expense. When boring under NCDOT roads, Contractor shall install utility in accordance with the NCDOT encroachment agreement.

11.2.1 Inspection: Boring and tunneling operations will be subject to inspection by the Engineer and by the department of transportation or railroad, as applicable. The department of transportation or railroad inspector will have full authority to stop work if, in his opinion, it may cause damage to the highway or railroad or endanger traffic.

11.2.2 Railroad Right-of-Way: For all work on railroad right-of-way, the Contractor shall notify the railroad at least 72 hours prior to beginning construction.

11.2.3 Experience: Before starting boring and tunneling operations, the Contractor shall submit to the Engineer an experience record of the proposed boring and tunneling subcontractor. Such a record shall include a list of equipment and personnel to be used, and a list of at least five previous successful similar installations under highways or railroads within the past five years. Failure to submit an experience record or submittal of a record not meeting these requirements will be cause for rejection of the boring and tunneling subcontractor.

11.3 MATERIAL:

11.3.1 Carrier Pipe: Carrier Pipe shall be as specified in the wastewater or water specifications.

11.3.2 Encasement Pipe: Encasement Pipe installed by boring and jacking shall be welded steel pipe conforming to ASTM A252, Grade 2, and shall be the size shown on the plans. Pipe shall be bituminous coated on the outside. Minimum wall thickness shall be as follows:

Diameter (in.)	Thickness (in.)
Under 14	0.188
14-16	0.219
18	0.250
20	0.281
22	0.312
24	0.344
26	0.375
28-30	0.406
32	0.438
34-36	0.469
38-48	0.500

When encasement pipe is installed without a protective coating or cathodic protection, the wall thickness shall be increased a minimum of 0.063 inch greater than the minimum thickness shown above.

11.4 INSTALLATION: Unless otherwise specified or directed, encasement shall be welded steel pipe installed by boring and jacking. Contractor shall submit complete drawings, details and other data of the proposed method of construction, materials and equipment to the Engineer and department of transportation or railroad for review. No open excavation will be allowed within the limits of the encasement without the Engineer's approval. All sheeting, shoring, and bracing shall be provided as necessary for the satisfactory and safe performance of the work and will be subject to the approval of the Engineer and in accordance with the requirements of the department of transportation or railroad. All work areas shall be maintained in a suitable dry condition at all times, with methods of dewatering, draining, pumping and disposal of water subject to approval of the Engineer and department of transportation or railroad.

11.4.1 Boring and Jacking Encasement: Encasement pipe shall be installed by boring and jacking with welded joints, to the required lines and grades. The Contractor shall bear the cost of any corrective action required to meet the line and grade requirements shown on the plans. Welding shall conform to the requirements of the American Welding Society and the American Railway ENGINEERING Association for this type of work. The distance to which boring is carried ahead of the pipe shall be not more than is absolutely necessary for installation purposes and will be subject to approval of the Engineer. The work shall be performed so that no voids occur in the earth surrounding the pipe and so that ground settlement adjacent to and within the limits of the pipeline crossing is eliminated. If voids occur or are encountered outside the pipe, grout holes shall be drilled at 10-foot centers in the top of the encasement pipe and the voids filled with 1:3 Portland cement grout applied at sufficient pressure to fill the voids and prevent embankment settlement.

A. If it becomes necessary to abandon an incomplete or unacceptable bore, the abandoned encasement shall be capped and filled completely with 1:3 Portland cement grout. Abandonment procedures shall be completed prior to moving to another boring location. All costs in connection with an abandoned bore, including the construction cost and capping and filling costs, shall be the Contractor's expense.

11.4.2 Carrier Pipe Installation: Carrier Pipe shall be installed in a manner to provide proper line and grade. Carrier pipe shall be adequately restrained with mechanical restraints to prevent movement,

including floatation. After the carrier pipe is installed, each end of the encasement shall be sealed with rubber casing boots with stainless steel straps.

11.4.3 Casing Spacers: Casing spacers shall be prefabricated stainless steel with polyethylene insulators capable of being securely fastened to the carrier piping. All attaching hardware shall be stainless steel. Spacing of casing spacers shall be per manufacturer's specifications, but not less than two supports per joint of carrier pipe. Refer to Chapter 8 for list of approved spacers.

11.4.4 Casing End Plugs: Casing ends shall be sealed with neoprene rubber boots securely fastened to the casing and carrier pipe with stainless steel bands. Refer to Chapter 8 for list of approved casing end plugs.

11.4.5 Appurtenances: Vents and drains shall be provided where indicated on the plans. Vents shall consist of pipe as noted, and shall be located so as not to interfere with highway maintenance or be concealed by vegetation. Drains shall be provided at the lower end and shall consist of stone as noted on the plans.

12 HORIZONTAL DIRECTIONAL DRILLING

12.1 SCOPE: Installation of utility pipelines by horizontal directional drill under highways, water bodies/wetlands, and railroads shall be as shown on the drawings and as specified herein.

12.2 GENERAL

12.2.1 Products with surfaces intended to be in contact with the drinking water shall be certified and listed in accordance with NSF 61 for potable drinking water and bear the NSF seal on each section of pipe.

12.2.2 Investigate the subsurface conditions at the crossing location.

12.2.3 Provide water for the drilling process.

12.2.4 Handle pipe in accordance with manufacturer's recommendation.

12.2.5 Utilize pipe rollers during layout and pull-back operations to prevent excess sagging of the pipe. Pipe rollers shall be of sufficient size to fully support the weight of the pipe while being hydro-tested before installation and during pull-back operations.

12.2.6 Directional drilling procedure shall include provisions to guard against electrical shock such as ground mats, ground cables, hot boots and gloves. Drilling equipment shall include an alarm system capable of detecting electrical current as it nears electrical lines.

12.2.7 Maintain log sheets for drilling fluid pressure, flow rate, drill thrust pressure, pull-back pressure, drill head torque and drill head location plots at 20-foot intervals.

12.2.8 Drilling fluids shall be inert and of no risk to the environment. No fluid will be utilized that does not comply with permit requirements and environmental regulations. Drilling fluid should remain in the bore hole to increase the stability of the surrounding soil and to reduce the drag on the pulled pipe.

12.3 QUALITY ASSURANCE

12.3.1 Pipe manufacturer shall have an established quality control program responsible for inspecting and testing incoming and outgoing material.

12.3.2 Manufacturers shall maintain permanent Quality Control (QC) and Quality Assurance records.

12.3.3 Contractor shall employee personal that have a minimum of ten (10) similar installations of FPVC by horizontal directional drilling as appropriate for the installation. Fusing technician shall be qualified by the pipe supplier to install the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

12.3.4 Directional drilling method shall be mechanical with fluid assistance. Pneumatic, water jetting, jacking, and boring methods will not be permitted.

12.3.5 Install pipe by directional drilling in accordance with the best industry practice, manufacturer's recommendations and the Contract Documents.

12.3.6 Equipment used to monitor pull-back pressure shall be calibrated prior to each installation.

12.3.7 Pipe and fusion services shall be warrantied for a minimum of one year from date of acceptance.

12.4 MATERIALS

12.4.1 Fusible Polyvinylchloride Pipe

A. Fusible polyvinylchloride pipe shall conform to AWWA C900. Testing shall be in accordance with AWWA standards.
B. Pipe shall be DIPS standard dimensions with a minimum pressure rating of 235 psi (DR18) and the size as indicated on the Drawings.
C. Piping shall be made from a PVC compound conforming to cell classification 12454 per ASTM D1784.
D. Fusible polyvinylchloride pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
E. Fusible polyvinylchloride pipe shall be manufactured in standard 40-foot nominal lengths.
F. Fusible polyvinylchloride pipe shall be green in color for wastewater use.
G. Pipe generally shall be marked per industry standards, and shall include as a minimum:
    1. Nominal pipe size
    2. PVC
    3. Dimension Ratio
    4. Pipe legend or stiffness designation, or AWWA pressure class
    5. AWWA Standard designation number
    6. Extrusion production-record code
    7. Trademark or trade name
    8. Cell Classification 12454 and/or PVC material code 1120 may also be included.
H. Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

12.5 DIRECTIONAL DRILLING

12.5.1 General

A. Drill pilot hole along the path shown on the Drawings to the following tolerances:
    1. Vertical Location - Plus or minus 1 foot
    2. Horizontal Location - Plus or minus 6 feet.
B. At the completion of the pilot hole drilling, provide a tabulation of coordinates referenced to the drilled entry point which accurately describes the location of the pilot hole.
C. Perform reaming diameter to 1.25 to 1.5 times the outside diameter of the pipe being installed. Prepare pipe to facilitate connection to the remainder of the pipeline being installed.
D. Use care to protect the pipe from scarring, gouging, or excessive abrasion.

E. Method of connection between HDD pipe and other pipe materials shall be as indicated on the Drawings.
F. Pipe shall be deflected within the tolerances as provided by the pipe manufacturer.
G. For drills under structural conditions (i.e., roadways), perform reaming diameter to 2 inches maximum greater than outside diameter of the pipe being installed. If larger size is necessary, provide statement from North Carolina Professional Engineer stating that "an overbore in excess of 2-inches will arch and no damage will be done to pavement or sub-grade".

12.5.2 Fusible Polyvinylchloride (FPVC) pipe

A. General
1. Installation guidelines from the pipe supplier shall be followed for all installations.
2. The fusible polyvinylchloride pipe will be installed in a manner so as not to exceed the recommended bending radius guidelines.
3. Where fusible polyvinylchloride pipe is installed by pulling in tension, the recommended maximum safe pulling force, established by the pipe supplier, shall not be exceeded

B. Handling and Storage
1. Pipe shall be offloaded, loaded, installed, handled, stored and stacked per the pipe supplier's guidelines. These guidelines include compliance with the minimum recommended bend radius and maximum safe pull force for the specific pipe being used.
2. The general best practices of the industry per AWWA M23 shall also be observed.

C. Fusion Joints
1. Fusible polyvinylchloride pipe lengths shall be assembled in the field with butt-fused joints. The fusion technician shall follow the pipe supplier's guidelines for this procedure. All fusion joints shall be completed as described in this specification.

D. Fusion Process
1. Fusible polyvinylchloride pipe will be handled in a safe and non-destructive manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.
2. Fusible polyvinylchloride pipe will be fused by qualified fusion technicians holding current qualification credentials for the pipe size being fused, as documented by the pipe supplier.
3. Pipe supplier's procedures shall be followed at all times during fusion operations.
4. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine, which utilizes a current version of the pipe supplier's recommended and compatible software.
5. Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. This includes requirements for safety, maintenance, and operation with minor modifications made for PVC.

E. Installation:
1. Pull heads for use with FPVCP
   a. Pipe pull heads shall be utilized that employ a positive through-bolt design assuring a smooth wall against the pipe cross-section at all times.
   b. Pipe pull heads shall be specifically designed for use with fusible polyvinylchloride pipe and shall be as recommended by the pipe supplier.
2. Pipe shall be fused prior to insertion, if the site and conditions allow, into one continuous length.
3. The contractor shall handle the pipe in a manner that will not over-stress the pipe prior to insertion. Vertical and horizontal curves shall be limited so that the pipe does not bend past

the pipe supplier's minimum allowable bend radius, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced.

4. The pipe entry area shall be graded as needed to provide support for the pipe and to allow free movement into the bore hole.
   a. The pipe shall be guided into the bore hole to avoid deformation of, or damage to, the pipe.
   b. The fusible polyvinylchloride pipe may be continuously or partially supported on rollers or other Owner and Engineer approved friction decreasing implement during joining and insertion, as long as the pipe is not over-stressed or critically abraded prior to, or during installation.
   c. A swivel shall be used between the reaming head and the fusible polyvinylchloride pipe to minimize torsion stress on the pipe assembly.
5. Buoyancy modification shall be at the sole discretion of the Contractor and shall not exceed the pipe supplier's guidelines in regards to maximum pull force or minimum bend radius of the pipe. Damage caused by buoyancy modifications shall be the responsibility of the Contractor.
6. Once pull-back operations have commenced, the operation shall continue without interruption until the pipe is completely pulled through the bore hole.
7. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, or movement and distortion of surface features. Any damages caused by the Contractor's operations shall be corrected by the Contractor.
8. Once installed, the contractor shall make connections to the open cut pipe by means of mechanical joint fittings, taking care to correct horizontal or vertical alignment with the fittings rather than the Fusible PVC.

12.6 CLEAN UP

12.6.1 Upon completion of the pipe installation, backfill the drilling pit and receiving pit as specified.

12.6.2 Properly remove and dispose of drilling fluid and spoil material in compliance with relative environmental regulations, right-of-way and workspace agreements under permit requirements. Drilling fluid returns at locations other than the entry and exit points shall be minimized. Immediately clean up drilling fluid that inadvertently surfaces.

12.6.3 Using available technology, Contractor shall provide a certified as-built drawing with profile indicating the depth from existing grade to the top of HDD pipe from the beginning to the end of the HDD construction.

12.7 FIELD TESTS

12.7.1 Prior to Installation Contractor shall performs a low pressure air test on the pipe line per the Wastewater System Standards & Specifications (Paragraph 2.1.4.C) or Water System Standards & Specifications (Paragraph 19.4) to determine the integrity of the joints. This shall not be considered an alternative to the testing required after installation.

12.7.2 Following installation test pipe in accordance with pressure testing in Wastewater System Standards & Specifications (Paragraph 2.3.4) or Water System Standards & Specifications (Paragraph 19.5).

13 ROADWAY REPAIR AND RESURFACING

13.1 AGGREGATE SURFACING: This section covers gravel or crushed stone surfacing for roads, drives and parking areas as shown on the plans and as specified herein.

13.1.1 Materials:

A. Drainage Structures and Pipe Material shall conform to the requirements shown on the plans and shall be as specified in other sections.

B. Surfacing shall consist of crushed stone or gravel reasonably free from soft pieces, disintegrated particles, and vegetable matter. The material shall generally conform to the requirements of the NCDOT, and shall be graded as follows:

Percent by Sieve Size Weight Passing

Sieve Size	Percent Passing
2 in.	100
1-1/2 in. (SC)	95-100
1 in.	70-100
½ in.	50-80
No. 4	30-55
No. 30	12-31
No. 200	6-15

13.1.2 Construction: Surfacing shall be graded to subgrade and compacted as specified in Section 7. Surfacing shall be finished by fine grading to the required lines, grades and sections, and by recompacting the subgrade with heavy rollers. Surfacing shall be graded to drainage structures.

A. Drainage Structures and Pipe shall be properly installed at the locations shown on the plans.

B. Surfacing shall be installed in accordance with all applicable provisions of the appropriate section of the NCDOT Standard Specifications. Surfacing shall be placed to a compacted thickness of 6 inches, unless otherwise noted.

13.1.3 Completion: Surfacing shall be fully completed, dressed off, and left in good condition at completion of the work.

13.2 CUTTING AND REPLACING PAVEMENT

This section covers cutting and replacing pavement for installation of utilities and resurfacing of existing pavement as shown on the plans and as specified herein. Existing pavement to be cut for installation of pipe or other utilities shall be replaced with new base and pavement as specified below.

13.2.1 Cutting Pavement: Pavement shall be neatly cut to a straight edge prior to trenching, with the method of cutting subject to approval of the Engineer. Pavement shall be cut 12 inches wider than the excavated area on each side. Ragged and irregular edges shall be redone. Concrete pavement shall be sawed with suitable concrete saw cutting equipment.

13.2.2 Trench Backfilling: Backfilling under pavement shall be as specified in Section 7. Base for pavement shall be crusher run stone or flowable fill per NCDOT requirements for all secondary highways and non-highway streets, and reinforced concrete for all primary highways. Base shall be placed in accordance with plan or encroachment permit details. Base width shall be as shown on the plans or encroachment permits for the various types of pavement cuts.

A. Crusher run stone shall be graded 1-1/2 inches and down, with fines being added if necessary. Stone shall be well mixed and compacted by tamping and rolling so as to prevent settlement. Crusher run base material shall be placed at the same time that the trench is backfilled. Backfilling to the top of the trench, to be cut out and replaced with base material at a later date, will not be allowed.

B. Base for highway pavement and adjacent drives shall be 8 inches of crusher run stone, stabilized with 5% Portland cement. Base shall be thoroughly mixed prior to compaction.

C. Base for non-highway pavement and adjacent drives shall be 8 inches of crusher run stone, without the addition of cement. Base for secondary roadways shall be flowable fill meeting NCDOT specifications.

D. Concrete base shall consist of 8 inches of concrete, reinforced with No. 4 steel bars placed at 8 inches on center in the transverse direction and No. 4 tie bars in the longitudinal direction. Concrete shall be designed to produce a compressive strength of 3000 psi at 28 days. Design of mix and source of supply will be subject to approval of the Engineer.

13.2.3 Pavement Replacement: Pavement shall be replaced with bituminous plant mix pavement, except that existing concrete pavement shall be replaced with 8 inches of Portland cement concrete. Pavement shall conform to the applicable NCDOT specifications for each type.

A. Pavement shall be repaired within the same week that it is cut. If inclement weather delays pavement replacement, Contractor shall not cut additional pavement until he has notified BRWS H2GO and received specific permission and instructions.

B. For bituminous pavement, the entire area to be resurfaced (including edges of existing pavement) shall be tack primed with an acceptable asphalt tack coat just prior to placing the new pavement. New pavement surfaces shall be smooth, true to grade and shall provide a smooth transition with existing surfaces. All settlement and damage occurring during construction and the warranty period shall be repaired by the Contractor.

C. All work on State Highways shall be done in strict accordance with state department of transportation requirements. The contractor shall familiarize himself with all such requirements. He shall obtain from the Owner a copy of all required encroachment permits and shall conform to all requirements and stipulations therein. In case of conflict between the plans and encroachment permits, the encroachment permits will govern.

13.3 RESURFACING OF EXISTING PAVEMENT

Work consists of the resurfacing of existing pavement as indicated on the plans and as specified herein. Unless otherwise specified, all work shall be in accordance with applicable state department of transportation specifications.

13.3.1 General: Proper surface drainage shall be maintained at all times, especially at private driveways. Concrete curbs and other items, where damaged, shall be repaired to the satisfaction of BRWS H2GO and to match existing. Manhole covers and valve boxes shall be raised as required prior to resurfacing. All potholes and other large depressions shall be filled to the satisfaction of BRWS H2GO.

13.3.2 Preparation: Existing pavement shall be thoroughly swept and scraped clean, free from dust and foreign material, and so maintained until the bituminous mixture is laid.

13.3.3 Leveling Course: Where the surface of existing pavement is irregular, it shall be brought to uniform contour by leveling with a bituminous mixture. The leveling course shall be thoroughly compacted until it conforms with the surrounding surface.

13.3.4 Tack Coat: A tack coat shall be applied to existing pavement and to the leveling course before the surface course is laid. Tack coat shall be asphalt cement, emulsified asphalt, or rapid curing type cutback asphalt. Contact surfaces of curbs, manholes and other items shall be painted with asphalt cement before the bituminous mixture is placed against them.

13.3.5 Surface Course: Surface course shall be hot laid asphaltic concrete placed over the leveling course to a compacted thickness of 1-1/2 inch. After compaction, the pavement surface shall be smooth and true to the established crown and grade. Defects shall be neatly cut out and replaced to the satisfaction of BRWS H2GO. Sections of new pavement shall be protected from traffic until they have properly hardened. All settlement and damage occurring during construction and the warranty period shall be repaired by the Contractor.

14 GRASSING AND SITE RESTORATION

14.1 SCOPE: This section covers cultivating, fertilizing and planting grass on all pipeline rights-of-way, and on all fill slopes, cut slopes, graded areas and disturbed areas as shown on the plans or as directed by BRWS H2GO.

14.2 GENERAL

A complete permanent grass cover of all areas to be grassed shall be obtained before these areas are acceptable. All such areas shall be seeded within 30 days after completion of grading. All eroded areas shall be filled and completely covered with grass before being acceptable. An acceptable grass cover is defined as a minimum 2-inch stand with bare spots less than 1 square foot after first mowing. All grass shoulders of NCDOT Roadways, shall be repaired and re-grassed in accordance with NCDOT requirements.

14.3 FERTILIZING AND GRASSING

14.3.1 General: Material shall be acceptable to the Engineer prior to use. Fertilizer shall be delivered in undamaged waterproof bags showing weight, chemical analysis and manufacturer. Lime shall be delivered in bags with a tag or label showing brand or trade name, magnesium carbonate equivalent and other pertinent information. Seed shall be delivered in original undamaged containers showing name of seed, net weight, percentage of pure seed and germination, origin, and date of packaging.

A. Fertilizer: Commercial type 4-12-12 or equivalent, conforming to state law.

B. Lime: Agricultural grade ground limestone, containing at least 34% magnesium carbonate.

C. Seed: Fescue, Bermuda or Pensacola Bahia, as required by seasonal or soil conditions, with at least 90% purity and 80% germination, conforming to state law.

14.3.2 Planting: Topsoil shall be as specified in Chapter 4.

A. Areas to be grassed shall be cultivated to a depth of 4 inches by mechanical tiller, with all clods or clumps broken up and foreign material and debris removed.

B. Fertilizer shall be applied at a minimum rate of 1000 lb./acre, and lime applied at a minimum rate of 2000 lb./acre. Fertilizer and lime shall be thoroughly incorporated into the top 3 to 4 inches of soil, and the surface raked smooth before applying seed. Fertilizer and lime may be applied in one operation.

C. Seed shall be applied evenly by a commercial applicator and raked in lightly. Seed shall not be sown immediately following rain, when the ground is too dry, or during windy periods. Seeded areas shall be compacted and dressed smoothly with a roller or other means acceptable to the Engineer. Hydro seeding is an acceptable method of grassing. Minimum application rates of seed shall be as specified below; heavier applications shall be made where necessary to provide an acceptable cover.

Seed Type	Application Rate
Fescue	200 lb./acre
Bermuda	40 lb./acre
Pensacola Bahia	40 lb./acre

D. Immediately after seeding, the area shall be sprayed with asphalt emulsion or covered with a suitable erosion control fabric or other acceptable material. Asphalt emulsion shall be a type specifically designed for mulching of seeded areas. Erosion control fabric shall be manufactured of materials which are biodegradable within 4 to 8 months of outdoor exposure and shall be applied in accordance with the manufacturer's recommendations.

E. After seeding is completed, seeded areas shall be watered as necessary until an acceptable grass cover is obtained.

14.3.3 Temporary Cover: If areas to be grassed are ready for seeding at a time inappropriate for establishing the permanent grass cover, a temporary cover shall be provided for protection of such areas until such time that the permanent cover can be established. At the appropriate time, the Contractor shall return to the site and provide the permanent cover as specified above.

A. Temporary cover shall be provided as specified above for the permanent cover, with the following exceptions:

1. Fertilizer shall be applied at one-half the rate specified for the permanent cover.

2. Seed shall be Rye or Sudan Grass applied at rates to provide an adequate and acceptable temporary cover.

B. After temporary seeding is completed, the seeded areas shall be watered until an acceptable grass cover is obtained.

14.3.4 Maintenance: During the period of the guarantee, the Contractor shall repair all damage due to erosion and other causes and shall maintain all grassed areas in an acceptable condition. During the maintenance period, grass shall be mowed at regular intervals and watered as required to prevent grass and soil from drying out.

A. Maintenance instructions shall be furnished to the Owner, and shall include cutting method and maximum grass height, and types, application frequency and recommended coverage of fertilizer and lime.

15 GENERAL WARRANTY

15.1 The General warranty of workmanship and material shall be signed and returned to BRWS H2GO upon completion of final as-builts and deeds of dedication. Once this has been submitted and accepted the one-year period of warranty begins.