

***FULTON COUNTY DEPARTMENT
OF PUBLIC WORKS***



**DESIGN AND CONSTRUCTION STANDARDS
FOR
NON-POTABLE, REUSE WATER LINES**

2005

(Edited October, 2006 for R002 Bell Road Reuse Water Main Extension – Phase I)

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ARTICLE I

PURPOSE

- 1.1** These standard specifications are intended to serve the following purposes, among others:
 - 1.1.1** To protect and promote the health, safety, and general welfare of the residents of Fulton County.
 - 1.1.2** To assure the adequate provision utilities, and other facilities and services to new and existing land developments in conformance with public improvement standards and regulations of Fulton County, Georgia.

ARTICLE II

DEFINITIONS

2.1 PURPOSE

2.1.2 Words not defined herein shall be construed to have the meaning given by Webster's New Collegiate Dictionary, tenth edition.

2.2 DEFINITIONS

2.2.1 Unless otherwise expressly stated, the following terms shall have the meaning herein indicated.

2.2.1.2 Board of Commissioners - The Board of Commissioners of Fulton County, Georgia.

2.2.1.3 Department - The Department of Public Works, Fulton County, Georgia.

2.2.1.4 Director - The Director of the Fulton County Department of Public Works, or his/her designee.

2.2.1.5 Driveway, access or shared - A paved area used for ingress or egress of vehicles, and allowing access from a street to a building, other structure or facility.

2.2.1.6 Driveway, Single-family Residential, access or shared (Private Drive) - A paved or unpaved area used for ingress or egress of vehicles which allows access from a street to a building, other structure, or facility for no more than three (3) single-family residential lots.

2.2.1.7 Easement - A grant by the property owner for use by the grantee of a portion of land for specified purposes.

2.2.1.8 Engineer – A duly recognized Professional Engineer possessing a current registration by the State of Georgia Secretary of State and representing practice in the areas of potable water and non-potable reuse water distribution system design and construction.

2.2.1.9 Land Disturbance Permit - An official authorization issued by the Department of Environment and Community Development, Fulton County, Georgia, allowing defoliation or alteration of a site or the commencement of any construction activities, including, but not limited to, clearing, grubbing, dredging, grading, excavating, transporting, and filling of land, but not including agricultural practices as defined in the Official Code of Georgia Annotated 1-3-3 (O.C.G.A.).

2.2.1.10 NPRL – Non-potable reuse line. A reuse or reclaimed water pipe or pipeline.

2.2.1.11 Plan, Conceptual - A drawing that shows the proposed layout of a non-potable reuse water project in sufficient detail to indicate its workability and feasibility, but is not in final form for recording, pursuant to these specifications. The conceptual plan is the first stage in securing a Land Disturbance Permit.

2.2.1.12 Standard Details - Illustrative minimum standards for non-potable reuse distribution activities in accordance with these specifications. These standards shall not supersede more restrictive prudent design requirements or good engineering practices as applied to specific situations on a case-by-case basis. All construction shall meet or exceed the Fulton County minimum standards.

2.2.1.13 Street, public - A dedicated and accepted right-of-way for vehicular traffic.

ARTICLE III

GENERAL DESIGN PROCEDURES

3.1 **SYSTEM EXPANSION AND REPLACEMENT/IMPROVEMENT PROJECTS**

This section outlines procedures for designs performed by the Contractor's Engineer under a direct contract with Fulton County.

- 3.1.1 All reuse water projects will require a Land Disturbance Permit that must be issued through the Department of Environment and Community Development (ECD). A list of required submittals may be obtained through ECD.
- 3.1.2 The Engineer shall attend a Concept Review meeting with the Fulton County Project Manager to discuss project scope and parameters.
- 3.1.3 Five (5) full size copies and one (1) 11" x 17" copy of the Concept Plans shall be submitted for all proposed projects requiring a Land Disturbance Permit. All plans must be stamped by a Georgia Registered Professional Engineer. The submittals shall also be submitted in a digital format as described in Article 5. The Engineer shall conduct a field review of both sides of the road(s) for which the proposed re-use line is to be installed.
- 3.1.4 The Engineer shall develop plans of the project area showing the road centerline, edge of pavement, all side streets, creek crossings, large rock outcroppings, existing sanitary sewer manholes, existing water lines (potable and NPRL), existing storm drains and headwall structures, exceptional trees (12" or greater in diameter, ornamental or obviously cared for as ornamental by property owner), densely wooded areas or areas which would require substantial clearing, linear footage of sod lawns, existing driveways (indicating types, i.e., concrete, asphalt, stone, etc.), existing water meters, existing fences within and adjacent to the rights-of-way, power poles within the rights-of-way, existing fire hydrants and valves, and any other structures located within or adjacent to the rights-of-way which may impact the proposed construction.
- 3.1.5 The Engineer shall contact all utility companies, including but not limited to, water, gas or petroleum pipelines, natural gas, buried electric lines, buried phone cables, fiber optic lines, etc. to obtain locations of those utilities within the project limits of both sides of the rights-of-way, including side streets. (NOTE: Although the "One-Call" Utility Protection Center provides notification service to subscribing utilities for "design" locates, individual notification is also required by this Department to ensure that all available information concerning other utilities are included on the project design.)
- 3.1.6 The Engineer shall place property lines and street numbers, land lot and district lines on the plan. If the design contract includes right-of-way research, place all existing rights-of-way and prescriptive easements on the plan.
- 3.1.7 The Engineer shall meet with the Fulton County Project Manager to review plan

and determine side of road on which the main is to be installed. Fulton County's normal location is the north side of east-west streets, and the west side of north-south streets, however, field conditions and obstacles identified on the field review may dictate a deviation from this standard. **NOTE: The non-potable reuse line (NPRL) location must maintain 3'-feet horizontal separation from existing parallel water mains or sewage collection lines, and 18-inch vertical separation from any existing perpendicular crossing of sanitary sewer mains. A minimum of 18-inch vertical separation shall be provided between the bottom of any potable water line and the top of any NPRL.**

- 3.1.8 The design of the proposed NPRL shall include horizontal alignment, all creek and bridge crossings, all tie-ins, future stubs, fire hydrants and valves, and abandonment of existing water lines (potable or NPRL), if any.
- 3.1.9 Digital plans created from a county-furnished ortho-photo generally do not require any field surveying work. The Fulton County Project Manager must authorize any required field surveying not in the design contract in writing. All approved surveying work must include two GPS coordinates, tying in with the County's coordinate system.
- 3.1.10 Prepare any required easement plats.
- 3.1.11 Submit a final proposed design to Fulton County for review.
- 3.1.12 Upon return of the proposed design make any changes noted and submit two (2) additional copies to Fulton County for approval.
- 3.1.13 Prepare submittal package, including any required drawings, plans, or details, for application of Ga. D.O.T., or railroad permits, or any other necessary permit applications and submit to Fulton County for processing.
- 3.1.14 Provide the following to Fulton County for bidding purposes:
 - 1. 3 sets of reproducible copies of the final approved design and a digital copy of the design file on a CD.
 - 2. Materials list and labor items list using cost data furnished by Fulton County.
 - 3. A project cost estimate in Microsoft Excel on a CD.
 - 4. A bid summary in Microsoft Excel on a CD.
- 3.1.15 If included in the design contract, perform the following:
 - 1. Attend bid opening and prepare bid tabulation in the format to be provided by Fulton County and submit to the Fulton County Project Manager.

2. Act as advisor and answer any questions regarding design during the construction phase.
3. Prepare and submit to Fulton County four (4) hard copies of as-built drawings and digital format as per Article V.

3.2 PRIVATE DEVELOPMENT/SUBDIVISION PROJECTS

This section outlines procedures for designs performed by an Owner/Developer's Engineer for private developments/subdivisions.

3.2.1 All water re-use projects will require a Land Disturbance Permit that must be issued through the Department of Environment and Community Development. A list of required submittals may be obtained through ECD.

3.2.2 The Engineer shall attend a Concept Review meeting with the Fulton County Project Manager to discuss project scope and parameters.

Five (5) full size copies and one (1) 11" x 17" copy of the Concept Plans shall be submitted for all proposed projects requiring a Land Disturbance Permit. All plans must be stamped by a Georgia registered Professional Engineer. The submittals shall also be submitted in a digital format as described in Article 3.

3.2.3 The design of the proposed NPRL shall include horizontal alignment, all creek and bridge crossings, all tie-ins, future stubs, fire hydrants and valves, and abandonment of any existing water mains, if necessary. Fulton County's required location for water mains within private development/subdivisions is on the north side of east-west streets, and the west side of north-south streets. **NOTE: The non-potable reuse line (NPRL) location must maintain 3'-feet horizontal separation from existing parallel water mains or sewage collection lines, and 18-inch vertical separation from any existing perpendicular crossing of sanitary sewer mains. A minimum of 18-inch vertical separation shall be provided between the bottom of any potable water line and the top of any NPRL.**

3.2.4 If the proposed development does not have an existing NPRL of sufficient capacity at the project entrance, the engineer shall design a NPRL of a size and source specified by Fulton County, in accordance with Fulton County design criteria.

3.2.5 Prepare submittal package, including any required drawings, plans, or details, for application of Ga. D.O.T. or railroad permits, or any other necessary permit applications and submit to Fulton County for processing.

- 3.2.6 Any subdivision which is submitted and approved as one project must either be constructed as one project, or if subsequently phased out to be constructed in multiple phases or units, be resubmitted and receive approval for each phase or unit individually prior to any further construction by Fulton County. In the instance of multiple phases or units, separate construction permits must be obtained for each phase or unit.
- 3.2.7 Record drawings (as-builts) must be submitted and approved before a project can receive final acceptance, and/or Certificates of Occupancy.
- 3.2.8 As-built record drawings must be sharp, clear, clean, legible, and suitable for microfilming and filing.
- 3.2.9 As-built record drawings shall include a site plan and any supplemental or shop drawings as may be required by Fulton County.
- 3.2.10 The Engineer/Developer must submit, for approval, four (4) sets of as-built record drawings and digital copies as per Article V.
- 3.2.11 Record Drawings must be stamped by a Professional Engineer registered in the State of Georgia.

ARTICLE IV

DESIGN CRITERIA

4.1 **PROPOSED NON-POTABLE REUSE LINE (NPRL)**

- 4.1.1 Fulton County's standard location for a NPRL is on the same side of the street as the potable water main, between the potable water main and the right of way.
- 4.1.2 For subdivisions, the proposed NPRL shall be located on the north side of east-west streets, and on the west side of north-south streets.
- 4.1.3 For existing county roads, the proposed NPRL will generally be located 5' inside the right-of-way. For existing Ga. D.O.T. roads, the proposed NPRL **must** be located 5' inside the right-of-way. Unusual circumstances such as embankments, obstructions, other utilities, etc. may warrant deviation with written approval.
- 4.1.4 For private developments/subdivisions the NPRL shall be located 9' from the back of the curb.
- 4.1.5 For non-subdivision streets, the side of the road the proposed NPRL will be located on may be primarily determined by the location of any existing lines to be tied into at the beginning and/or end of the project.
- 4.1.6 For non-subdivision streets, the location may also be determined by existing rights-of-way, or lack thereof. The NPRL must be installed within deeded rights-of-way. Installations within "prescriptive" easements will not be permitted.
- 4.1.7 For non-subdivision streets, generally avoid designing the location on the same side of the road as the gas lines. In projects where any existing gas lines have "active" cathodic protection for corrosion prevention, the NPRL **must** be designed on the opposite side of the road, and may require additional protective measures as specified by Fulton County.
- 4.1.8 For non-subdivision streets, if none of the above apply, then design the NPRL for the side of the road that has the fewest conflicts, i.e. rock outcroppings, trees, side roads, fences, structures, involved landscaping, embankments, prescriptive easements, etc. **NOTE: The non-potable reuse line (NPRL) location must maintain 3'-feet horizontal separation from existing parallel water mains or sewage collection lines, and 18-inch vertical separation from any existing perpendicular crossing of sanitary sewer mains. A minimum of 18-inch vertical separation shall be provided between the bottom of any potable water line and the top of any NPRL.**
- 4.1.9 The proposed NPRL shall be shown on the plans as solid lines.

- 4.1.10 The existing NPRL shall be shown as dashed lines.
- 4.1.11 All existing County road crossings shall be shown to be bored, and shall be noted as follows: **"ALL COUNTY ROAD CROSSINGS TO BE BORED WITH STEEL CASING UNLESS OTHERWISE APPROVED BY THE FULTON COUNTY DEPARTMENT OF PUBLIC WORKS, TRANSPORTATION DIVISION PRIOR TO CONSTRUCTION"**. All Ga. D.O.T. roads will be bored with steel casing.
- 4.1.12 All NPRLs owned and maintained by Fulton County shall be a minimum pipe size of 4". If adequate volumes for flow requirements, and pressures are not available at the point of connection, a larger main and/or additional improvements may be required. Determination of volume or pressure inadequacy will be hydraulically modeled and calculated by developer's Engineer.
- 4.1.13 Standard depth of cover is four (4) feet and shall not exceed five (5) feet in depth unless authorized by Fulton County. In the event the shoulder of the roadway is below the elevation of the edge of pavement, then a minimum of four (4) feet of earth cover is to be maintained at all times.

4.2 VALVES

- 4.2.1 In-line valves are to be generally located every 1,000 feet, and are to be located at intersections in such a manner to enable isolation of various streets within the development without shutting down adjacent streets.
- 4.2.2 For future stubs, the valve is to be located approximately 20 feet (one full joint of ductile iron pipe) from the plugged end.
- 4.2.3 All proposed valves 12 inch and larger shall be butterfly valves (except tapping valves). All valves less than 12" shall be resilient seated gate valves.
- 4.2.4 All valves must be marked with a White Drivable marker #CIB-380 (78") inches long (manufactured by Carsonite International) to extend to the valve. The markers are not to protrude the finished surface grade more than (3') feet and no less than (18") inches above the finished grade. There must be a label on both sides of the marker. See drawing R-34 in Appendix A.
- 4.2.5 All NPRL valves will have square valve boxes with the words **RECLAIMED WATER** cast in the lid. All boxes must be painted on the inside and lid with (Pantone 522 or 512 or other shade of purple accepted by Fulton County).

4.3 TIE-INS TO EXISTING NPRL

4.3.1 Tie-ins are usually made as follows:

1. Proposed main is tied straight into existing main using a solid sleeve.
2. Proposed main is tied straight into existing main using a reducer, or other fitting, and a solid sleeve.
3. Proposed main is tied into a tapping valve with a mechanical joint connection.
4. Proposed main is tied directly into an existing main by securing the bell end to the spigot end of a push-on joint

4.4 EASEMENTS

4.4.1 It is the policy of Fulton County that NPRLs are to be installed only in dedicated rights-of-way or dedicated easements. Decisions as to use of easements will be made by Fulton County on a project-specific basis. Generally, use of easements will only be permitted along existing County roads where there is no right-of-way, or there is structural conflict within the right-of-way.

4.5 STATE HIGHWAY D.O.T PERMITS

4.5.1 For any portion of a proposed project that enters a State of Georgia controlled right-of-way, a Ga. D.O.T. permit application is required. This is to be submitted to Fulton County for processing by the Ga. D.O.T. Pages must be 8 ½" X 11", but drawings need not be to scale. All measurements indicated on the permit application must be submitted in metric. Generally, portions of the project design can be reduced in size and matchlined, if necessary, as long as the text is still legible. Compaction notes must be included on every page of the application drawings (see "Georgia D.O.T. Utility Accommodation Policy and Standards"). Application must include four each of the following: plan, profile, traffic control plan, and section from D.O.T. county map.

4.6 DRAWING TEXT

4.6.1 All existing NPRLs shall be labeled for size, material, and Fulton County project reference number(s) under which they were installed. This information can be obtained through Fulton County Records Management Section.

4.6.2 For all side streets and intersections, indicate whether existing NPRLs are one-way fed or, if not, the location of the next in-line valve. This information can be obtained through Fulton County Records Management Section.

4.6.3 Any existing NPRLs to be abandoned as part of the proposed project shall be so noted.

4.6.4 All valves shall reflect the required symbols, labeled as to size and whether gate valve or butterfly valve (GV or BFV), and stationed to the nearest 5-feet.

Manufacturer's name and model number shall be provided on the "as-built" drawings.

4.6.5 Water meter information on existing potable water lines will be provided by Fulton County in an ASCII format, and shall be imported into the drawing file and placed above the respective water meter symbol for account identification.

4.6.6 .1" fonts or larger shall be used for most text. .2" fonts or larger shall be used for road names and rights-of-way.

4.7 LINE WEIGHTS

4.7.1 Proposed water main and right-of-way should be equivalent to a #3 pen.

4.7.2 Existing utilities should be equivalent to a #2 pen.

4.7.3 Edge of pavement, driveways, property lines, fences, etc. should be equivalent to a #1 pen.

4.8 RECORD DRAWINGS (AS-BUILTS)

4.8.1 Record drawings (as-builts) must be submitted to Fulton County before a project can receive final approval, and/or Certificates of Occupancy. (NOTE: In order to avoid delays in the "approval process" of developments/subdivisions, as-built drawings should be submitted as soon as the NPRL installation is complete to allow sufficient time for review).

4.8.2 Record drawings must be sharp, clear, clean, legible, and suitable for microfilming and scanning.

4.8.3 Record drawings shall include a site plan and any supplemental or shop drawings as required by Fulton County.

4.8.4 Four (4) complete sets of record drawings must be submitted by the Engineer/Developer to Fulton County for review and approval along with digital copies as per Article V.

4.8.5 Record drawings must be stamped and signed by a Professional Engineer or Registered Land Surveyor registered in the State of Georgia.

ARTICLE V

DIGITAL FILE FORMAT

NOTE: The following section is mandatory for all entities designing system expansion and replacement/improvement projects under a direct contract with the County or by private developer's engineer to ensure compatibility with the County G.I.S. mapping system.

The following are standards for the formatting of digital data. Fulton County is willing to give DXF files to engineering firms to encourage digital formatted projects (Concepts, Preliminary and, As-Built reviews). If at any time a firm receives files from Fulton County for personal gain and not for the interest of Fulton County, we reserve the right to back charge for those files received and / or eliminate that firm from receiving DXF files from Fulton County at no charge.

FORMAT:

Projects are to be submitted as an AutoCAD .DWG file release 14.

COORDINATE SYSTEM:

In accordance with the Fulton County, Georgia Standards for Digital Mapping Geographic Information Systems AGIS@ the coordinate system used for mapping the County land features and the Water and Sewer Systems facilities will be the Georgia State Plane Coordinate System, Western Zone, 1983 North America Datum and in feet units. Any files submitted to Fulton County for base map, water or sewer updates will use this coordinate system.

GENERAL:

All map files contained in the Automated Mapping System are stored in ArcInfo coverages format. Automated mapping files will be supplied in AutoCAD format upon special request. Base maps are sectioned into 2500 & 5000 square foot tiles. These tiles contain topographical and hydrological features. Water, NPRL, and sewer maps are each sectioned into three (3) separate base files, one for each layer.

DESIGN

DRAWINGS: Product Requirements

1. All files provided to consultants shall be returned to Fulton County in the same format, style and coordinate system as the original files provided to the consultant. The consultant shall, as the Contract Documents specify, provide the final Water and Sewer system as-built drawings in digital format. Projects should be submitted on CD.
2. All sewer facilities and annotations shall be stored in a separate file other than the water, NPRL, or base map features. Similarly, all water facilities and annotations shall be stored in a separate file other than the sewer, NPRL, or base map features. Water, NPRL, and sewer as-built drawings must contain only a single view of the project area, a top or aerial view. Any other views, such

as map inserts, plan and profiles, location maps, etc., must be placed in separate drawings other than the as-builts. When provided for in contract documents, these separate drawings shall be delivered to Fulton County, along with the as-built drawing.

3. All water, NPRL, and sewer features must be placed on the levels/layers specified and must use the specific cells or blocks as provided. No other features should exist on the levels except those specified.
4. All water, NPRL, and sewer features must be snapped together, such that there are no undershoots or overshoots between pipes, manholes, valves, etc. Line features (i.e. pipes) shall not be broken so that text can be placed along the pipe.

For sewer facilities, lines representing sewer mains should run continuously from one manhole to the next. However, lines should not run continuously between several manholes (i.e., a line should not be digitized that runs the entire length of a street if there are more than two manholes along that street). There should be one and only one graphic line per any two manholes.

5. For water or NPRL facilities, all lines representing water mains must start and end at nodes. Nodes are located at points in the water system where the water pressure may change (i.e. change in pipe diameter or material), or where there is a change in direction (i.e. tees, bends crosses, etc.). There should be one (and only one) graphic line per two nodes.
6. Text must be placed beside each facility on the map (i.e. water and sewer), indicating the following information:

Water Main Appurtenances: Item Description (i.e. valves, meters, fire hydrants, etc) Station #

Water Mains: Diameter Material Depth

NPRL Appurtenances: Item Description (i.e. valve, stubs, meters, etc.) Station #

Non-Potable Reuse Lines: Diameter Material Depth

Sewer Manholes: Invert Elevation(s) In Invert Elevation(s) Out
Top Elevation (rim)

Sewer Mains: Diameter Material Lengths and Slopes
Existing and Proposed Ground Elevation

All text information must be placed on the layers designated as Label for each of the facilities (i.e. Manhole Labels are Placed on level two of the sewer maps).

7. No grid shall be present on the map.
8. The coordinate system of the final map must be identical to the coordinate system of the map provided by Fulton County to the consultant at the onset of the project.
9. Plans shall be delivered to Fulton County in 2D (zero Z level) format only.
10. Any user defined layers (i.e. other than 1-63) must be removed from the drawing prior to submission to Fulton County.
11. AutoCAD “shapes” will not be used in the drawing.

Any drawings not conforming to the above requirements, or their supplemental addenda, shall be rejected by Fulton County and returned to the consultant with comments for correction.

ARTICLE VI

CONSTRUCTION INSTALLATION

6.1 PRIOR TO CONSTRUCTION

- 6.1.1 At no time will any Non-Potable Reuse Line construction commence prior to approval of all plans, receipt of any required agreement documents, and issuance of a "NON-POTABLE REUSE LINE CONSTRUCTION PERMIT".
- 6.1.2 Only Fulton County approved contractors may install Non-Potable Reuse Lines.
- 6.1.3 All NPRLs, valves, blow offs, and other appurtenances to be dedicated to or owned by Fulton County shall be installed according to the "approved" design. All field changes must be pre-approved by Fulton County. Contractor must have a set of the "approved" design drawings containing an original Fulton County stamp and a copy of the Design and Construction Standards for Non-Potable, Reuse Water Lines on site at all times.
- 6.1.4 Contractor shall adhere to all Federal, State, County, and local laws, ordinances, and regulations which in any manner affect the conduct of work, including, but not limited to, initiating, maintaining, and supervising all safety precautions and programs in connection with the Work.
- 6.1.5 The Contractor shall fully comply with the applicable requirements of local, State, and Federal agencies in the control and containment of soil erosion, during construction and including post-construction maintenance of erosion control devices.

6.2 EARTH EXCAVATION

6.2.1 Work Included

The Contractor shall clear the site, make all pavement cuts, remove all trees and stumps, remove any fences or other structures necessitated by the work, to install the lines at the grades indicated on the "approved" design, and complete the excavation required for the various pipe lines and structures, including any additional foundation work.

6.2.2 Additional Excavation

It is expected that satisfactory foundations will be found at the elevations indicated on the "approved" design, however, should it be found desirable or necessary to go to additional depth, the excavation shall be continued and then backfilled as directed.

6.2.3 Clearing and Care of Surface Materials

The areas to be excavated shall first be cleared of all paving, trees, walls, fences, sidewalks, stumps, brush, rubbish, and crops, which shall be removed or disposed of in a satisfactory manner. On all lawns and other improved grass areas, the sod shall be carefully removed, kept alive, and replaced after the

backfilling is completed or the identical sod type purchased and replaced. The Contractor shall also remove all spoil from such areas as quickly as possible after the excavation is backfilled, and shall leave the premises in as good a condition as before undertaking the work. Fences, which have been removed, damaged, or broken down, shall be replaced at or before completion of the work, in first class condition.

Topsoil shall be removed to its entire depth from all areas to be excavated or graded. The topsoil shall be piled in designated or approved locations where it will not interfere with construction operations. Topsoil, as stored, shall be reasonably free of subsoil, debris, and stones larger than two (2) inches in diameter. The stored topsoil shall be left in piles to be used for finished grading.

The removal of existing pavement shall be done in accordance with the requirements of the authority within whose jurisdiction such pavement is located.

Whenever the removal of pavements (other than gravel types) is required, the Contractor shall outline the area to be removed by making saw cuts, providing vertical kerfs in straight lines in order to permit removal in a straight line. Should pavement breakage occur beyond the original saw cut, the Contractor will be required to make a new saw cut beyond the furthest point of breakage.

6.2.4 Protection of Trees and Shrubbery

The Contractor shall be responsible for the protection of tops, trunks, and roots of existing trees that are adjacent to, or are to remain within the construction boundaries of the project site, or in parks, lawns, or other improved areas. All trees shall remain and receive protection, if necessary, in areas where there is no excavation or embankment. Existing trees, which may be subject to construction damage, shall be boxed, fenced, or otherwise protected before any work is started. The boxing shall be removed when directed, or at completion of the project. Heavy equipment or stockpiles will not be permitted within branch spread. Interfering branches shall be removed without damage to trunks and all cuts or scars shall be covered with tree paint.

No tree shall be removed unless absolutely necessary for the construction, as directed by Fulton County. On areas beyond construction right-of-way or easements, no trees or shrubbery shall be removed without the written authorization of the property owners and approval of Fulton County. Copies of such written authorization are to be provided to Fulton County prior to any removal.

6.2.5 Excavation Methods

All excavation shall be in open cut unless otherwise indicated on the "approved" design or directed by Fulton County. In general, topsoil may be removed by machine method. Excavation below topsoil may also be performed by machine, but shall be supplemented by such hand dressing or leveling as may be required to conform to lines and grades as given by Fulton County. Material so removed

shall be used in backfill, making embankments, filling low areas, or as otherwise directed.

Hand tool excavation shall be used where necessary to protect existing Works and structures.

All slopes shall be carefully cut or graded by hand to grades required by Fulton County and shall be tamped or otherwise compacted to maintain the material in position.

The final trimming of the bottoms and sides of excavations against which masonry is to be built, shall be done just before concrete is placed.

In open or improved lawn areas, excavation should be done, if possible, utilizing a tractor-mounted backhoe and extreme care should be taken to avoid damage to adjoining lawn areas. In areas not readily accessible by machinery and where excavation is required near existing trees and shrubs, which may be damaged by excavation equipment, the trench shall be excavated using hand tools.

6.2.6 Removal of Water

The Contractor shall pump out, or otherwise remove and properly dispose of any water (including storm water), which may be found or may accumulate, as fast as it may collect in the excavation. This removal is required regardless of the source.

All necessary precautions shall be taken to prevent disturbance at, and to properly drain any areas upon which concrete is to be poured, or upon which pipe is to be laid.

There shall be located at the work site at all times during construction, proper and approved equipment with sufficient capacity for the removal of any water from the work, and in such a manner as not to withdraw sand or cement from any concrete. Contractor is also to insure that removal of any liquids will not interfere with the proper laying of masonry, pipe, or prosecution of any of the required work for the complete construction of the project.

The flow in sewers, drains, gutters, or water courses encountered during the construction shall be adequately provided by the Contractor to ensure these flows do not interfere with the execution of the Work, and are maintained in such a manner as to insure continuity of flow at all times.

Unless otherwise permitted, ground water encountered within the limits of excavation shall be depressed to an elevation not less than twelve (12) inches below the bottom of such excavation. This depression is to be done before pipe laying or concrete work is started and shall be so maintained until concrete and joint materials have attained initial set.

Should sewage or any other odorous liquids be encountered during the work in the excavation, Fulton County shall be immediately notified. Fulton County will then determine if actions by the Contractor have caused the source of the odorous liquids to leak and will promptly notify the appropriate regulatory agencies, if necessary. In addition, Fulton County will instruct the Contractor as to what actions, if any, the Contractor can and cannot perform prior to any directives, which may be issued by the regulatory agencies. Any sewage will be pumped and hauled to a manhole, pump station, or water reclamation facility, as directed by Fulton County. Any other liquids will be properly disposed of as directed by Fulton County and/or any regulatory agencies having jurisdiction.

6.2.7 Sheeting and Shoring

The Contractor shall be responsible for supporting and maintaining excavations as required. This shall include sheeting and shoring the sides and ends of excavations with timber or other supports. If the sheeting, braces, shores, stringers, wailing timbers, or other supports are not properly placed, or are insufficient, the Contractor shall provide additional or stronger supports as may be required, or as directed. The requirement of sheeting or shoring, or of the addition of supports, shall not relieve the Contractor of his responsibility of ensuring their sufficiency.

Trench sheeting shall be left in place until the backfilling has been completed to an elevation not less than twelve (12) inches above the top of the pipe. Unless otherwise ordered by Fulton County, sheeting shall be cut off at the top of the lowest set of bracing and the upper section shall be removed.

Where, in the opinion of Fulton County, the removal of sheeting may endanger the work, such sheeting shall be ordered to be left in place and the tops cut off as directed or as specified in Section 4.11. In removing the sheeting the work shall be done in such a manner as to prevent injurious caving of the sides. All voids left by the sheeting along trenches shall be carefully filled and rammed with suitable tools.

In quicksand or soft ground, sheeting shall be driven to such depth below the bottom of the trench as directed.

6.2.8 Trench Excavation

The maximum width of trench from an elevation of twelve (12) inches above the top of the pipe to the bottom of the trench shall be as indicated on Detail R-5.

Excavation of pipe trenches with sides sloping to the trench bottom shall not be permitted. Should trenches be excavated with more than the specified maximum widths, Fulton County may require the Contractor to furnish concrete cradles or concrete encasement for the pipe.

6.2.9 Length of Trench to be Opened

The length of trench to be opened, or the areas of the surface to be disturbed at any one time, shall be limited by Fulton County with regard both to expeditious construction, and to the convenience, safety, and comfort of citizens directly or indirectly affected by the work. New trenches will not be permitted to be excavated if there are previously excavated trenches that require backfilling, or surface areas that require restoration. In any event, no additional work of any kind will be permitted if there are streets or roadways that require attention to return them to a safe and proper condition. IN GENERAL, NO TRENCH SHALL BE OPENED MORE THAN 150 FEET AHEAD OF PIPE LAYING AND BACKFILLING.

6.2.10 Storage of Materials

All salvageable materials, which may be removed from the site, together with all materials taken from the trenches, shall be stored in an approved, suitable place, or as directed by Fulton County. The Contractor shall be responsible for any loss of or damage to salvageable materials through careless removal or neglectful or wasteful storage of such materials.

In the storing of excavated material, which is to be used as backfill, the Contractor shall exercise care so as to avoid inconveniencing the public. If in the opinion of Fulton County, it is necessary to remove this excavated material from streets, or lots, the Contractor shall be required to do so.

6.3 ROCK EXCAVATION

6.3.1 Work Included

The Contractor shall make the lines and grades as shown on the drawings or as directed, including excavation and removal of all rock and masonry as required, and shall dispose of all excavated materials as specified under Section 4.2, or as directed by Fulton County.

6.3.2 Removing Rock

In removing rock for the placement of masonry, special care shall be taken to excavate it as closely as possible to the required shape and with no projection into the neat outside line of such masonry. The surfaces of all rock foundations shall be sufficiently rough to bond well with the masonry. Before any masonry is built on or against a rock surface, the latter shall be scrupulously free of all dirt, gravel, boulders, ice, snow, or other objectionable substances, including loose fragments of rock.

Unless otherwise directed by Fulton County, rock shall be fully removed at least twenty-five (25) feet in advance of pipe laying, and at least 6" below the bottom of the pipe.

If the use or storage of explosives is required the contractor shall assume all responsibility/liability associated with blasting activities. Blasting shall be conducted so as not to endanger persons or property. Whenever required, or as

ordered by Fulton County, the blast shall be covered with mats or otherwise satisfactorily confined. **ONLY LICENSED EMPLOYEES OR SUBCONTRACTORS WILL BE ALLOWED TO CONDUCT BLASTING ACTIVITIES - PROOF OF SUCH LICENSING MUST BE PROVIDED TO FULTON COUNTY PRIOR TO ENGAGING IN ANY BLASTING ACTIVITIES.**

Explosives shall be used, handled, and stored as prescribed by the laws and regulations of the State of Georgia, and all applicable local laws and regulations pertaining to such. All explosives shall be stored in a safe place at a sufficient distance from the work, so that no damage will occur to any portion of the work should an accident occur relating to the stored explosives.

6.4 FOUNDATION CUSHION

6.4.1 Work Included

The Contractor shall furnish all the materials for and shall properly place at locations where deemed necessary by Fulton County, a cushion or foundation of well compacted crushed stone in order to obtain a firm base on which to build the structures and lay pipes.

6.4.2 Materials

Embedment materials shall be angular graded crushed stone, ¼ inch to ¾ inch in size with no more than 5% passing a No. 8 standard sieve, in accordance with Class I materials as defined in ASTM D2321-72 Section 5.1.1.

6.4.3 Placement

The bedding material shall be placed in the bottom of the trench after the trench has been excavated to an elevation sufficient to permit the placing of not less than six (6) inches, or as directed. The surface of the bedding material shall be screeded to form a uniform support for the pipe and appurtenances. After installing each section of the pipe, additional bedding material shall be placed on either side of the pipe to an elevation consistent with the Class Bedding indicated on the plans or specifications, or as directed by Fulton County. This material is to be well tamped and compacted into place so as to secure a firm, even bearing.

Foundation material shall be placed across the full width of the trench bottom.

6.5 PIPE AND FITTINGS

6.5.1 Work Included

The Contractor shall furnish all materials and shall properly install, adjust, test, and place in continuous operation at the location indicated on the approved plans, or as directed, all push-on ductile iron pipe and ductile iron fittings, all mechanical joint ductile iron pipe and mechanical joint ductile iron fittings, all flanged ductile iron pipe and flanged ductile iron fittings, and all steel carrier pipe

and steel fittings, for the construction of the NPRLs as required for the proper completion of the work. The contractor shall also furnish all labor and equipment necessary and sufficient to relocate existing pipelines where directed.

No work may be started or continued if the Contractor's foreman or job-site representative does not have a complete set of "approved" plans and specifications available at all times on site for reference.

Whenever the work disturbs existing conditions or work already completed, the same shall be restored in as good as or better than the original condition in every detail. All such replacement and repair shall meet with the approval of Fulton County.

It is the intent and requirement of these "Specifications" to ensure an installation, which is complete in every detail, whether or not indicated on the drawings, or specified herein. Consequently, the Contractor shall be responsible for all details, devices, accessories, and special construction which may be necessary to properly furnish, install, adjust, test and place in continuous and satisfactory operation, a complete installation.

Attention is also called to the construction procedure required. The proposed NPRL shall be constructed in complete sections; each section terminating at a valve. As each section is installed, it shall be tested, and upon receipt of a "passed" Inspection Report from the project Inspector, the Contractor shall place the section in service immediately. Reuse water shall be "carried forward" with the construction.

All pipe and fittings shall be color coded as per the general color code requirements listed in the Utility Location and Coordination Council's Uniform Color Code. NPRL main pipe and fittings shall be marked with Pantone 522 or 512 or a shade of purple accepted by Fulton County.

6.5.2 Ductile Iron Pipe

No NPRL shall be less than 4". All pipe shall be ductile iron. Ductile iron pipe shall be in accordance with ANSI A21.50/AWWA C150 and conform to requirements of A21.51/AWWA C151, latest standards. Push-on and restrained joint pipe shall have a minimum rated working pressure of 200 psi. All buried pipe shall be pressure class as follows:

- 4" – 12" Pressure Class 350
- 14" – 20" Pressure Class 250
- 24" and larger – Pressure Class 200
- Pipe wall thickness shall be in accordance to the bury depth as shown on drawings.

- Flange pipe or Victaulic grooved pipe shall be class 53.
- Direct tapping may be used in lieu of service saddles for ¾” and 1” as per AWWA C-800.

6.5.3 Fittings

Mechanical fittings and restrained fittings shall conform to ANSI A21.53/AWWA C153 or A21.10/AWWA C110.

Flanged fittings shall conform to ANSI A21.10/AWWA C110. The AWWA C110 fitting flanges shall have facing and drilling which match AWWA C115 thread-on flanges which also match ANSI B16.1 class 125 flanges except where class 250 are specifically noted.

Fittings shall be available in 4” through 24” sizes and shall be cast from ductile iron in accordance with ANSI/AWWA C153/A21.53 with mechanical joint bells or push-on joint bells. Fittings shall be listed by an approved certifying agency as conforming to the requirements of ANSI/NSF 61. The working pressure shall be 350 PSI. Fittings shall be made in the USA. No foreign fittings shall be allowed. Ductile iron fittings shall be coated with 6-8 mil nominal thickness, fusion bonded epoxy conforming to the requirements of ANSI/AWWA C550 and C116/A21.16

6.5.4 Flanges

Flanged ductile iron pipe twelve inches or less in length (spool pieces), shall have flanges cast solidly to the pipe barrel. Flanges on ductile iron pipe longer than twelve inches in length shall be screw type and attached to a threaded pipe section, and shall be factory fabricated. Pipe threads shall be of such length that, with flanges screwed home, the end of the pipe projects beyond the face of the flange. Flange and pipe shall be faced to give a flush finish to the pipe and flange surface normal to the axis of the pipe. The flanges shall be of such design that flange neck completely covers the threaded portion of the pipe to protect same against corrosion. Flanges on ductile iron pipe and fittings are to be coated with a Pantone 522C or 512C or other shade of Purple accepted by Fulton County.

Flanged fittings shall conform to ANSI A21.10/AWWA C110. The AWWA C110 fitting flanges shall have facing and drilling which match AWWA C115 threaded-on flanges which also match ANSI B16.1 class 125 flanges except where class 250 are specifically noted.

Flanged bolt holes on each end of flanged ductile iron pipe and fittings shall accurately straddle the same horizontal and vertical center lines.

6.5.5 Push-On Joints

Pipe ends (spigot end, bell and socket) for all pipe shall be gauged with suitable gauges at sufficiently frequent intervals to ensure compliance to the standard dimensions of ANSI / AWWA C151/A1.5, latest edition.

Push-on joints shall conform to ANSI A21.11 / AWWA C111 approved Fastite, Tyton, or Belltite or equal. Push-on joints shall be made with gaskets suitably formed of high-quality vulcanized rubber, made to exact dimensions, and in the form of solid rings. Gaskets shall have a durometer hardness of approximately 65 on the large end, which enters the bell first, and approximately 85 on the other, smaller end. Composition of the rubber, its hardness, and other properties, and the design of the gasket recess shall be such that the joint is tight under all ranges from a vacuum up to a maximum rating of 350 pounds per square inch internal liquid pressure.

Sufficient lubricant shall be furnished with each order of pipe to provide a thin coating on both the gasket and the spigot-end of the pipe. Lubricant shall have no deleterious effect on the rubber gasket. Lubricant shall be of such consistency that it can be easily applied to the pipe in either hot or cold weather, and shall satisfactorily adhere to either wet or dry pipe. **ONLY LUBRICANT FURNISHED WITH THE PIPE BY THE PIPE MANUFACTURER SHALL BE USED.**

6.5.6 Flanged Joints

Flange joints shall conform to ANSI A21.11 / AWWA C115. Bolts and nuts shall conform to ANSI A21.11 / AWWA C111. Form flanged joints with through, stud, or cap bolts, as required, of the size and length specified by the manufacturer to thoroughly make up the joint. Use only full-face type, red rubber gaskets one-sixteenth inch thick, as manufactured by the U.S. Rubber Company, in all flanged joints.

Except as otherwise specified or noted, machine bolts, stud bolts, and cap bolts shall be made from alloy steel, complying with the requirements of ASTM Des. A193-64, Grade B7, and nuts shall be made from alloy steel, complying with the requirements of ASTM Des. A194-64, Grade 2 or 2H.

For bolts, nuts, and threads, conform to the latest requirements of the following ANSI Standards and ASTM Designations:

Semi-finished, hexagonal bolt heads and nuts, Heavy Series dimensions	ANSI B18.2-60
Bolt threads after plating, Coarse Thread Series, Class 2A, and nut threads after plating, Coarse Thread Series, Class 2B	ANSI B1.1-60
Galvanizing (if used)	ASTM A153-61
Studs and nuts to be utilized underground or in contact with liquids - alloy steel, Grade B8	ASTM A193-64

6.5.7 Restrained Joints

Restrained joints shall be American Fast-Grip, Flex-Ring, Field Flex-Ring, Lok-Ring, US Pipe TR Flex, Field Lock, Griffin Snap-Lok, Ebba megalug or equal. Restrained joints shall be in accordance with DIPRA "Thrust Restraint Designed for Ductile Iron Pipe" utilizing laying condition 2 or 3 (as specified), a pressure of 200 psi or greater, the type of soil encountered and the depth of cover shown on the drawings

Steel bolts and nuts shall be cadmium plated, Sherardized, or hot dip galvanized after the threads are cut. Threads shall be well fitting and sound after plating. Cadmium plating shall be 0.0003 to 0.0005 inches thick on the body, and 0.00015 inches thick on the threads. Connecting flanges shall be conformed to proper position and alignment without the use of external force to bring them properly together.

After each joint has been properly made, give steel bolts and nuts a phosphate type chemical wash and then paint with one coat of primer especially prepared for galvanized surfaces. After this pre-treatment has been completed, coat bolts and nuts as follows:

Give bolts and nuts that will be exposed or submerged in liquids two coats of primer as specified by the manufacturer.

Paint all bolts and nuts that will be underground with two heavy coats of Koppers Bitumastic No. 50, or approved equal, coal tar pitch and paint.

6.5.8 Mechanical Joints

All mechanical joints on ductile pipe and fittings shall conform to the latest requirements of AWWA C111/A21.11 in all respects, except as otherwise specified or noted herein. Gaskets shall be of a rubber quality which is unaffected by liquids or gasses with which they will come in contact. Gland bolts shall be ductile iron.

All joints of mechanical joint ductile iron pipe and fittings shall be installed in accordance with the requirements of AWWA C600, Section 3.4, and also in accordance with the "Notes on Installation of Mechanical Joints", AWWA C111/A21.11, Appendix A. All bolts shall be tightened in alternating sequence to the recommended torque.

6.5.9 Protective Coating

All ductile iron pipe and fittings shall be field encased in polyethylene encasement prior to backfill. Polyethylene encasement shall be low density, 8 mils thick, and manufactured in accordance with ANSI/AWWA C105/A21.5.

Polyethylene shall be supplied in Pantone 522 or 512 or a shade of purple accepted by Fulton County.

All polyethylene encasement shall be installed in accordance with manufacturers recommendations or ANSI/AWWA C105/A21.5.

After installation, the Contractor must paint all steel sleeves, tapping sleeves, threaded rods, straps, nuts, bolts, washers, couplings, or other connecting/restraining apparatus with either Roster Laboratories, Inc., "Roskote Mastic No. A-939", Koppers Company, Inc., "Bitumastic Superservice Black", or approved equivalent protective coating.

All exposed fittings and appurtenances shall be field coated and color coded as per the general color code requirements listed in the Utility Location and Coordination Council's Uniform Color Code.

NPRL main pipe exterior and fittings shall be completely painted with Pantone 522 or 512 or a shade of purple accepted by Fulton County. The paint shall be an all acrylic, pigment stabilized (UV resistant), water reducible, fast drying, semi-gloss coating and shall be suitable for painting over asphaltic coatings.

Coating data shall be as follows:

- Surface preparation: clean and dry
- Coverage: theoretical 615 square feet per gallon at 1.0 mil dry film thickness
- Dry film thickness: 1.0-2.0 mils per coat
- Wet film thickness: 3.0-8.0 mils per coat

Apply coating in strict accordance to the manufacturer's recommendations.

Paint shall be manufactured by Induron.

6.5.10 Linings and Coatings of Pipe

Ductile iron pipe, specials and fittings shall be lined with cement lining and exterior coated with an asphaltic coating in accordance with AWWA C104, except that all pipe 42"-64" pipe shall be cement lined with high density mortar lining or with double cement lining per AWWA C104.

Defective linings shall be resolved as follows. All repairs shall be as smooth as practical and may not project into the water way. Cracks in the mortar lining greater than 0.016" in width are unacceptable. Linings shall have no "looseness" or disbondment from the inner surface of the pipe.

The lining for 42" diameter and larger ductile iron pipe shall be manufactured with or without a seal coat. The cement mortar lining shall be cured in a facility with controlled temperature and humidity.

Ductile iron pipe and fittings for buried service shall receive a 1 mil asphaltic coating in accordance with ANSI A21.50. All exposed piping shall be primed at the manufacturer's plant to receive a field coating as specified by Fulton County. Contact ductile iron manufacturer for recommended primers.

6.5.11 Storing of Materials

All tools, materials, machinery, and equipment required for the Work may be stored in a neatly, compactly stock-piled manner adjacent to the work site, in a location approved by the Fulton County Project Manager, and in such a manner as to cause the least inconvenience to the affected property owners, insure traffic safety, and so as not to endanger the general public in any way. All active, existing fire hydrants must be kept unobstructed and accessible at all times. All water and gas valves and underground power and telephone manholes must also be left uncovered by such storing of materials.

6.5.12 Cutting of Pipe

Whenever the pipe requires cutting to fit into the line, or to fabricate joints, the work shall be done in such a manner as to leave a smooth end at right angles to the axis of the pipe.

6.5.13 Drilling and Tapping of Pipe

Where indicated on the approved design, or as required by Fulton County, the Contractor shall drill and tap the ductile iron pipe or fittings to receive a threaded pipe connection. Holes shall be drilled accurately, with respect to the size and location of the pipe to be received, and at right angles to the axis of the pipe or fittings. Skilled workers using the appropriate tools shall carefully and neatly do tapping.

6.5.14 Connections to Existing Lines

Connections to existing NPRLs shall generally be made by the use of tapping sleeves and valves, except as specifically indicated on the approved drawings to be otherwise, or as may be directed by Fulton County. In certain instances it may be specified or desirable to tap a "dry" line. In this circumstance a tapping sleeve and valve is required and the tap accomplished utilizing a standard

"tapping machine". **Under no circumstances will the Contractor be permitted to "burn" a hole in the main using oxyacetylene tools.**

The closing of any existing mainline valves to isolate a particular pipe for a "wet cut-in" will be accomplished by the Contractor under the specific direction and presence of the Fulton County Project Inspector, and at such time as may be directed by Fulton County. All such shut downs must be approved in advance by Fulton County. The Contractor shall provide all labor and equipment sufficient to uncover valves and clean out valve boxes for access to any existing valves necessary to complete or repair work as part of the Project. Fulton County will provide all records and information available to assist in the locating of covered valves, and will also provide assistance in the form of electronic locating equipment. This assistance shall not relieve the Contractor of his responsibility to locate any necessary valve to accomplish the Work.

THE CONTRACTOR WILL BE RESPONSIBLE FOR NOTIFYING ALL CUSTOMERS WHO WILL BE AFFECTED BY THE INTERRUPTION OF REUSE WATER SERVICE. SUCH NOTIFICATION MUST BE MADE AT LEAST 24 HOURS IN ADVANCE OF THE PLANNED SHUT-DOWN. NO SERVICE MAY BE INTERRUPTED WITHOUT FULTON COUNTY INSPECTOR'S PRIOR APPROVAL.

6.5.15 Built-In Pipe and Fittings

Where indicated on the approved drawings, specified, or as directed, pipe and fittings shall be carefully built in, connected to, or supported on concrete or brick masonry. In all instances such masonry work shall be performed so as to avoid covering or obstructing glands, bolts, nuts, retainers, etc. All such appurtenances must be free of all masonry so as to provide sufficient clearance for proper maintenance and operation after the masonry work has been completed.

6.5.16 Anchorage and Reaction Blocking

Where indicated on the approved drawings, specified, or as directed, plugs, caps, tapping sleeves, or other fittings or combination of fittings, shall be provided with concrete reaction blocking, metal thrust-restraint systems, or other methods of anchoring the fittings to provide the required pressure-system integrity. Such anchoring systems must be "individually" inspected by Fulton County to ascertain their conformity and compliance with the specific type system required for each kind of installation which requires anchoring; size and shape as identified in Details R-10 through R-16. Concrete for reaction blocking shall be Class B as specified under Section 6.10.

6.5.17 Corrosion Protection

All NPRL pipe shall be protected against corrosion as required near cathodically protected gas lines, in corrosive soils, etc. according to ANSI/AWWA C105/A21.5-93 and DIPRA's "Stray Current Effects on Ductile Iron Pipe".

6.5.18 Marking

All ductile iron pipe shall be marked in accordance with the requirements of Section 51-10, "Marking Pipe", of AWWA C151/A21.51. All ductile iron fittings shall be marked in accordance with the requirements of Section 10-9, "Marking of Fittings", of AWWA C110/A21.10.

When requested, the contractor shall furnish Fulton County with lists, in duplicate, of all pieces of pipe and fittings received on the project including copies of shipping documents from the manufacturer and/or supplier. Said lists shall indicate the serial or mark number, weight, class, length, size, and description of each typical piece received.

6.5.19 Material Inspection

When requested, the Contractor shall furnish Fulton County with three (3) copies of the manufacturer's sworn affidavit of inspection and testing of all ductile iron pipe and fittings provided for the intended work. All ductile iron pipe and fittings will be subject to the inspection and approval by Fulton County after delivery of the material to the site. Broken, cracked, misshapen, imperfectly coated, unsatisfactory, or otherwise damaged ductile iron pipe or fittings are not permitted to be used in the work.

Such inspection by Fulton County does not relieve the Contractor of full responsibility for the materials installed. FAILURE BY Fulton County TO REJECT UNACCEPTABLE MATERIALS SHALL NOT CONSTITUTE AN ACCEPTANCE OF SAID MATERIALS.

6.5.20 Unloading and Laying

Unload ductile iron pipe, fittings, and accessories from cars or trucks with hoists or by skidding. Do not skid or roll pipe handled on skidways against pipe already on the ground. Under no circumstances are said materials to be dropped off any delivery vehicle. Should any material be dropped, accidentally or otherwise, it shall be immediately set aside and thoroughly inspected by Fulton County before any decision is made regarding its acceptability. If damage occurs to the lining, repairs or replacement shall be made as directed by Fulton County. If there is any question regarding acceptability of said suspect materials by Fulton County, the contractor shall either remove and replace the questionable materials, or obtain a sworn statement from the manufacturer certifying the materials as "undamaged".

Use proper, suitable tools and appliances for the safe and convenient handling and laying of pipe and fittings. Take great care to prevent the coating and lining from being damaged.

Pipe may not be "strung" along the project within existing highway rights-of-way, unless specifically directed to do so by Fulton County, and only then after receiving permission from the road authority which has jurisdiction.

The Contractor shall carefully examine all pipe and fittings for defects just before laying and shall not lay pipe or fittings, which are known to be defective. In the event that defective pipe or fittings are discovered after having been laid, the Contractor shall remove and replace with sound pipe or fittings in a manner satisfactory to Fulton County.

It is the Contractor's responsibility to maintain a clean work site and clean materials throughout the project. All pipe and fittings shall be kept free from mud, dirt, and debris while stored on site, and shall be thoroughly cleaned before being laid. During any breaks in the laying of pipe, and when ending construction for the day, the Contractor shall install a mechanical or fitted plug in the open end of the pipe to prevent contamination of the pipeline. Should any accidental contamination occur, the pipe shall be thoroughly cleaned and swabbed out, and inspected by Fulton County, before new or further pipe installation may commence.

6.5.21 Clean-Up

A thorough clean-up of the entire project shall be made before final acceptance is given by Fulton County. All excess rock, debris, stumps and roots, pipe, fittings, and materials shall be removed from the site. All public rights-of-way and private property shall be restored in as good or better than original condition, to the satisfaction of Fulton County. In private developments, final plat approval or Certificates of Occupancy may be withheld until all clean-up is complete.

6.5.22 Guarantee of Work Completed

The Contractor (and Developer in private developments) shall guarantee for a period of twelve (12) months from the date of final acceptance (from date of final plat approval or Certificate of Occupancy in private developments), all water mains, appurtenances, trenches, roadway and surface restorations, landscaping, and any other areas disturbed by the construction of the project, to be free from defects, and to be installed in compliance with all regulations, specifications, plans, directions, and construction practices which govern said installations. In private developments, the conditions stated in the "Owner/Developer Agreement" shall govern.

The Contractor shall be responsible for repairs to any leaking pipe, fittings, etc. Should trenches settle during the warranty period, he shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any leaks or trench settlement occur under new pavement, the Contractor will be held responsible for the cost of all repairs, including pavement replacement.

The determination of the requirement for the Contractor to perform work under this guarantee shall be at the sole discretion of Fulton County.

6.6 VALVES & WET CUT-INS

6.6.1 Work Included

The contractor shall furnish all the materials for, and shall properly set in place at the locations indicated on the drawings or as directed; all gate valves, butterfly valves, tapping sleeves and valves, and other valve-type assemblies of the size and type specified or directed, which are necessary for the completion of the work, including all excavations required for their installation.

6.6.2 Wet Cut-ins

The contractor shall provide all labor and equipment necessary to make a cut-in to an existing NPRL for the purpose of making a connection, installing a valve, or other fittings and appurtenances. A "wet cut-in" is defined to be the physical cutting into any existing reuse water main which will result in the interruption of service to an existing customer, or which shall necessitate the removal of reuse water contained within the existing NPRL from the excavation which is caused by the cutting into the pipe.

6.6.3 Gate Valves

Gate valves shall conform to AWWA C500-86 for double-disc gate valves or AWWA C509-87 for resilient-seated gate valves, and shall be as manufactured by American Flow Control, U.S. Pipe, Mueller, or approved equal. Gate valves shall be hand operated, non-rising stem, with ductile iron bodies, and adapted for joints as indicated in the approved design drawings, or as directed.

All gate valves shall open by turning the operating nut to the left (counter clockwise).

Gate valves shall only be used in sizes 4" through 10".

6.6.4 Butterfly Valves

Butterfly valves shall conform to the requirements of AWWA C504-87, and shall be as manufactured by American Flow Control, Henry Pratt, Allis-Chalmers, or approved equal.

Butterfly valves shall be hand operated with ductile iron bodies, and adapted for joints as indicated in the approved design drawings, or as directed.

All butterfly valves shall open by turning the operating nut to the left (counter clockwise). Butterfly valves shall only be used in sizes 12" and larger.

6.6.5 Tapping Sleeves and Valves

The Contractor shall furnish and install tapping sleeves and valves suitable for connection to the existing NPRLs at locations indicated on the approved plans, or as directed. The Contractor shall also provide the tapping machine and competent supervision for the making of taps. It is the Contractor's responsibility to verify the type, size, and O.D. and class of the existing pipe before ordering the tapping sleeve and valve.

Prior to making the tap, the Contractor, in the presence of the Project Inspector, shall hydrostatically pressure test the complete tapping sleeve and valve installation at a test pressure of 150 PSI, or 50 PSI over the existing system static pressure, whichever is greater, **(PNEUMATIC, OR AIR-PRESSURE TESTING IS PROHIBITED)**. The Contractor shall properly support the tapping sleeve and valve using bricks, blocks, wedges, or other substantial supporting materials, which will not permit the tapping valve or tapping machine to transfer any downward rotational force to the tapping sleeve. This support shall be provided before mounting the tapping machine.

Tapping sleeves shall be ductile iron with mechanical joint ends as manufactured by American Flow Control, Mueller, or approved equal. Outlets shall be sized to permit a tap to be made using a full-size shell cutter. The existing pipe shall be thoroughly cleaned prior to the installation of the tapping sleeve. **THE USE OF STRAP-TYPE TAPPING SADDLES FOR TAPS LARGER THAN 2" IS NOT PERMITTED.**

Tapping valves shall conform to the requirements for gate valves hereinbefore stipulated, except for any modifications necessary to permit the use of full size shell cutters. If of the double-disc variety, tapping valves 16" and larger shall be installed in a horizontal configuration, and shall be supplied with a by-pass. Resilient seated tapping valves 16" and larger may be supplied without the by-pass. When using resilient seated gate valves for making taps 16" and larger, it is the Contractor's responsibility to determine the finished depth of cover that shall remain over the operating nut of the valve after installation. If finished depth of cover in a standard vertical configuration is less than 2-feet, then the tapping valve shall be supplied in a horizontal configuration with differential operator.

- 6.6.6 Backtaps
BACKTAPS SHALL NOT BE PERMITTED UNLESS SPECIFICALLY AUTHORIZED BY FULTON COUNTY. ANY SAID AUTHORIZED BACKTAPS SHALL BE CONSTRUCTED USING M.J. FITTINGS AND "MEGALUG" RETAINER GLANDS, AND SINGLE JOINTS OF PIPE. THREADED ROD SHALL ONLY BE PERMITTED FROM THE STEEL CASING TO THE FIRST FITTING, AND SHALL BE WELDED FOR A MINIMUM OF 8-INCHES ON EACH ROD ALONGSIDE THE CASING. **WELDING OF I-BOLTS DIRECTLY TO THE CASING FOR THE PURPOSE OF INSTALLING THREADED ROD IS NOT PERMITTED.**
- 6.6.7 Accessory Equipment
All valves, which are to be buried in the ground, shall be provided with a valve box and cover. The Contractor shall provide suitable, permanently installed valve stem extensions and guides, which have been approved by Fulton County prior to fabrication and placement.
- 6.6.8 Valve Markers
Valve markers shall be furnished and installed with each valve on the proposed project. The markers shall be white drivable markers #CIB-380 (78") long (manufactured by Carsonite International) and extend to the valve. The markers shall be installed as close to the valve as possible, facing the street. The marker is not to protrude the finished surface grade more than (3') feet and no less than (18") inches above the finished grade. Each marker must be labeled on both sides (the labels will be provided by the Fulton County Inspector or Project Manager. (See also Article 4.2)
- 6.6.9 End of line / stub outs
At the end of all lines there must be a four (4) inch flush point. The flush point will consist of (4)-inch ductile iron with a four inch gate valve and box. Flush points will be piped to sanitary sewer as shown on drawing R-37 in Appendix A.
- 6.6.10 Future Stubs
All stubs for future use must be marked with a White Drivable Marker #SNFB096-01 eight (8') feet long (manufactured by Carsonite International) and extend to the pipe. The markers shall be installed facing the street. The marker is not to protrude the finished grade less than two (2') feet and not to exceed three (3') feet. Each marker must be labeled on both sides (the labels will be provided by the Fulton County Inspector or Project Manager.
- 6.6.11 Installation and Placement
All valves shall be set accurately and carefully to the lines and grades given on the approved design, or as directed, and shall be joined to the pipe utilizing such approved joints as hereinbefore specified for ductile iron water mains.

Tapping sleeves and valves and insert valves shall be installed in accordance with the manufacturer's recommendation.

Valve boxes shall be centered plumb over the operating nut of the valve with the cover flush with the surface of the finished pavement, finished grade after landscaping, or as directed. The valve box shall not be in direct contact with the bonnet of the valve, and shall be supported in such a manner as not to transmit shock, stress, or load directly to the valve. A formed or pre-cast concrete collar shall be placed around the collar of the valve box as indicated in Detail R-8.

Valve boxes shall be Russco C2503 6.5" square. Valve box lids are to have "RECLAIMED WATER" cast in the lid. See Detail R-29 Note: Standard round valve boxes are prohibited for non-potable reuse. Valve box lids shall be painted with Pantone 522 or 512 or a shade of purple accepted by Fulton County.

Where indicated on the approved design, or as directed, the Contractor shall provide concrete thrust collars, restrained joints, or other restraining mechanisms for valves 24" and larger to prohibit movement of the pipe when the valve is closed.

6.6.12 Testing

All valves shall be tested at the point of manufacture in accordance with the specific AWWA standard for that size and type of valve. After the valves have been set in place, the Contractor shall hydrostatically field-test each valve as part of the hydrostatic test of the main. Any valve not proved to be bubble-tight shall either be repaired to make it so, or be removed from the line and replaced. Valves repaired or replaced shall be re-tested for leakage prior to acceptance by Fulton County.

6.6.13 Shop Drawings

If directed, the Contractor shall provide the Project Manager copies of all shop drawings or "cut sheets" for the proposed valves, prior to their installation.

6.6.14 Painting and Other Coatings

All valves, where not constructed of brass or bronze, or of finished steel, shall be coated at the point of manufacture in accordance with the AWWA Standard Specifications for Painting Ductile or Cast Iron Water Pipes and Fittings. Resilient seated gate valves shall only be provided with a bonded epoxy coating. Machined surfaces shall be given a suitable coating of grease or other protective material.

6.7 RELOCATION AND RE-CONNECTION OF EXISTING, VALVES, AND LARGE METERS

6.7.1 Work Included

The Contractor shall, where required, disconnect, relocate and reconnect existing, valves, and large meters. The work shall be done in accordance with the following items:

Salvaging valves shall include transporting and delivering such valves for salvage to locations designated by Fulton County.

Relocating existing 3" and larger NPRL water meters shall include removal of the existing metering device and vault, and reinstallation of these items to locations identified on the approved design. If construction phasing requires such, existing devices and vaults shall be carefully removed and stored, and properly reinstalled in the work where indicated or required.

If a wet cut-in is required for the relocation, the Contractor shall request the Fulton County Project Inspector to perform a "trial shutdown" to verify that an existing line is actually shutdown before the work is permitted to take place. **All shutdowns, which affect any existing customer service, must be authorized and coordinated by Fulton County.**

6.7.2 Existing Materials and Appurtenances

Existing valves which, in the opinion of Fulton County, are suitable for re-use shall be thoroughly cleaned and, if necessary, shall have their internal parts reworked, and shall be properly placed in the work where indicated or required.

The Contractor shall perform the disconnecting, relocating, and reconnecting carefully so as to avoid damaging the materials or appurtenances. Materials or appurtenances damaged in the course of performing the relocation or re-connection shall be replaced or repaired by the Contractor at his own expense and to the satisfaction of Fulton County.

6.8 RECLAIMED WATER SERVICE CONNECTIONS

6.8.1 Work Included

The Contractor shall furnish all materials, labor, tools, and equipment for the proper installation, relocation or replacement of all NPRL service connections, service lines, NPRL water meters and meter boxes which are indicated to be so addressed on the approved design, or as directed by Fulton County. If in the process of conducting the work, the Contractor determines that additional NPRL services or connections will be affected by the proposed design, or discovers NPRL services which were hereto previously unknown, the Contractor shall immediately notify the Fulton County Project Manager for direction concerning the services. New service connections to NPRLs shall be made in accordance

with the approved design, or if, in the opinion of Fulton County, such are necessary for establishing proper service to the customer.

The Contractor shall make all relocations of existing NPRL services from existing mains to NPRL mains constructed as part of the approved project, as indicated on the approved design, or as directed by Fulton County, whether or not the existing mains are to be abandoned as part of the project. When the existing mains are to remain in service, or when directed, the Contractor shall abandon all portions of the existing service by excavating the service connection at the existing main and closing the corporation stop for each service to be abandoned.

The Contractor shall make all pavement and sidewalk cuts, excavation, sheeting, shoring, boring, backfilling, sidewalk and pavement repairs, and landscaping and re-grassing/reseeding required for the installation of NPRL service connections. This includes any disturbed areas associated with long-side services on both sides of roadways.

Said work shall be accomplished as specified elsewhere in these standards.

6.8.2 Special Attention

All temporary relocations or replacements of reclaimed service connections necessary to execute the work shall be made at the Contractors expense. Any replacements made necessary due to negligent or careless operations by the Contractor shall be accomplished immediately if customer service is affected, shall be of first class workmanship, and shall be completed using only approved materials, as indicated elsewhere in these Standards, or as directed.

NOTE: RECLAIMED SERVICE CONNECTIONS SHALL NOT BE CONNECTED TO NEW MAINS UNTIL SUCH HAS BEEN ACCEPTED By Fulton County.

6.8.3 New Service Installations/Meters and Meter Boxes

To ensure identification of reclaimed water meters, the lid of the register, the register face, lid, shroud and meter bottom shall be painted with Pantone 522 or 512 or as approved by Fulton County. The word "RECLAIMED WATER" shall be marked on the brass housing.

All reclaimed water meters shall be installed in a Carson-Brooks Plastics box. Meter boxes and lids shall be Pantone 522 or 512 or as approved by Fulton County. Meter box lids shall be labeled "RECLAIMED WATER".

All reclaimed meter installations must maintain a minimum of three (3) feet from the potable water meter.

6.8.4 Materials

Service lines shall be constructed of copper pipe or ductile iron pipe with fittings and appurtenances in accordance with the following:

Copper Pipe (or tubing) shall be manufactured and furnished in accordance with ASTM Specifications B88, Type "K". Fittings shall be of the compression "pack-joint" coupling type. Copper pipe or tubing shall be polyethylene coated Aqua Shield as manufactured by Kamco Products or approved equal. Polyethylene coating shall be colored Pantone 522 or 512 or a shade of purple accepted by Fulton County.

Ductile Iron Pipe shall be manufactured and furnished in accordance with C151/A21.51-96: ANSI Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water and C104/A21.4-95: ANSI Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

All ductile iron fittings shall be manufactured and furnished in accordance with C110/A21.10-98: ANSI Standard for Ductile-Iron and Gray-Iron Fittings, 3" through 48" for Water and C115/A21.15-99: ANSI Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges and C111/A21.11-00: ANSI Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings

Appurtenances such as corporation stops, curb stops, adapters for copper service lines shall meet the requirements of ASTM Designation B-62 for bronze construction, and AWWA C-800 for threads. Adapters shall be furnished as required for connecting. Corporation stops shall be Ford FBRW1100-4; curb stops shall be Ford B41-444W. Double strap saddles, for the purpose of tapping the main shall be Dresser Style No. 91, or Smith-Blair Style No. 313, and shall be tapped for Mueller threads.

All pipe and fittings shall be color coded as per the general color code requirements listed in the Utility Location and Coordination Council's Uniform Color Code. NPRL pipe and fittings shall be marked with Pantone 522 or 512 or a shade of purple accepted by Fulton County.

NOTE: THE USE OF SOLDERED JOINTS OR FLARE-JOINTS FOR COPPER PIPE AND FITTINGS IS PROHIBITED.

6.9 JACKED CASING

6.9.1 Work Included

The Contractor shall furnish all material, labor, tools, and equipment necessary for the complete installation of a jacked steel casing, free-bore, or installation of steel casing by open-cut method, as may be indicated on the approved plans, or as directed by Fulton County, including, but not limited to bore pit excavation, sheeting, shoring, plating, and safety barriers for the protection of workers, traffic, and general public. In general, the work shall include steel pipe casing, excavation, backfill, restoration of site, sheeting, grout, brickwork, earth augers,

jacking machine, welder, and other accessories necessary for a complete installation as specified or directed.

The Contractor shall be fully responsible for protecting against surface subsidence, damage or disturbance to adjacent property and facilities from his construction methods. If loose material is encountered and cave-ins occur or are anticipated, all jacking/augering will be suspended, shoring provided, and all voids filled or pressure grouted. Supplemental measures and alternative methods must receive Fulton County approval before jacking/augering operation re-commences. Any settlement or upheaval of the existing roadway pavements during the jacking and boring operation, and throughout the warranty period for the overall project, shall be repaired/restored by the Contractor immediately upon notification by Fulton County of the pavement failure.

All jacking/augering operations must be performed in compliance with the rules and regulations of the Fulton County Department of Transportation, State of Georgia Department of Transportation, or other authorities having jurisdiction.

Any sheeting placed for the jacking/augering operation must be completely removed by the Contractor prior to backfill.

6.9.2 Maintaining Traffic and Public Safety

All working operations of the Contractor, his subcontractors, and/or their agents or employees must be subordinated to the free and unobstructed use of the highways, and structures encountered in the prosecution of jacking and boring operations.

The Contractor shall proceed with the work in such a manner as will permit regular transaction of business by commercial operations adjacent to the project site without delay or danger to persons or property, permit free access to and from private residences, and will allow the safe flow of traffic and pedestrians around the work site. The contractor shall employ the use of barricades, barriers, warning signs, signals, lights, and if necessary, watchmen, for the protection of the general public. The Contractor, when directed by Fulton County, shall suspend all operations relating to jacking and boring until necessary safety precautions have been met.

The Contractor shall submit for approval, when requested by Fulton County and/or highway Departments, all working drawings and schedules of procedure proposed to be followed in the prosecution of jacking and boring operations.

Working drawings shall show in detail the size and location of bore pits, together with all sheeting and shoring to be used in supporting embankments and trench walls, and all other structural details together with large scale plan and profile of the proposed jack and bore installation. Drawings shall also indicate the location and proximity of any adjacent structures or underground Works which could be affected by the operation.

Schedules shall set forth the sequence of the various operations together with the time proposed to begin and complete the phases of the work.

The Contractor shall not proceed with any portion of the jack and boring operation until he has received approval of the Drawings and Schedule by Fulton County and/or highway Departments.

6.9.3 Jacked Casing

The Contractor shall jack a steel casing pipe as indicated on the approved design, using a special earth auger machine. The wall thickness of the steel pipe shall be a minimum of 0.375 inches, with the pipe having sufficient strength to withstand superimposed loads and jacking stresses. The casing shall be jacked to the line and grade indicated on the approved design.

Each joint of the casing pipe shall be fully welded around its entire circumference to the adjacent joint prior to being jacked.

Following completion of the jacking operations, the NPRL pipe shall be inserted within the casing and its invert supported by wooden skids as indicated in Detail R-17. Pre-fabricated casing spacers are acceptable in lieu of wooden skids, pending pre-installation approval by Fulton County. The ends of the casing shall be sealed with brick bulkheads using brick and mortar.

6.9.4 Free-Bore

Where permitted or directed by Fulton County, the Contractor shall use a special earth auger machine to bore a hole to the line and grade as indicated on the approved design. Said hole shall be of a constant diameter, which shall not exceed the bell diameter of the proposed carrier pipe to be inserted in the borehole by more than four inches. If the annular space between the earthen hole and the carrier pipe exceeds six inches, then the Contractor shall fill such space either by pressure grouting or pumping in a fluid fill to eliminate possible settlement.

At no time will free-bores in excess of forty (40) feet be permitted.

6.9.5 Steel Casing (Open-Cut Installation)

Where permitted or directed by Fulton County, the Contractor shall place the steel casing directly in an open cut ditch for subsequent installation of a carrier pipe after backfill. Except for the method of installation, all requirements of Sections 6.9.1 through 6.9.3 relating to steel casing specification and jacked boring shall apply. Ditch preparation, backfill, and compaction shall be as required for direct-bury ductile iron pipe.

6.10 CONCRETE

6.10.1 Work Included

The Contractor shall furnish all materials for, and shall place all concrete masonry in the structures indicated on the approved design, and other such concrete masonry as may be found necessary for completion of the work.

There shall be two classes of concrete; Class A for foundation, cast-in-place manhole and vault sections, brace and thrust blocking, concrete pipe cradles, footings, and steel reinforcement structures; and Class B for concrete encasement and concrete fill. The Contractor shall provide concrete which on tests in standard cylinders shall have a compressive strength of not less than three thousand (3,000) pounds per square inch in twenty-eight days for Class A; and not less than two thousand (2,000) pounds per square inch in twenty eight days for Class B concrete.

Slump shall range from three to five inches for Class A concrete, and four to six inches for Class B concrete; except that where equipment that is subject to vibration is used, slump shall not exceed three inches.

The Contractor shall provide a standard cone of metal for making slump tests, and a supply of suitable containers for making standard six inch by twelve-inch cylinders for testing the compressive strength of the concrete.

No admixtures will be permitted unless specifically approved by the Fulton County Project Manager prior to placement.

6.10.2 Placement

Provision shall be made by the Contractor for transporting the concrete rapidly from the place of mixing to the work, and with as little jiggling as possible so that the tendency of the water to rise to the top may be reduced to a minimum. The concrete shall be placed before it has had time to obtain its initial set, and under no circumstances shall it be re-tempered and used in the work.

6.10.3 Placement in Water Prohibited

Concrete shall not be laid in water, nor shall water be allowed to rise on or flow over freshly placed concrete until the concrete has set for at least twenty-four hours.

6.10.4 Freezing and Inclement Weather

Concrete placed in cold weather shall be heated with an approved device to a temperature that will permit it to be transported by standard conveyance on the work site and placed in the forms at a temperature of not less than fifty degrees Fahrenheit.

6.11 LUMBER LEFT IN PLACE

6.11.1 Work Included

When in the opinion of Fulton County proper protection and support of the pipe or structures may be adversely affected by the continuation of the work, the Contractor may be ordered to leave in place such sheeting, sheet piling, bracing, and shoring as may be considered necessary to provide the proper protection.

Where sheeting and bracing is left in place in accordance with the orders of Fulton County, all projecting planks shall be cut off two feet below the surface of the ground. If so ordered, the upper portion of the lower set of sheeting shall be cut off so as to permit the complete filling in of the space below the timbers of the upper set of sheeting.

6.12 BACKFILLING

6.12.1 Backfilling Structures

Backfilling of structures shall proceed as various structures or parts of structures are completed. The Contractor shall refill the space outside and around the wall with material excavated from the site and stored for this purpose. Immediately adjacent to the structure, the backfill material shall be placed in twelve-inch layers and compacted to avoid future settlement. This filling shall be carried to such height as will bring the finished grade to the required elevations.

6.12.2 Trenches

Backfill in trenches where pipe has been laid shall be placed continuously by hand in layers not exceeding six inches in thickness and carefully and thoroughly consolidated by tamping simultaneously on both sides of the pipe to a height of twelve inches above the top of the pipe. This backfilling and compacting must be done promptly and before any backfill material is deposited directly from a machine bucket, loaders, trucks, or other mechanical equipment. Once utilizing a machine bucket for backfilling, the bucket must be lowered into the trench to deposit the material in such a manner as to avoid the shock of falling earth, which could injure or damage the pipe or structure. Under no circumstances should the material be allowed to fall from the machine or loader bucket directly onto the pipe or conduit in the trench.

Except as otherwise ordered by Fulton County, all forms, bracing, and lumber shall be removed from the trench before backfilling.

Bottoms of trenches in earth must be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials, as directed, or where indicated on the approved design, to give full support to the lower segment of the pipe. This shall be done in such a manner as to prevent any subsequent settlement of the pipe. Boulders or loose rock, which might bear against the pipe, will not be permitted in the trench bottom, or in the backfill within two feet above the top of the pipe. Bottoms of excavations, which are of loose granular soils, shall be compacted by vibratory compactor prior to laying of pipe.

Where foundation conditions are such that proper bedding cannot be provided, such as in quicksand, the Contractor may be directed by Fulton County to provide foundation cushion, concrete cradles, or other special provisions as may be required for the proper support of the pipe.

Only after the backfill has been placed and hand-compacted to at least twelve inches above the top of the pipe, may the work proceed in the placement of the remaining backfill material, which must be carefully placed and compacted. In streets, other surfaced areas, or where directed, the backfill shall be placed and compacted in lifts not to exceed twelve inches in thickness. All precautions must be taken to avoid having any unincorporated material, which may result in future settlement in these areas. Approved mechanical tampers shall accomplish compaction. The number of workers tamping shall at no time be less than the number of workers backfilling, and if necessary, additional workers shall be kept in the trench to spread the material.

Material shall be compacted to a density of not less than 95% as determined by a modified proctor ASTM Des. D1557-70. When directed, the Contractor shall arrange to have such compaction tests conducted by an independent testing firm; the number and locations to be determined by Fulton County.

Materials used for backfilling shall be free from all perishable organics or other objectionable materials, and shall contain no stones larger than twelve inches in its longest dimension.

No clay backfill shall be used in pipe trenches under roadways or other paved areas. In such paved areas where clay is encountered, trenches shall be backfilled with bank run gravel.

If, in the opinion of Fulton County, the original excavated material is unsuitable for use as backfill, such as perishable matter, refuse, building materials, wire, brush, stumps, ashes, large stones, muck, or other soft materials, the Contractor shall properly dispose of the objectionable materials, and shall furnish, haul, and place borrow material suitable for proper backfill.

Backfilling shall not be done in freezing weather, except by permission of Fulton County, and shall not be done using frozen materials or upon frozen materials.

All backfilling shall be left with smooth, even surfaces, properly graded, and shall be maintained in such condition until final completion and acceptance of the work, notwithstanding applicable warranty periods. Where directed by Fulton County, the Contractor shall mound the backfill slightly above the adjacent ground to allow for settlement.

6.12.3 Embankment Over Pipes

Where indicated on the approved design, or where authorized by Fulton County, for the crown of the pipe to come close to or extend above the surface of the ground, the Contractor shall cover and protect the pipe by an embankment. This embankment shall be at least three feet deep over the top of the pipe, at least four feet wide at the top, and with side slopes not less than 1½ horizontal to 1 vertical extending to the surface of the undisturbed ground. Provisions shall be made to allow for surface drainage.

The materials of which embankments are to be constructed shall be the same as those permitted for backfill, and shall be free from objectionable materials as defined in Section 6.15.3. The earth shall be placed in layers not exceeding twelve inches in thickness, which shall be compacted by hand tamping, or by other methods approved or directed by Fulton County. The embankments shall not be built during freezing weather or with frozen materials. The surface shall be brought to the true lines and grades as indicated on the approved design, or as directed, and shall be raked smooth and left free from rubble, stones, dirt clods, or gravel. Placing of fill or embankment over and around structures shall be done evenly on all sides to avoid unbalanced loading or overturning action.

6.12.4 Concrete Protection Cap

Where indicated on the approved design, or where authorized by Fulton County, to permit less than three feet of cover over the top of the pipe, the Contractor shall construct a concrete cap over the top of the pipe for protection of the pipe for the entire length where the pipe has less than the minimum cover. The concrete cap shall be Class B concrete, a minimum of four feet wide, four inches thick, and shall be placed no less than one foot above the top of the pipe, but should not extend above the ground at any point. At no time shall a concrete cap be utilized as a substitution for an embankment as required under Section 6.12.3.

6.12.5 Erosion Control

The Contractor shall fully comply with the applicable requirements of local, State, and Federal agencies in the control and containment of soil erosion. The Contractor shall install/construct all necessary measures or devices in accordance with Best Management Practices, as may be indicated on the approved design, as may be directed by Fulton County,

or as directed by other agencies having jurisdiction, to control and contain all soil erosion within the construction limits, with no exception. Necessary measures and devices may include, but are not limited to; reinforced silt fencing, hay bales, and/or rock check dams. The Contractor shall maintain these measures until such time as a satisfactory vegetative cover is established, and final acceptance of the work is obtained from Fulton County, notwithstanding any required warranty period. The Contractor shall be held fully responsible and liable for any damages and/or penalties arising out of his failure to install or maintain an adequate soil erosion control program at all times during the project.

6.12.6 Disposal of Material

The Contractor will be required to remove from the site of the work all earth in excess of that required to backfill the excavation or to create necessary fill. This shall be done immediately after the backfill is completed to the satisfaction of Fulton County. All material removed shall become the property of the Contractor, and he shall make his own arrangements for its disposition, subject to Fulton County's approval. All surplus material, shot rock, organics, clearing debris, stumps, and other such material as Fulton County may deem unfit for use as backfill, shall be disposed of by the Contractor, and shall be done in such manner so as to give a minimum of inconvenience to the public.

Any material which may spill or drip from the vehicles while being transported on public streets, drives, or other paved surfaces, shall be immediately removed by the Contractor and those surfaces cleaned to the satisfaction of Fulton County.

6.12.7 Borrow

When acceptable excess material is not available from other parts of the Project for backfill, required fills, embankments, etc., the Contractor shall obtain the necessary "borrow" material at locations off the site of the work from locations approved by Fulton County. Locating such acceptable "borrow" sites shall be the sole responsibility of the Contractor.

All materials to be used as borrow shall be approved by Fulton County. Borrow material for backfilling trenches under roadways or other paved areas shall be bank run gravel reasonably free from loam or other foreign material.

6.13 TESTING

6.13.1 Testing

Pipes, fittings, and appurtenances shall be laid in such a manner as to leave joints watertight. After the pipe is laid, each section, as may be

determined or defined by Fulton County, shall be properly and adequately flushed, all air removed, and then tested under a hydrostatic pressure of 150 PSI as measured at the lowest elevation of the test section. Where static pressure exceeds 100 PSI, the test pressure, as measured at the lowest elevation of the test section shall equal to the static pressure plus 50 PSI. If elevation differentials, within a test section, vary by more than 45 feet, then the section shall be broken into shorter lengths by the insertion of additional valves.

All stub-outs shall be flushed and included in the pressure test. Each stub-out shall be properly plugged, braced, and tested with the stub-out valve open. Following a successful pressure test, all stub-out valves shall be left in the "closed" position.

All testing of NPRL mains, fittings, and appurtenances shall be conducted in the presence of the Fulton County Project Inspector, and under his direction. To facilitate the testing, the Contractor shall furnish: 1) a pressure gauge for measuring the pressure on the NPRL; 2) a corporation cock in the main for pressure pump connection; 3) suitable pump, piping, appliances, labor, and other items necessary to conduct the pressure test; 4) a valve wrench and labor to accompany the Fulton County Project Inspector to verify that all valves, are fully open during the pressure test. Each section of pipe shall be filled slowly with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump shall operate by pumping water from a separate reservoir into the main to be tested, until the specified test pressure is attained. The County shall furnish all water necessary for flushing and testing of the main. The Contractor shall provide whatever means necessary to transport or convey the water from a designated source to the main.

Before applying the specified test pressure, **all** air must be expelled from the pipe. To accomplish this, it may be necessary for the Contractor, to install additional $\frac{3}{4}$ " service taps at the highest elevations, including any intermediate points, of the section of the pipe to be tested, or at locations directed by Fulton County. The Contractor prior to final acceptance of the main must remove any such taps installed.

The test pressure shall be maintained for a minimum of two hours to allow for thorough examination for leakage, and permit the Fulton County project Inspector to confirm that all air has been removed, and that all valves within the test section of pipe are fully open.

6.14 RESTORING PAVEMENTS, SIDEWALKS, AND CURBS

6.14.1 Work Included

The Contractor shall furnish all materials for, and properly restore all pavements, drives, sidewalks, and curbs, which may have been damaged, removed, or disturbed as a result of accomplishing the Work. Restoration and replacement shall be made to the satisfaction of Fulton County. This shall include in general, but without limitation, all necessary concrete, reinforcing steel, stone, cinders, gravel, slag, asphalt, or other bituminous material necessary for the proper completion and restoration of the Work as may be required, directed, or specified.

6.14.2 Materials and Workmanship

Materials to be used in the repair and restoration of pavements, drives, sidewalks, and curbs, shall be first quality. All materials removed while accomplishing the work shall be disposed of by the Contractor on sites approved by Fulton County. No existing material may be reused in the Work unless pre-approved by Fulton County. All workmanship shall be first class.

6.14.3 Restoring Pavements

After the pipe has been laid, appurtenant work constructed, and backfill completed, the Contractor shall furnish, place, restore, and maintain all pavements or roadway surfaces, which have been removed or damaged by or in pursuit of the Work. The form and degree of restoration shall be as specified on the approved design, as specified herein, or as directed by Fulton County.

For backfilling roadway cuts, only crusher-run gravel, bank run gravel, or properly rammed sand shall be used. Backfill material shall be placed and compacted to a density of not less than 95% as determined by a modified proctor ASTM Des. D1557-70. Fulton County may require that tests, conducted by an independent laboratory, be made at various locations to confirm the density of the compacted material. The location and number of tests shall be designated by Fulton County as the work progresses. All costs associated with such testing shall be borne by the Contractor.

All roadway restoration shall be done in accordance with the lawful requirements of the authorities within whose jurisdiction such pavement is located. All highway Works and traffic controls are to be maintained, and work shall conform to the rules and regulations of the authorities, including the use of standard signs. The Contractor shall furnish all such bonds or checks, which may be required by the highway authorities to insure proper restoration of paved areas.

Whenever the removal of pavements is required (other than gravel types), the Contractor shall outline the area to be removed by making saw-cuts, providing vertical kerfs to allow the removal of the paving material in straight lines. Should pavement breakage occur beyond the saw-cut, the Contractor shall make a new straight saw-cut beyond the furthest point of breakage.

The Contractor shall be responsible for maintaining all pavement cuts prior to project acceptance, and during the one-year maintenance period. Should any failures be noted associated with any portion of the work, the Contractor shall remove all such damaged surfaces and make full repairs, including adding and re-compacting approved backfill materials, placing and maintaining bituminous concrete pavement or stone road surfaces. The Contractor shall affect all required pavement repairs necessitated due to pavement failure, either prior to final project acceptance or during the one-year maintenance period, within five (5) working days of notification by Fulton County. Bituminous concrete pavements or stone road surfaces, which the Contractor is required to replace, shall be in at least as good condition at the end of the one-year maintenance period as it was before construction.

6.14.4 Roadway Permits

The Contractor is responsible for obtaining all road-opening permits from the Fulton County Department of Transportation, including providing any required restoration bonds.

Fulton County shall obtain all road-opening permits required by the Ga. Department of Transportation. The Contractor is not permitted to make any type cuts on roadways requiring a permit from the Ga. D.O.T. until such time as the permit is provided and prominently displayed on-site.

6.14.5 Restoring Driveway Pavements

The Contractor shall repair or replace all driveway sections disturbed by the process of the work. Driveways shall be constructed of the same materials, and to the thickness of the adjoining wearing surface, or to the minimums indicated on detail drawing R-31 in the Appendix, whichever is greater. In restoring driveways, the subsoil and foundation material shall be well compacted so as to prevent any future settlement or cracking of the driveway pavement. Where necessary to cut a concrete driveway, the cuts shall be made with a masonry saw, providing a smooth, straight line completely across the driveway. Partial cut-outs, crooked cuts, or cuts made by any other method other than masonry saw are not permitted. In general or where directed, concrete slab removal shall be made in entire pavement sections to the nearest existing expansion-joint.

6.14.6 Restoring Curbs

The Contractor shall restore all curbs and combination curbs and gutters, which have been removed or disturbed in the progress of the work. Curbing shall be made to conform accurately in size, line, grade, and materials to that adjoining. In restoring curbs, the subsoil and foundation material shall be well compacted so as to prevent any future settlement of the concrete curbing.

All concrete shall conform to the specifications for Class A Concrete, Section 6.10.1

6.14.7 Restoring Sidewalks

The Contractor shall restore all sidewalks, which have been removed or disturbed in the progress of the work. Sidewalks shall be constructed to the same dimensions and materials as the adjoining sections.

Where necessary to cut a walk, entire sections shall be removed and replaced unless otherwise directed by Fulton County.

The sub-base shall be thoroughly rolled or tamped and shall be wetted just before the concrete is placed, but shall show no pools of water.

6.14.8 Contractor's Warranty of Restored Paved Surfaces

The Contractor shall make every provision to insure compaction by properly tamping any backfill under areas to be paved. Any settlement which may occur during the one-year warranty period shall be corrected by the Contractor at his expense, including removing, re-compacting, and replacing any paved surfaces which show signs of settlement, whether or not actual damage to the paved surface has occurred. This shall apply to all paved surfaces including streets, drives, sidewalks, and curbs and gutters.

Should settlement, cracks, or other indications of failure, or impending failure, appear in the paved surface, the adjoining paving shall be removed to the extent necessary to secure a firm, undisturbed bearing. All removal, re-compaction, and replacement shall be in accordance with the specifications concerning these operations as stated elsewhere.

6.15 SEEDING / SOD REPLACEMENT

6.15.1 Work Included

The Contractor shall furnish all materials for, and properly restore to the satisfaction of Fulton County, all ground surfaces irrespective of type, which may be disturbed in the progress of the work.

This shall include in general but without limitation, the spreading of topsoil, seeding, sod replacement, fertilizing, and mulching required to restore disturbed areas as may be necessary, directed, or specified herein. On all "sod" type lawns and other improved, well established grass areas, the sod/grass shall be carefully removed, kept alive, and replaced after the backfilling and grading is finished. The Contractor shall also remove all spoil from such areas as quickly as possible after the excavation is backfilled, and he shall leave the premises in as good condition as before undertaking the work. It is the intent of these Specifications to restore all disturbed areas, to place seed and mulch in areas not specifically identified as improved lawns, to place topsoil and seed where improved lawns existed prior to construction, and to provide for "sod" removal and replacement in areas identified as such prior to construction.

6.15.2 Standard Specification for Seeding / Sod Replacement

The requirements of the Department of Transportation of the State of Georgia "Standard Specifications - Construction of Roads and Bridges", 1983 Edition, and as revised to date, shall apply insofar as they are applicable for all seeding/sod replacement. If requirements set forth in these Specifications differ from those of the Ga. D.O.T., then these requirements shall take precedence.

6.15.3 Topsoil

Where directed by Fulton County, area to be seeded shall be covered with a layer of topsoil. The topsoil shall be of sufficient thickness that when spread and compacted, a minimum of four (4) inches will be available. The Contractor shall furnish natural topsoil of a good condition and tillable structure. Obtain topsoil as borrow from an outside source of uniform texture, drainage, and other characteristics so as to constitute a homogeneous soil meeting the requirements of the Ga. D.O.T., and as approved by Fulton County. The Contractor shall furnish topsoil that is free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated rock, large roots, or other materials that are not integrally a natural component of good agricultural soils, and which are harmful or not beneficial for successful plant growth. Do not use topsoil containing frost or in a muddling condition. If utilizing existing material obtained from the initial excavation of the work site for re-use as topsoil, the Contractor must first obtain approval from Fulton County as to suitability of its content, including approval of location and method of storage of topsoil for re-use.

6.15.4 Seeding

Seeding shall be accomplished by the Contractor using a properly proportioned mixture of inoculated seed approved for use in "Zone One" as detailed in the Ga. D.O.T.'s Standard Specifications. Seeding shall

only be permitted in the specified planting season for "Zone One" for the specified mixture. All seeded areas shall be uniformly mulched immediately after seeding.

The Contractor shall maintain all seeded areas to include mowing, watering, and re-seeding any bare areas until a satisfactory stand of grass has been obtained and final acceptance of the work has been received from Fulton County. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and re-seeded as required.

In general, the Contractor shall replace existing maintained lawn areas with the same type of grass as was established prior to construction. Any deviations or alternatives proposed due to unavailability of seasonal grasses, or inappropriateness of seeding due to time of year must be presented to Fulton County Inspector in writing with **signed** authorization of homeowner.

6.15.5 Preparation of Seeded/Sod Areas

The subgrade for any areas to be seeded shall be brought to a uniform grade by the Contractor, and shall be free of stones larger than 1", roots, gravel, or other debris. Where topsoil is required by Fulton County, the topsoil shall uniformly graded, trimmed, and raked free of unsuitable materials, ridges, bumps, or depressions. Over this area, the Contractor shall spread agricultural lime at the rate of 40 pounds per 1,000 square feet, and shall spread a general fertilizer uniformly on the surface of the ground at a rate of 1,500 pounds per acre. The lime and fertilizer shall be mixed uniformly into the top four (4) inches of the soil using suitable harrows, tillers, or other mechanical equipment.

6.15.6 Sod Removal/Replacement

On all well established and "sod" type lawns, the Contractor may at his discretion, utilizing suitable sod cutting equipment, cut the sod into rolls, carefully remove and store the sod, and water and maintain in a viable condition for replacement after backfill. Any such sod removed and replaced in this manner must be demonstrated to be living to Fulton County Inspector prior to final acceptance of project.

If sod is to be replaced with "new" sod, the Contractor shall only replace using sod of the same type as that removed. Any deviations or alternatives proposed due to unavailability of seasonal grasses must be presented to Fulton County Inspector in writing with **signed** authorization of homeowner.

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