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SECTION 1.0

INTRODUCTION

1.1 GENERAL

The purpose of this document is to provide a guideline for Property Owners, Developers and Engineers to assist with design of plans and specifications for projects which will become part of the City of New Bern water and/or sewer system. All proposed utility projects shall meet or comply with all applicable requirements set forth by the North Carolina Department of Environmental and Natural Resources (NCDENR) and the standards contained herein. A project which shall require a variation from these requirements must be approved by the City of New Bern Engineering Department prior to permitting.

1.2 CONTACT INFORMATION

All correspondence regarding proposed utility projects shall be directed to the City Engineer at the following address:

Mr. David A. Muse, P.E.
City Engineer

City of New Bern Engineering Department
Dunn Building, Fourth Floor
248 Craven Street
New Bern, N.C. 28563

Phone: (252) 639-7526
Fax: (252) 672-5152
Email: cityeng@newbern-nc.org

1.3 SYSTEM INFORMATION

1.3.1 Water System

Name: City of New Bern
Owner: City of New Bern
PWS I.D. No.: 04-25-010
WSMP No.: 01-00769
County: Craven

1.3.2 Sanitary Sewer System

The City of New Bern WWTF – Permit Number NC0025384

1.3.3 Low Pressure S.T.E.P. Sanitary Sewer System

The City of New Bern Township No. 7 Lagoon WWTF – Permit No. WQ0003765

SECTION 2.0

PLAN APPROVAL AND PERMIT SUBMITTAL

2.1 PLAN AND SPECIFICATION SUBMITTAL

Two (2) complete sets of plans, specifications, design calculations, and all other relative information shall be submitted for review to the City of New Bern Engineering Department for any project which proposes to tap, extend, or otherwise alter the existing City of New Bern water or sanitary sewer systems. All modifications to the project plans and specifications which are requested after review by the City Engineer must be complete and shown on revised plans prior to the project approval.

2.2 PERMIT APPLICATIONS

2.2.1 Commercial Sewer Use Permits

Effective January 1, 2009, all businesses requesting to connect to the City of New Bern low pressure S.T.E.P sewer system will have to make application for and obtain a Commercial Sewer Use Permit. The permit application has to be submitted to and approved by the City Engineering Department prior to establishing a water and sewer account with the City. Permit applications can be picked-up at the City of New Bern Engineering Department or downloaded from the City of New Bern webpage at www.newbern-nc.org.

The permit shall be non-transferable and shall be issued to the business owner not the property owner. Therefore, the permit will have to be renewed upon change of business owner or building occupancy use.

Businesses applying for a commercial sewer use permit for an existing building must have a daily designed sewer flow less than or equal to the average daily flow of the previous business. The average daily flow of the previous business shall be based on actual water use records for the previous 12 months. The daily designed sewer flow for the new business shall be based on the criteria set forth in the most recent version of Section 15A NCAC 02T .0114 of the North Carolina Administrative Code.

Businesses applying for a commercial sewer use permit for a newly constructed building must have a daily designed sewer flow less than 500 gallons per day be based on the criteria set forth in the most recent version of Section 15A NCAC 02T .0114 of the North Carolina Administrative Code.

Newly constructed commercial buildings will only be allowed to connect the low pressure S.T.E.P system in the areas where the S.T.E.P. system has been designed and permitted for commercial use (Kale Rd. and Justin Dr.)

2.2.2 State Water and Sewer System Extension Permits

Projects which will require an extension of the City of New Bern water system or sanitary sewer system shall be permitted through the appropriate State agency with the City of New Bern listed as the permit applicant. Once the proposed plans and specifications have been approved by the City of New Bern Engineering Department, permit applications shall be executed by the City and returned to the responsible engineer for submittal to the appropriate State agency. The project engineer and/or developer shall be responsible for submitting all required fees and attachments that must accompany permit applications.

SECTION 3.0

DESIGN GUIDELINES FOR WATER & SEWER SYSTEM EXTENSIONS

3.1 GENERAL

At a minimum, all proposed water and sewer extensions shall be required to meet the design requirements contained in this sections as well as all requirements set forth by the NCDENR. In any case where the City of New Bern standards and the NCDENR are not the same, the more stringent of the two shall apply.

3.2 PROPOSED WATER & SEWER MAINS

3.2.1 Sizing of Water and Sewer Mains

All proposed water and sewer main extensions shall be sized according the latest requirements of NCDENR and the standards set forth by the North Carolina Administrative Code. The City of New Bern reserves the right to increase the size of proposed mains as needed to accommodate future development within the general vicinity of the proposed project area.

3.2.2 Horizontal Location of Proposed Water & Sewer Mains

All proposed water and sewer mains shall be located within existing street rights-of-way or within a permanent utility easement. The minimum width of permanent utility easements for water mains and sewer force mains shall be ten feet (10'). The minimum width of permanent utility easements for gravity sewers shall be twenty feet (20'). All proposed water and sewer mains shall be located a minimum of ten feet (10') away from any existing or proposed permanent structure.

3.2.3 Vertical Location of Proposed Water & Sewer Mains

All proposed water and sewer mains shall be designed to provide at least three feet (3') of cover from the top of the pipe to the finished grade. At locations where this requirement can not be met the main shall be constructed with ductile iron pipe.

Sewer force mains shall be designed where possible with uniform grade between low points and high points of the alignment. Air release valves shall be installed at all high points as described in section 3.6. Sewer force mains shall be installed to the designed grade to ensure that all high points are accounted for and air release valves are installed in the proper locations.

3.2.5 Separation of Water Mains and Sanitary Sewer Mains

Water mains shall be laid at least ten feet (10') laterally from existing or proposed sewers, unless local conditions or barriers prevent a ten foot (10') lateral separation in which case the following is required:

The water main shall be laid in a separate trench, with the elevation of the bottom of the water main at least eighteen inches (18") above the top of the sewer;

or

The water main shall be laid in the same trench as the sewer with the water main located at one side on a bench of undisturbed earth, and with the elevation of the bottom of the water main at least eighteen inches (18") above the top of the sewer.

3.2.5 Water and Sewer Main Crossings

3.2.5.1 Crossing a Water Main over a Sewer Main

Whenever it is necessary for a water main to cross over a sewer main, the water main shall be laid at such an elevation that the bottom of the water main is at least eighteen inches (18") above the top of the sewer. If location conditions or barriers prevent an eighteen inch (18") vertical separation then both the water main and the sewer main shall be constructed of ductile iron pipe and with joints that are equivalent to water main standards for a distance of ten feet (10') on each side of the point of crossing.

3.2.5.2 Crossing a Water Main under a Sewer Main

Whenever it is necessary for a water main to cross under a sewer main, both the water and sewer main shall be constructed of ductile iron pipe and with joints equivalent to water main standards for a distance of ten feet (10') on each side of the point of crossing.

3.2.6 Fire Flow Requirements for Water Mains

Fire Flow requirements for all proposed development shall be determined by the City of New Bern Fire Department (252) 639-2931.

3.2.7 Pressure Requirements for Water Mains

Water mains shall be designed to maintain a minimum residual pressure of twenty (20) psi at peak demand during fire flow. Peak Demand shall be determined as described in Title 15A, Subchapter 18C of the North Carolina Administrative Code.

3.2.8 Reaction Anchorage and Thrust Blocking

All exposed piping with mechanical couplings, push-on, mechanical joints, or similar joints subject to internal pressure shall be blocked, anchored, or harnessed to preclude separation of joints. All mechanical joint tees, all horizontal bends, vertical bends deflecting twenty two and one half (22 ½) degrees or more, and plugs which are installed in buried piping (subjected to internal hydrostatic heads in excess of thirty feet (30')) shall be provided with suitable reaction blocking, anchors, joint harness, or other acceptable means for preventing movement of the pipe caused by internal pressure. Concrete blocking shall extend from the fitting to solid undisturbed earth and shall be installed so that all joints are accessible for repair. The fittings shall be wrapped in plastic to protect the fitting, bolts, and nuts from being permanently set in concrete and facilitate access for repair.

3.2.9 Detectable Tape and Tracer Wire

Detectable warning tape shall be installed on all water and sewer main extensions. Tracer wire shall be installed on all water and sewer main extensions. The color of the detectable tape shall meet the standards of the AWWA color code.

The tracer wire shall be brought to the surface and located in a standard meter box at the following locations:

- At all bends and changes in horizontal direction.
- At all valves the tracer wire shall run along the exterior of the valve box and through a notch cut in the top (see detail W-4).
- At the ends of a directional bore.
- Any location where two sections of tracer wire need to be spliced together. No underground wire connections shall be permitted.
- On straight runs of pipe, at 500' intervals.

3.3 PROPOSED WATER & SEWER SERVICES

3.3.1 Location of Water & Sewer Services

All projects shall provide for individual water and sewer services to be installed at each lot or residential unit. Services shall be installed flush to finished grade along the limit of the street right-of-way and at the center of the parcel or lot to be served. Services shall not be located within sidewalks, driveways, or other paved areas which are subject to vehicular traffic. Service pipe or tubing shall be installed perpendicular to the main.

3.3.2 Water Service Sizing

Water meters shall be sized by the City of New Bern Engineering Department based on water demand data provided by the Developer and/or Engineer.

3.3.3 Water Service Connections

Water services shall be designed with a corporation stop, an angle stop, polyethylene service tubing, and a meter box.

3.3.3.1 Corporation Stops

Taps shall be located at 10:00 or 2:00 o'clock with respect to the circumference of the pipe. Taps shall alternate from one side of the pipe to the other side, whenever possible, and be at least 12" apart. In the event two taps are made on the same side of the pipe in succession, they must be a minimum of 24" apart. Service taps on PVC pipe shall be made using a double strap service saddle. Service taps on four inch (4") or larger ductile iron pipe may be installed by direct tapping of the main.

3.3.3.2 Angle Stops

Angle stops shall be installed so as not to cause a bind on the pipe once the meter is installed. The angle meter stop shall be perfectly plumb, 3" to 5" from the back of the meter box, centered between the sides of the meter box, and 3" to 4" above the bottom of the meter box.

3.3.3.3 Service Tubing

The water service tubing shall be one continuous piece of pipe from the corporation stop to the angle meter stop, with no unions. Each water service line shall run perpendicular to the main and straight to the meter with no kinks and/or bends.

3.3.3.4 Meter Boxes

Water meter boxes shall be placed on, no less than four (4), common brick to prevent settling. Meter boxes shall have four inches (4") of stone under the brick to aid in drainage.

3.3.4 Gravity Sewer Service Connection

Gravity sewer services shall be designed with a wye connection, a clean-out placed at the right-of-way and service piping. The minimum size of a gravity sewer service shall be four inches (4").

3.3.4.1 Wye Connections

Gravity sewer service line taps shall be located at 10:00 or 2:00 with respect to the circumference of the pipe. The sewer service line tap fitting shall be appropriate for the type of pipe being used.

3.3.4.2 Clean-outs

The sewer service line clean-outs shall be made using a long sweep wye on the sewer service line. A one foot (1') extension shall be placed on the through section of the wye with a cap glued in place. A single piece of sewer service line pipe shall be extended to grade from the wye, with a cap glued in place. Residential developments with multiple lots shall leave the clean-outs stubbed up 3' to 4' above grade until the private sewer has been connected to the clean-out, at which point the clean-out shall be lowered to be flush with the finished grade. The final clean-out cap shall have a slotted top or inverted nut. No raised nut clean-out caps will be permitted.

3.3.4.3 Service Piping

The sewer service line shall be constructed with the longest piece of pipe available from the manufacturer and the least amount of fittings. Couplings shall not be allowed on the sewer service lines to join short pieces together.

3.4 PROPOSED FIRE HYDRANTS

3.4.1 Location of Fire Hydrants

Proposed fire hydrants shall be placed within the street right-of-way and where possible at street intersections. On curbed streets the hydrant shall be placed no closer than two feet (2') and no further than five feet (5') from the back of the curb. On streets without curbing the hydrant shall be placed between the top of the ditch back slope and the right-of-way boundary. In no case will the hydrant be allowed to be placed in the ditch slopes. All hydrants shall be installed so that the pumper nozzle is perpendicular to the roadway and the centerline of the nozzle is a minimum of eighteen inches (18") and a maximum of twenty-four inches (24") above finished grade.

3.4.2 Spacing of Fire Hydrants

The spacing of proposed fire hydrants shall meet the following requirements:

Residential Areas: Hydrants shall be spaced with a maximum of 800 feet between hydrants.

Commercial Areas: Hydrants shall be spaced with a maximum of 400 feet between hydrants.

Industrial Areas: Hydrants shall be spaced with a maximum of 200 feet between hydrants.

The spacing length shall be measured along vehicle access routes which will allow for proper hose placement.

3.4.3 Fire Hydrant Assembly

All proposed fire hydrant assemblies shall include a water main tee, a hydrant leg, a gate valve, a riser, and the hydrant. Hydrants shall be installed perpendicular to water mains. Hydrant elbow shall be tied through all fittings and valves to the hydrant tee with the use of stainless steel threaded rods.

3.5 PROPOSED GATE VALVES

Gate valves shall be provided at all intersection of proposed water and sewer force mains. At each intersection a valve shall be provided for all but one of the branches (i.e. two (2) valves at a tee and three (3) valves at a cross). Valve boxes shall be installed on all valves. Gate valves shall be installed at intervals of 1,500 feet on all proposed water and sewer force mains.

3.6 PROPOSED AIR RELEASE VALVES

3.6.1 Location of Air Release Valves

Air release valves shall be located at all high points along pressure mains where the distance between the high point and the low point in the pressure main exceeds ten feet (10') in elevation. The City of New Bern Engineering Department may require additional air release valves to be provided at other locations where it is determined that the possibility exists for the accumulation of excess air in the main.

3.6.2 Air Release Valve Assembly

All air release valves other than temporary blow-offs shall be automatic in type. The proposed ARV manholes shall be installed so that the manhole cover is flush with the existing grade and they shall not be installed in the centerline of any existing ditch or swale. If needed, these manholes shall be installed to back of the existing ditch and the ARV will be piped to the force main with the appropriate sized brass pipe.

3.7 PROPOSED BLOW-OFFS

3.7.1 Location of Blow-Offs

Manual blow-off assemblies shall be provided at dead-ends of all pressure mains.

3.7.2 Six Inch (6") and Larger Water Mains

At dead-end locations on all water mains six inches (6") in diameter and larger a standard fire hydrant shall be provided as a blow-off assembly.

3.7.3 Four Inch (4") and Smaller Water Mains

At dead-end locations on all water mains four inches (4") in diameter and smaller a manual blow-off assembly shall be provided in a meter box. The meter box shall be located at the limit of right-of-way.

3.7.4 Sewer Force Mains

At dead-end locations on all sewer force mains a manual blow-off assembly shall be provided in a meter box. The blow-off assembly shall have a brass ball valve and a two inch (2") hose connection in the meter box. The hose connection shall be equipped with a removable cap. The meter box shall be located at the limit of right-of-way.

3.8 PROPOSED BACKFLOW PREVENTION ASSEMBLIES

Backflow prevention assemblies shall be required for all applications in which the potential exists for the public water supply to be contaminated by the backflow from a private water system. The degree of protection required shall depend on the severity and type of possible contaminant. Protection requirements and device locations may vary by project and will be reviewed on an individual basis by the City of New Bern Engineering Department.

3.9 PROPOSED SANITARY SEWER MANHOLES

3.9.1 Location of Proposed Manholes

All proposed gravity sanitary sewer mains shall be designed so that a manhole is installed at all locations where changes in horizontal alignment, vertical grade, or pipe diameter are required. The maximum distance between manholes as measured along the sewer main shall be 425 feet.

3.9.2 Manholes in Paved Areas

Where practical design allows, all manholes located within paved areas shall be set along the center line of the road and out of designated parking spaces.

3.9.3 Manhole Structure

3.9.3.1 Base

Installation of all precast concrete manholes shall consist of a minimum of 6 inches of stone leveling course beneath the base section.

3.9.3.2 Sections

All proposed manholes shall be constructed with precast concrete sections. Brick constructed manhole are not permitted. The precast top sections shall have eccentric cones unless otherwise noted. All sections shall have tongue and groove joints.

3.9.3.3 Steps

Manholes over 3 feet in depth shall have steps installed in the precast concrete sections. The steps shall be installed 16 inches on center.

3.9.3.4 Ring and Cover

Final grade adjustment shall be made with concrete riser rings. The use of bricks shall not be allowed without prior approval. The ring and cover shall be traffic bearing and have the word "SEWER" cast into the cover.

3.9.3.5 Flexible Pipe Sleeve

Flexible manhole pipe sleeves shall be used at all pipe entries into the manhole. The sleeve shall be cast into the manhole wall providing a watertight collar for the pipe. The sleeve shall be filled with hydraulic cement from the inside of the manhole to block water from backing into the sleeve.

3.9.3.6 Grout

All perforations pick holes, seams, transitions, joints and leaks shall be sealed with hydraulic cement or approved equal.

3.9.3.7 Drop Manholes

Manholes with sewer pipes entering 2 ½ feet, or more, above the bottom shall have an inside drop manhole connections installed. All drop manholes shall have a minimum inside diameter of 5 feet.

3.10 PROPOSED PUMP STATIONS

3.10.1 Option to Use Pump Stations

In the design of all proposed sanitary sewer system extensions every effort and consideration shall be made to use conventional gravity sewer for the system extension. The use of pump stations and force mains shall only be permitted when the proposed extension can not be properly connected to the existing gravity system due to local conditions or when existing gravity sewer is unavailable.

3.10.2 Sizing of Proposed Pump Stations

Proposed pump stations shall be sized as required by the NCDENR guidelines for the proposed property usage. The City of New Bern reserves the right to increase the size of proposed pump stations as needed to accommodate anticipated future development within the general vicinity of the proposed project area.

3.10.3 Pump Station Site

All proposed pump stations shall be placed on a site (50' x 50' min.) within the project area with a ground elevation above that of the flood plain. The site shall be graded to direct drainage away from the wet well structure. The site shall be accessible by an access road. At a minimum, the access road shall be twelve foot (12') wide and constructed of six inches (6") of compacted ABC stone. The site shall be enclosed by a galvanized chain-link fence with a lockable gate. Compacted stone shall be placed within the entire fenced area. A concrete pad shall be poured to create a level surface between the wet well access and the control panel. An elevated area light shall be installed at the site, as well as a frost proof yard hydrant.

3.10.4 Pump Station Structure

3.10.4.1 Wet Well

All proposed wet well structures shall be constructed of precast concrete sections with the diameter as required by design and in no case less than six feet (6'). The top section shall be flat with the access openings cast in. Access openings and covers shall be sized and placed to allow for pump removal. A mushroom style vent shall also be cast in the top section of the wet well.

3.10.4.2 Pumps

All proposed pump stations shall use a duplex pump system. Pumps shall be submersible in type and of equal size and pumping capacity. Pumps shall be mounted on a guide rails and have a chain lifting system. Pumps shall be sized per the recommendations of the pump manufacturer for the designed flow.

3.10.4.3 Check Valves

Check valves shall be installed on each of the pump discharge lines. Check valves shall be the spring and lever type and installed in precast concrete valve vault. The valve vault shall be equipped with a lockable access cover.

3.10.4.4 Control and Electrical Components Rack

All electrical components and pump controls shall be located on a single rack within the pump station site. The rack and rack supports shall be constructed of stainless steel or aluminum and installed on a concrete slab. The rack shall have a minimum thickness of ¼ inch. A sun shield shall be provided across the entire length of the rack.

3.10.4.5 Pump Station Piping

All piping in the wet well, check valve vault, and additional piping within the pump station site shall be ductile iron. All piping within the pump station site shall have the same diameter.

3.10.4.6 Alternative Power Source

The alternative power source for all proposed pump stations shall be a generator. For pump stations with a designed average daily flow of less than 15,000 gallons per day, the pump station shall be equipped with a manual emergency transfer switch and hook-up for the generator.

For pump stations with a designed average daily flow of 15,000 gallons per day or more, the pump station shall be equipped with a permanently mounted generator and an automatic emergency transfer switch. A concrete pad shall be provided for the generator.

SECTION 4.0

GUIDELINES FOR USE OF THE TOWNSHIP NO. 7 LOW PRESSURE S.T.E.P. SEWER SYSTEM

4.1 GENERAL

This section identifies special requirements which are applicable to all customers contributing flow that is tributary to the City of New Bern Township No. 7 Lagoon WWTF. This collection system is commonly referred to as the Township No. 7 S.T.E.P. system.

4.2 GENERAL REQUIREMENTS FOR S.T.E.P. SYSTEM USE

4.2.1 The City of New Bern will only provide (1) S.T.E.P. service per building lot. To be considered eligible for connection to the S.T.E.P. sewer system, a lot has to be permitted through NCDENR, platted through the Craven County Register of Deeds prior to January 22nd, 2007, and has to be located in an area currently served by the S.T.E.P. system.

4.2.2 The City of New Bern Engineering Department will have final determination on service availability and shall have the right to refuse service if the existing infrastructure in a particular area cannot handle additional loading.

4.2.3 To determine if a lot will be eligible for connection to the S.T.E.P. sewer system, the property owner shall contact the City of New Bern Customer Service Representative at (252) 639-7596. No lot will be provided service without a Sewer Availability letter issued by the City of New Bern Customer Service Representative.

4.2.4 The property owner shall be responsible for repairing or replacing the S.T.E.P. tank, at his/her own expense when notified in writing by the City of New Bern that tank repairs, tank replacement, or the removal of solids is necessary.

4.3 REQUIREMENTS FOR RESIDENTIAL INSTALLATION AND USE

4.3.1 Only one residence per lot will be allowed to connect to the S.T.E.P. system. For a residential development, only single family dwellings will be allowed.

4.3.2 For residential properties wanting to connect to the S.T.E.P. system, the property owner shall be responsible for obtaining a Sewer Availability letter, paying the required tap fee, providing the required electrical service, and installing the S.T.E.P. tank.

- 4.3.3 After the Engineering Department has determined sewer service is available and issued the property owner a sewer availability letter, the tap fee can be paid during normal business hours at the City of New Bern Customer Service Office located at 606 Fort Totten Drive. The tap fee for existing residential lots within Township No. 7 will be \$3,500.00.
- 4.3.4 The property owner shall install (2) twenty amp three wire electrical circuits stubbed out from the residence as described below:(Also as approved by Craven County Building Inspections Department).
- 4.3.4.1 The power supply wiring should be installed within 20 feet of the discharge end of the S.T.E.P. tank. The control panel location should be visible from the road.
- 4.3.4.2 Two (2) twenty amp circuits on separate circuit breakers are required. One circuit is required for the pump and the other for the control panel. The control panel will be mounted by the City.
- 4.3.4.3 Note that special provisions may be necessary for installations below the flood plain elevation of 10 feet above mean sea level. Any exceptions must meet the latest applicable National Electric Code
- 4.3.5 The S.T.E.P. tank to be installed by the property owner shall be a 1,300 gallon vacuum tested precast concrete septic tank/pump tank combination. A concrete riser ring shall be provided if needed to adjust ring and cover to final grade. A watertight manhole ring and cover shall be provided for access to the pump. The tank shall be manufactured by Futrells Precast, Inc. of Deep Run, N.C. (252- 568-3481) or The Stallings Company, Inc. of Greenville, N.C. (252-756-0267). The tank installer will need to contact the City of New Bern Sewer Enforcement Officer at (252) 639-7597 to witness the installation and vacuum testing of the S.T.E.P. tank at the time of installation.
- 4.3.6 Once the tank and electrical service have been installed, and the tap fees are paid, the City of New Bern will schedule the installation of the pump components and the connection of the sewer service. The actual installation time will depend on the City's current work load

4.4 REQUIREMENTS FOR COMMERCIAL INSTALLATION AND USE

- 4.4.1 Only one business per lot will be allowed to connect to the S.T.E.P. system. For a commercial development, only a single building with a single storefront will be allowed. Strip centers and other multiple occupant buildings will not be allowed to connect to the S.T.E.P. system.
- 4.4.2 All proposed commercial development must have a average daily designed flow of less than 500 gallons per day based on the criteria set forth in the most recent version of Section 15A NCAC 02T .0114 of the North Carolina Administrative Code.

- 4.4.3 Owners of commercial buildings must notify the City of New Bern Engineering Department prior to any change the occupant use of the building. The new occupant use must meet the requirements of section 4.3.2.
- 4.4.4 Commercial properties wanting to connect to the S.T.E.P. system will be required to obtain a Commercial Sewer Use Permit, pay the applicable equipment and tap fees, and completely install the S.T.E.P. system service. The Developer shall provide a licensed utility contractor with experience in S.T.E.P system installation to install the service tap, the service line and all pump components.
- 4.4.5 The required tap fee will vary based on the proposed water meter size serving the property. The equipment fee will be \$3,600.00 and will cover the cost of the major components for a duplex pump system.
- 4.4.6 The developer shall install the same 1,300 gallon vacuum tested tank as described in section 4.2.4.
- 4.4.7 All commercial services shall require a duplex system utilizing (2) Zoeller model 163 submersible effluent pumps.
- 4.4.8 The required equipment fee to be paid by the developer covers the cost of the major system components (pumps, control panel, control items, check valves), thus these items shall be provided to the developer by Ihire Supply (1602 Old Cherry Point Rd.) at no additional cost to the developer. However, the developer will be responsible for purchasing all of the 1 ½” CTS pipe, brass fittings, and other incidental items associated with the complete installation of the S.T.E.P. service, including materials required for tapping the existing force main if there is no existing service tap on the lot. Once the required equipment and tap fees are paid, please contact the City of New Bern Customer Service Representative at (252) 639-7596 to coordinate the pick-up of the major system components.
- 4.4.9 The Developer shall have installed (1) Single pole, 20 amp circuit and (1) double pole, 40 amp circuit for the electrical supply to the pumps and control panel. The electrical contractor shall provide 1½” PVC conduit and fittings between the pump tank and the control panel. The developer shall provide a licensed electrician to wire the control panel and the pumps.
- 4.4.10 The service line from the main to the check valve assembly and from the check valve assembly to the pump tank shall be 1 ½” CTS, Green, HDPE Tubing manufactured by ENDOT pipe. A continuous run (no fittings) of pipe shall be supplied in both locations.
- 4.4.11 If there is no existing service tap on the lot the Developer will be responsible for making the required tap. The connection to the main shall be made using the appropriate sized service saddle and a brass corporation

stop. The ball valve at the check valve assembly shall be a ¼ turn, brass ball valve with a lever handle. The Corporation stop, ball valve and all brass fittings used in the service line assembly shall be “MAC-PAC” type compression fittings manufactured by AY McDonald or an approved equal. The utility contractor will need to contact the City of New Bern Sewer Enforcement Officer at (252) 639-7597 to witness the tap.

- 4.4.12 The actual check valve used in the check valve assembly shall be a Spears 1 ½”, wye-check threaded to accept 1 ½” MIP brass fitting on both ends. The wye-check shall have a continuous stainless steel reinforcing ring around the outside of the threads to prevent fittings from being over tightened.
- 4.4.13 To help assist with service line locating, a continuous run of 10 gauge, solid wire shall be installed on all service lines extending from the main to the check valve assembly box and from the check valve assembly box to the pump tank. Each service shall have approximately 18” of wire coiled up in the box.
- 4.4.14 After the service line (which should be left uncovered), pump and panel are installed, the contractor shall contact the City of New Bern Customer Service Representative at (252) 639-7596 to schedule the final inspection of the S.T.E.P. system. During the final inspection the Contractor shall operate all system components to ensure the system functions properly and that no leaks are present.
- 4.4.15 Any questions regarding the materials or the installation procedure should be directed to the City of New Bern Engineering Department (252) 639-7526.
- 4.4.16 The Contractor will provide a 1 year warranty for the workmanship of the installation.

SECTION 5.0

MATERIAL SPECIFICATIONS FOR WATER & SEWER EXTENSIONS

5.1 PIPE FOR GRAVITY SEWER MAINS

5.1.1 PVC Pipe

All Polyvinyl Chloride (PVC) pipe used in the construction of gravity sewer main extensions shall meet the following standards:

Pipe: Pipe shall meet the requirements of ASTM D3034

Dimensions: Standard Dimension Ratio (SDR) 35

Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.

Joints: Joints shall be push-on type with elastomeric gaskets conforming to ASTM F477

Fittings: PVC fittings shall conform to ASTM D3034, 7.4

5.1.2 Ductile Iron Pipe

All Ductile Iron Pipe (DIP) used in the construction of gravity sewer main extensions shall meet the following standards:

Pipe: Class 50 Ductile iron conforming to ANSI/AWWA A21.51/C-151

Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110

Joints: Mechanical joints conforming to ANSI/AWWA A21.11/C-111 or push-on joint conforming to ANSI/AWWA A21.51/C-151

Lining: All pipes and fittings shall be lined in accordance with ANSI/AWWA A21.4/C-104

Coating: All pipes and fittings shall be coated interior and exterior with bituminous coating approximately 1 mil thick.

5.2 PIPE FOR SEWER FORCE MAINS

5.2.1 PVC Pipe

All PVC used in the construction of sewer force mains shall meet the following standards:

- Pipe: Pipe shall conform to the standards of AWWA C-900
- Dimensions: Standard Dimension Ratio (SDR) 18 for both bell and pipe thickness
- Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.
- Pressure: Pipe shall be pressure rated at 150 psi
- Joints: Joints shall be push-on type with elastomeric gaskets conforming to ASTM F477
- Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110

5.2.2 Ductile Iron Pipe

All Ductile Iron Pipe (DIP) used in the construction of sewer force mains shall meet the following standards:

- Pipe: Class 50 Ductile iron conforming to ANSI/AWWA A21.51/C-151
- Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110
- Joints: Mechanical joints conforming to ANSI/AWWA A21.11/C-111 or push-on joint conforming to ANSI/AWWA A21.51/C-151
- Lining: All pipes and fittings shall be lined in accordance with ANSI/AWWA A21.4/C-104
- Coating: All pipes and fittings shall be coated interior and exterior with bituminous coating approximately 1 mil thick.

5.2.3 High Density Polyethylene (HDPE) Pipe

All HDPE used in the construction of sewer force mains shall meet the following standards:

- Pipe: Pipe shall meet the requirements of AWWA C-906

- Dimensions: Standard Dimension Ratio (SDR) 9 for pipe thickness
- Material: Pipe shall be constructed of PE 3408 conforming to ASTM D1248, Minimum cell classification of 345434E.
- Pressure: Pipe shall be pressure rated at 200 psi
- Joints: All pipe and fittings shall be butt fusion jointed utilizing procedures, tools and equipment recommended by the pipe manufacturer
- Fittings: Fittings for HDPE Pipe shall be miter fusion fabricated and shall provide a pressure rating equal to that of the pipe. Molded butt fittings shall be manufactured in accordance with ASTM D-3261.

5.3 PIPE FOR WATER MAINS

5.3.1 PVC Pipe 4” and Larger

All PVC used in the construction of water mains four inches (4”) in diameter and larger shall meet the following standards:

- Pipe: Pipe shall conform to the standards of AWWA C-900
- Dimensions: Standard Dimension Ratio (SDR) 18 for both bell and pipe thickness
- Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.
- Pressure: Pipe shall be pressure rated at 150 psi
- Joints: Joints shall be push-on type with elastomeric gaskets conforming to ASTM F477
- Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110

5.3.2 PVC Pipe 3” and Smaller

All PVC used in the construction of water mains three inches (3”) and smaller in diameter shall meet the following standards:

- Pipe: Pipe shall meet the requirements of ASTM D2241
- Dimensions: Standard Dimension Ratio (SDR) 21 for both bell and pipe thickness
- Material: Pipe shall be constructed of PVC conforming to ASTM

D1784, Minimum cell classification of 12454B.

- Pressure: Pipe shall be pressure rated at 200 psi
- Joints: Joints shall be push-on type with elastomeric gaskets conforming to ASTM F477
- Fittings: Fittings shall be Schedule 80 PVC with solvent weld joints

5.3.3 Ductile Iron Pipe

All Ductile Iron Pipe (DIP) used in the construction of water mains shall meet the following standards:

- Pipe: Class 50 Ductile iron conforming to ANSI/AWWA A21.51/C-151
- Fittings: Ductile Iron conforming to ANSI/AWWA A21.11/C-110
- Joints: Mechanical joints conforming to ANSI/AWWA A21.11/C-111 or push-on joint conforming to ANSI/AWWA A21.51/C-151
- Lining: All pipes and fittings shall be lined in accordance with ANSI/AWWA A21.4/C-104
- Coating: All pipes and fittings shall be coated interior and exterior with bituminous coating approximately 1 mil thick.

5.3.4 High Density Polyethylene (HDPE) Pipe

All HDPE used in the construction of water mains shall meet the following standards:

- Pipe: Pipe shall meet the requirements of AWWA C-906
- Dimensions: Standard Dimension Ratio (SDR) 9 for pipe thickness
- Material: Pipe shall be constructed of PE 3408 conforming to ASTM D1248, Minimum cell classification of 345434E.
- Pressure: Pipe shall be pressure rated at 200 psi
- Joints: All pipe and fittings shall be butt fusion jointed utilizing procedures, tools and equipment recommended by the pipe manufacturer
- Fittings: Fittings for HDPE Pipe shall be miter fusion fabricated and shall provide a pressure rating equal to that of the pipe.

Molded butt fittings shall be manufactured in accordance with ASTM D-3261.

5.4 SANITARY SEWER SERVICES

5.4.1 Gravity Sewer Services

All materials used in the construction of gravity sewer services shall meet the following standards:

- Pipe: Schedule 40 PVC - Drain, Waste, and Vent (DWV) conforming to the requirements of ASTM D2665
- Material: Pipe shall be constructed of PVC conforming to ASTM D1784, Minimum cell classification of 12454B.
- Fittings: Fittings shall be Schedule 40 PVC conforming to ASTM F1866 with solvent weld joints. Joint primer shall conform to ASTM F656 and joint solvent shall conform to ASTM D2564
- Clean-out: Service clean-out shall use a standard wye and clean-out plug as made or recommended by the pipe manufacturer
- Service Connection: Service connection shall use a standard wye made or approved by the pipe manufacturer

5.4.2 S.T.E.P. System Services

All materials used in the construction of S.T.E.P system services shall meet the following standards:

- Tank: All individual S.T.E.P systems shall use a vacuum tested, precast concrete septic tank/ pump tank combination. A concrete riser ring shall be provided to adjust ring and cover to final grade. A standard manhole ring and cover shall be provided for access to the pump chamber. Tanks for residential use shall be manufactured by The Stallings Company, Inc. of Greenville, N.C. (252-756-0267) or Futrells Precast, Inc. of Deep Run, N.C. (252- 568-3481).
- Pump: The effluent pump shall be of the submersible type capable of delivering a flow and total dynamic head (TDH) as determined for each installation, and shall be sufficient to pump effluent to the mainline pressure pipe for elimination. The maximum pump shutoff head shall not exceed seventy-five percent (75%) of the working pressure of the pipe. Pump shall comply with the following:

- a. Pump shall be specifically designed and rated to pump sewage effluent into pressure wastewater collection systems.
- b. All residential effluent pumps shall be Zoeller model 163 pumps or approved equal.
- c. All pumps supplied must be constructed per (and bear the label of) an authorized testing authority such as Underwriter's Laboratories, Inc. (UL) for effluent duty.
- d. Pumps shall have a thirty-five-foot (35') long extra heavy-duty (SO) multiconductor NEC rated electrical cord with ground to motor plug.
- e. The submersible pump shall pass a ¾ " spherical solid.
- f. Pump motor shall be of the submersible type.
- g. Motor shall be Single Phase, 230 Volts, 60 Hertz, 3500 RPM minimum or equal.
- h. Single-phase motors shall be thermally protected with an automatic reset feature.

Control
Panel:

The pump control panel shall be CSI or approved equal simplex pump control/alarm panel with the following features:

- a. All control components shall be contained in a single NEMA 4X fiberglass enclosure. The enclosure shall be of one piece, weatherproof construction and gray in color. Enclosure cover shall be hinged with a stainless steel piano hinge and be lockable with two (2) stainless steel latches.
- b. The panel shall be equipped with a red alarm light and an integrated audible alarm to indicate "high level" alarms. A silence switch for the audible alarm shall be located on the exterior of the panel. The audible alarm shall produce a minimum of 80 decibels of sound pressure.
- c. Level indication and pump operation shall be controlled with the use a pressure bell assembly with a rolling diaphragm. A single float switch shall be provided to serve as a redundant high level indicator.

Pipe:

Service pipe shall be 1 ½ inch CTS, polyethylene conforming to the standards of ANSI/AWWA C901. Pipe shall be made of PE3408 material with a standard dimension ratio of 9 (SDR 9) and a pressure rating of 200 psi. The pipe shall be green in color.

Service
Saddles:

Service saddles shall be brass with stainless steel straps and/or bolts. Saddles shall have (AWWA) CC threads. Saddles with straps shall be the double strap type. Saddles

shall be manufactured by McDonald, Ford, Romac, or approved equal.

Corporation

Stops: Corporation stops shall be bronze body with (AWWA) CC tapered threaded inlet and compression connection outlet. Corporation stops shall be manufactured by McDonald, Ford, Muller, or approved equal.

Ball

Valve: Ball valves shall be bronze body and have a stainless steel ball, with a quarter turn, lever handled shut-off. Ball valves shall be manufactured by McDonald, Ford, Muller, or approved equal.

Check

Valve: Check valves shall be PVC wye-Check valves having IP threaded type pipe connections. The valve shall incorporate a weighted piston seat carrier as the sealing closure. Valve end (bonnet) shall be configured with a removal eye pin. Valve body shall be constructed of PVC which meets or exceeds the requirements of ASTM D-1784. The valve shall have a minimum pressure rating of 150 psi. The check shall be a 1 ½", wye-check threaded to accept 1 ½" MIP brass fitting on both ends. The wye-check shall have a continuous stainless steel reinforcing ring around the outside of the threads to prevent fittings from being over tightened. Check valves shall be manufactured by Spear, George Fischer or approved equal.

Meter

Box: Meter Boxes shall be constructed of cast iron conforming to ASTM A-48 Class 30B, with an asphalt coated finish. Dimensions shall be 20" L x 10" W x 12" H. The word "SEWER" shall be cast into the lid. Box shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal.

5.5 WATER SERVICES

All materials used in the construction of water services shall meet the following standards:

Pipe: Service pipe shall be one inch (1") polyethylene tubing conforming to the standards of ANSI/AWWA C901. Pipe shall be made of PE3408 material with a standard dimension ratio of 9 (SDR 9) and a pressure rating of 200 psi. The tubing shall be blue in color.

Service

Saddles: Service saddles shall be brass with stainless steel straps and/or bolts. Saddles shall have (AWWA) CC threads. Saddles with straps shall be the double strap type. Saddles shall be manufactured by McDonald, Ford, Muller, or approved equal.

Corporation

Stops: Corporation stops shall be bronze body with (AWWA) CC tapered threaded inlet and compression connection outlet. Corporation stops shall be manufactured by McDonald, Ford, Muller, or approved equal.

Angle

Stop: Angle stops shall be bronze body with compression connections for the inlet and outlet. Ball valves shall have a stainless steel ball and a lockable, quarter turn, tee handled shut-off. Ball valves shall be manufactured by McDonald, Ford, Muller, or approved equal.

In shallow water service installations straight meter valves shall be utilized instead of angle stops at locations where the service tubing has to come through the side of the meter box instead of up through the bottom. The straight meter valves shall be either Muller Model B-24350 or Ford Model B43. Both valves will have a swivel meter nut on one side and a compression type pack joint for CTS tubing on the other side, along with a lockable wing.

Meter

Box: Meter Boxes shall be constructed of cast iron conforming to ASTM A-48 Class 30B, with an asphalt coated finish. Dimensions shall be 20" L x 10" W x 12" H. The word "WATER" shall be cast into the lid. Box shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal.

5.6 VALVES AND VALVE BOXES

5.6.1 Gate Valves

Gate valves shall be resilient seated and conform to AWWA C-509 for water and other liquids. Gate valves shall be iron bodied bronze mounted having non-rising stems and mechanical joints. Gate valves shall open counter clockwise, have a standard 2 inch square operating nut, and a cast-on direction arrow. Gate valves shall be manufactured by Mueller, Clow, American, or approved equal.

5.6.2 Butterfly Valves

Butterfly valves 20" and smaller shall conform to AWWA C504 for class 150B. Butterfly valves shall be iron bodied mechanical point with cast iron valve discs ASTM A-436 Type 1, Stainless steel valve shafts Type 316 recognized synthetic compound valve seals bonded to withstand 75 lbs. Pull butterfly valves shall be fitted with sleeve-type corrosion resistant bearings and self adjusting valve packing. Valve operators for butterfly valve shall conform to AWWA C 504 with 2 inch square operating nut.

The valve operators shall be the self locking type designed to hold the valve in any position without creeping or fluttering. Butterfly valves shall open counter-clockwise. Butterfly valves shall be manufactured by American, Clow, Mueller, Pratt, or approved equal.

5.6.3 Tapping Sleeve & Valve

Tapping sleeves and all required hardware shall be constructed of stainless steel and have a minimum working pressure of 150 psi. Tapping sleeves shall be manufactured by Ford, Muller, Romac or approved equal.

Tapping valves shall meet all the requirements for gate valves as set forth in Section 4.6.1.

5.6.4 Valve Box

Valve boxes shall be constructed of cast iron and rated for H-20 traffic loading. Valve boxes shall be two (2) piece adjustable screw type telescopic valve boxes with the tops marked SEWER or WATER for their relative use and location. Valve Boxes shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal.

5.7 AIR RELEASE VALVES

5.7.1 Automatic Air Release Valves

Automatic Air Release Valves shall be automatic float operated valves designed to release accumulated air from a piping system while the system is in operation and under pressure.

The valve body and cover shall be constructed of ASTM A126 Class B cast iron for working pressures up to 300 psig. Higher pressure rated valves shall be constructed of ASTM A536 Grade 65-45-12 ductile iron. The orifice, float and linkage mechanism shall be constructed of Type 316 stainless steel. Non-metallic floats or linkage mechanisms are not acceptable. The orifice button shall be Viton for simple lever valves and Buna-N for compound lever designs.

5.7.2 Manual Air Release Valves

Manual air release valves shall consist of the same materials as specified for a Water Service connection as described in Section 4.5

5.8 FIRE HYDRANTS

Fire hydrants shall conform to AWWA C502. Fire hydrants shall be manufactured with two (2) 2 ½ inch hose nozzles and one (1) 4 ½ inch pumper nozzle. All threads shall conform to the standard for the City of New Bern. All hydrant legs

shall be six inch (6”) ductile iron pipe with a mechanical joint valve. All hydrants furnished shall have a minimum 3'-6" inch bury depth hydrant. Hydrants shall be ordered for the correct bury depth so that extensions are not needed to properly set the final fire hydrant grade. All hydrants furnished are to be bronze to bronze threads between the seat or seat ring and the seat attaching assembly with a drain ring. Fire hydrants shall be dry top type with a breakable traffic feature assuring the hydrant remains closed should it be broken off at the ground level. In addition to the factory coat, all hydrants shall be painted after installation using high grade exterior enamel paint. All fire hydrants shall be Mueller Cat. No. A421, 4 ½” Centurion Fire Hydrant with mechanical shoe, American Darling 4 ½ “ MK-73-1, or approved equal.

5.9 MANHOLES

All materials used in the construction of manholes shall meet the following standards:

- Sections: All manholes shall be constructed using precast concrete sections conforming to ASTM C-478.
- Joint
Material: Joints shall be watertight, and conform to ASTM C-478. The joint sealing material shall meet the requirements of Federal Specifications SS-5-00210, Sealing Compound, Preformed Plastic for Pipe Joints, Type I rope, or Type II flat.
- Steps: Manhole steps shall be constructed of 0.5” diameter, grade 60 steel bars. The steps shall be have a plastic coating and meet the requirements of Federal Specification RR-F-621C.
- Ring &
Cover: Manhole rings and covers shall be constructed of Class 30 cast iron conforming to ASTM A48, and shall be traffic bearing. The words “SANITARY SEWER” shall be cast in top of the cover. Rings and covers shall be manufactured by Capital Foundry, East Jordan Iron Works, Charlotte Pipe and Foundry, or approved equal.
- Pipe
Sleeve: Pipe sleeves with stainless steel clamps conforming to ASTM C-923 shall be used for pipe to manhole connections. The pipe sleeve shall be design and constructed to provide a flexible watertight seal.
- Inverts: Inverts shall be precast into the bottom section of the manhole.
- Drop
Connections: Inside drop manhole connections shall be installed using Duran Inc’s RELINER Inside Drop System Components and RELINER Drop End Flume System or approved equal.

5.10 PUMP STATIONS

All materials used in the construction of pump stations shall meet the following standards:

5.10.1 Wet Well Structure

All components of the wet well structure shall conform to the requirements for manholes as described in Section 4.9.

5.10.2 Pumps

Sanitary sewer wastewater pumps shall be manufactured by Flygt, or approved equal which meets the following requirements:

Pump

Construction: Major pump components shall be of grey cast iron, ASTM A-48, Class 35B, with smooth surfaces devoid of blow holes or other irregularities. All exposed nuts or bolts shall be AISI type 304 stainless steel construction. All metal surfaces coming into contact with the pumpage, other than stainless steel or brass, shall be protected by a factory applied spray coating of acrylic dispersion zinc phosphate primer with a polyester resin paint finish on the exterior of the pump.

Sealing design shall incorporate metal-to-metal contact between machined surfaces. Critical mating surfaces where watertight sealing is required shall be machined and fitted with Nitrile or Viton rubber O-rings. Fittings will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit.

Rectangular cross sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal. No secondary sealing compounds, elliptical O-rings, grease or other devices shall be used.

Cooling System:

Motors are sufficiently cooled by the surrounding environment or pumped media. A water jacket is not required.

Cable Entry Seal:

The cable entry seal design shall preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall consist of a single cylindrical elastomer grommet, flanked by washers, all having a close

tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the body containing a strain relief function, separate from the function of sealing the cable. The assembly shall provide ease of changing the cable when necessary using the same entry seal. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the interior from foreign material gaining access through the pump top. Epoxies, silicones, or other secondary sealing systems shall not be considered acceptable.

Motor: The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings shall be insulated with moisture resistant Class H insulation rated for 180°C (356°F). The stator shall be insulated by the trickle impregnation method using Class H monomer-free polyester resin resulting in a winding fill factor of at least 95%. The motor shall be inverter duty rated in accordance with NEMA MG1, Part 31. The stator shall be heat-shrink fitted into the cast iron stator housing. The use of multiple step dip and bake-type stator insulation process is not acceptable. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 40°C (104°F) and capable of up to 15 evenly spaced starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches set to open at 125°C (260°F) shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber containing the terminal board shall be hermetically sealed from the motor by an elastomer compression seal. Connection between the cable conductors and stator leads shall be made with threaded compression type binding posts permanently affixed to a terminal board. The motor and the pump shall be produced by the same manufacturer.

The combined service factor (combined effect of voltage, frequency and specific gravity) shall be a minimum of 1.15. The motor shall have a voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 40°C (104°F) ambient and with a temperature rise not to exceed 80°C. A performance chart shall be provided upon request showing curves for torque, current, power factor,

input/output kW and efficiency. This chart shall also include data on starting and no-load characteristics.

The power cable shall be sized according to the NEC and ICEA standards and shall be of sufficient length to reach the junction box without the need of any splices. The outer jacket of the cable shall be oil resistant chlorinated polyethylene rubber. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

Bearings: The pump shaft shall rotate on two bearings. Motor bearings shall be permanently grease lubricated. The upper bearing shall be a single deep groove ball bearing. The lower bearing shall be a two row angular contact bearing to compensate for axial thrust and radial forces. Single row lower bearings are not acceptable.

Mechanical Seal:

Each pump shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. The seals shall operate in a lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. The lower, primary seal unit, located between the pump and the lubricant chamber, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide ring. The upper, secondary seal unit, located between the lubricant chamber and the motor housing, shall contain one stationary and one positively driven rotating, corrosion resistant tungsten-carbide seal ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment nor depend on direction of rotation for sealing. The position of both mechanical seals shall depend on the shaft. Mounting of the lower mechanical seal on the impeller hub will not be acceptable. For special applications, other seal face materials shall be available.

The following seal types shall not be considered acceptable nor equal to the dual independent seal specified: shaft seals without positively driven rotating members, or conventional double mechanical seals containing either a common single or double spring acting between the upper and lower seal faces. No system requiring a pressure differential to offset pressure and to effect sealing shall be used.

Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The drain and inspection plug, with positive anti-leak seal shall be easily accessible from the outside. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate dry without damage while pumping under load.

Seal lubricant shall be FDA Approved, nontoxic.

Pump
Shaft:

Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. Couplings shall not be acceptable. The pump shaft shall be stainless steel – ASTM A479 S43100-T.

If a shaft material of lower quality than stainless steel – ASTM A479 S43100-T is used, a shaft sleeve of stainless steel – ASTM A479 S43100-T is used to protect the shaft material. However, shaft sleeves only protect the shaft around the lower mechanical seal. No protection is provided for in the oil housing and above. Therefore, the use of stainless steel sleeves will not be considered equal to stainless steel shafts.

Impeller:

The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, double shrouded non-clogging design having a long throughlet without acute turns. The impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. When ever possible, a full vaned, not vortex, impeller shall be used for maximum hydraulic efficiency; thus, reducing operating costs.

Wear
Rings:

A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass, or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet.

Volute:

Pump volute(s) shall be single-piece grey cast iron, Class 35B, non-concentric design with smooth passages large enough to pass any solids that may enter the impeller.

Protection:

All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. The thermal switches shall open at 125°C (260°F), stop the motor and activate an alarm.

5.10.3 Control Panel

The control panel shall be a NEMA 4X, stainless steel, lockable, watertight enclosure with an aluminum back panel and inner door. The control panel shall contain the following components:

1. Incoming Power Block
2. Main and Emergency Circuit Breakers. w/ Interlock
3. Generator Receptacle (if designed flow < 15,000 gpd)
4. Motor Circuit Breakers
5. Control Circuit Breakers
6. NEMA Rated Size 2 Starters
7. 3-KVA Transformers
8. Hand-Off-Auto Switches
9. Pump Run Lights
10. Seal Fail Lights and Relays
11. Heat Sensor Circuitry
12. Alarm Horn w/Silence Circuitry
13. Elapsed Time Meter
14. Alternator w/Silence Selector Switch
15. Alarm Light
16. Required Control Relays
17. High Level Alarm Light
18. Alarm Test-Silence Switch
19. Overload Resets Mounted to Inner Door
20. Time Delay Relay
21. Required Control Relays
22. Auxiliary Alarm Contacts
23. Multitrode MT2PC Controller
24. Monitor Pro
25. Pump Fail Pilot Lights
26. GFI Receptacle
27. Battery Back Up
28. 24 VAC Control Transformer

5.10.4 Liquid Level Sensor

The liquid level sensor shall be a multi-stage conductive level sensing device designed to detect conductive liquid level in wet wells and interface with an electronic pump controller for control and management of a duplex pump configuration. The liquid level sensor shall be ITT/Flygt Multitrode Conductive Level Sensing Probe or approved equal.

5.10.5 Piping

All piping within the wet well structure and through the valve vault shall be Ductile Iron Pipe (DIP) conforming to the following standards:

Pipe: Class 50 Ductile iron conforming to ANSI/AWWA
A21.51/C-151

Fittings:	Ductile Iron conforming to ANSI/AWWA A21.10/C-110
Joints:	Flanged joints conforming to ANSI A21.4
Lining:	All pipes and fittings shall be lined in accordance with ANSI/AWWA A21.4/C-104
Coating:	The exterior of all exposed pipes, fittings, and valves shall be coated with 2 coats (total 8 mils dried thickness) of Tnemec N69 Hi-Build Epoxoline II.

5.10.6 Check Valves

Check valves shall be provided on each pump discharge line and be located in a precast concrete valve vault. Check valves shall be horizontal mounted, swing type with a bronze disc and cast iron body. Check valves shall be manufactured by Muller, American Darling, Apco Valves or an approved equal.

5.10.6 Access Hatches

Aluminum access hatches shall be provided for both the wet well and the valve vault. The frame shall be one piece and constructed of aluminum or stainless steel with integral concrete anchors. The cover(s) shall be constructed of one-quarter inch (1/4") thick diamond pattern plating, reinforced to withstand a live load three hundred pounds-per-square foot (300 psf). The cover(s) shall include a handle for raising and have a safety handle for locking in the open position. Access hatches shall be provided with a factory installed padlock hasp for locking each cover. All hatch hardware and hinges shall be constructed on stainless steel.

5.10.7 Vent Pipe

All proposed pump stations shall include a mushroom type vent for the wet well structure. The vent shall be constructed of four inch (4"), class 150 cast iron vent pipe. Vent outlets shall be provided with a two (2) mesh, 14 gauge, bronze wire screen.

5.10.8 Guide Bracket Assembly

Two (2) guide bars shall be provided for the raising and lowering of each pump. Guide bars shall be stainless steel pipe, extending from the lower guide holders to the upper guide holders. Lower guide holders shall be integral with the pump discharge connection. Guide bars shall not support any portion of the weight of the pumps.

5.11 TELEMETRY SYSTEM

5.11.1 General

For all proposed telemetry systems the developer shall be responsible for the following:

1. Provide and install new remote terminal unit (RTU), and antenna as required to communicate with the existing SCADA system and Pump Control Panel.
2. Provide additions/modifications to HMI software at the existing Water Treatment Plant as required to monitor, record, trend, totalize runtimes and flows, control, report, etc. the remote lift station I/O.
3. Provide additions/modifications to the Master Site Radio and FIU program to accommodate proper polling of the new remote site, to include the report by exception routine and polling as required.
4. Coordinate with City personnel for required FCC licensing and frequency search fees, path studies, and frequency analysis as applicable.
5. Supplying and installing all antennas, antenna cable and accessories, mast stand-offs, control panel relays and contact blocks, level measuring devices, metering equipment, RTU's, and any other SCADA equipment necessary for a complete system. All antenna towers or structures, and any other materials necessary for a complete installation of the SCADA equipment, but not mentioned, shall be furnished and installed.
6. Verifying all antenna locations with City of New Bern prior to proceeding with installation.

5.11.2 Reference Standards

1. NFPA 70 - National Electrical Code (NEC).
2. ISA-S5.4 - Instrumentation, Systems, and Automation Society (ISA).
3. UL-508A - Underwriters Laboratory Industrial Control Panel Certification.

5.11.3 Quality Assurance

1. For standardization purposes the System Supplier shall be Lord & Company, Inc. of Fort Mill, SC, 803-802-0060, extension 107.
2. The Developer shall provide or supply all hardware and software specified herein or required and provide all required and specified collateral services in connection with the system such as testing, calibration, start-up, operation and maintenance manuals, and operator training without additional cost to the City of New Bern.
3. The system supplier will be responsible to coordinate with the contractor to obtain all necessary data from individual manufacturers to determine the necessary transition for operation, control and/or monitoring from the manufacturer's equipment.

4. All materials, equipment sizes, and capacities shall conform to the requirements of the NEC, the National Electric Manufacturer's Association, and to applicable regulations of the local electric codes.
5. All materials and equipment must be UL listed.

5.11.4 Responsibility for Complete System

The SCADA System Supplier is responsible for providing the design, supply, delivery, installation, certification, calibration and adjustment, software configuration, testing and start-up, of a complete, coordinated system.

5.11.4 Software Licenses

Purchase any and all software packages required for the system in the name of the City of New Bern. All software shall be delivered to the owner with original disks and in its original box.

5.11.5 FCC Licenses

If required, purchase any and all frequencies including frequency search and coordination fees, licensing fees, etc. as part of this contract. Licensee for the FCC applications shall be in the name of the City of New Bern.

5.11.6 Factory Testing

Test all specific functions including, but not limited to, the following:

1. Failure mode and backup procedures: power failure, auto restart, disk backup and reload, retentive outputs.
2. All network communications.
3. Human Machine Interface (HMI), all functions.
4. Operator Interface Terminal (OIT), all functions.
5. Completely simulate all possible field conditions and run in full automatic, allowing meter pumps to ramp to all possible speeds.
6. Provide certified factory testing documents showing all tests performed and results achieved.

5.11.7 Product Handling and Storage

1. Schedule the delivery of the equipment to coordinate with the project completion schedule.
2. Each item of equipment shall be tagged with identifying number shown on the Shop Drawings visible after packaging.
3. General Contractor's attention is directed to the fact that equipment has delicate components and extreme care shall be taken in handling to avoid internal and/or external damages.
4. Damaged equipment will not be accepted. Damaged equipment by the GC unloading or by inadequate storage shall be replaced by the GC.
5. Equipment not for immediate use shall be stored inside a building, with enclosures under protective coverings and shall be fully protected from moisture, extreme heat and vibration.

5.11.8 Instrumentation Calibration

1. All instrumentation supplied by the system supplier shall be calibrated to the specified ranges and requirements of the project.
2. Provide documentation in the form of an Instrument Calibration Worksheet to prove the actual calibration of all instrumentation. All instrument data shall be included on the worksheet including but not limited to make, model, tag, zero, span, range, service, process, calibration procedures with actual readings and results. Worksheet shall be signed and dated by the service technician or engineer that performed the calibration.

5.11.9 Telemetry Products

Remote Terminal Unit (RTU)

The RTU's supplied for the remote sites shall be Motorola ACE3600 with the XLT5000 800 MHz Trunk Radio or Microwave Data Systems (MDS) iNet Remote Radio compatible with the existing radio system, as required by a RF Path Survey. As a basis of design the RTU will be provided with the MDS iNet Remote radio but the new RTU must be compatible with the existing 800 MHz Trunk Radio System and the existing MOSCAD RTU's. The existing 800 MHz Trunk System is being updated with new radio hardware (XLT5000 Radios) during the Nextel Re-banding in the near future. Coordination with the Re-banding efforts and contractor performing the work is necessary to assure the exact type of hardware that will be required if the 800 MHz radio has to be provided to due to the results of the RF Path Study.

The RTU must have exceptional communication capability being able to communicate with many different methods, media and protocols for future growth and updates.

Communication Ports: Up to 5 ports per CPU

1. Serial - up to 4 x RS-232 ports. Provide two (2)
2. Multi-drop – up to 3 x RS485 ports
3. Ethernet - up to 2 x 10/100 MB ports and 1 x 10 MB port. Provide two (2) 10/100 MB Ports
4. Two-way radio/analog trunked radio - up 2 x modem ports. Provide one (1)

Motorola Radio Support:

Mobile two-way radio - CM200, CM340, GM3188, EM200, CDM750. Portable two way radio – HT750, GP320, GP328, PRO5150. Astro – XTL5000 (digital and analog trunk), XTS2500 (digital trunk). Dimetra – MTM800 (PD).

Third Party Radio Support:

Compatible with two way radios, data radios, TETRA radio (PD)

Modem Support:

Compatible with Dial-up modems, cellular modems (dial mode & PD)

Protocols:

MDLC, TCP, UDP, IP, PPP, NTP, DHCP

Third Party Protocol:

MODBUS RTU (master/slave, RS-232/RS-485), DF1 (Allen Bradley – Master on RS-232), User Protocol (in user program) Possible on RS-232, RS-485 and Ethernet port.

Pump Controller Interface:

Provide Ethernet Modbus TCP/IP Communications with the specified Multitrode “Multismart” Pump Controller System.

Other Features:

- Power PC based processor provides very high performance
- VX-Works based real-time operating system
- Up to three Ethernet ports
- Up to four serial communication ports
- Up to two radio modem ports
- 0,3,5,7 or 8 I/O slot wall mount frames, 19” rack mount on 8 slot frame
- Single and double density I/O modules
- Hot Swap I/O replacement
- Wide operating temperature range -40 to +70 °C
- NEMA 4 / IP65 Housing, 40 x 40 cm and 50 x 50 cm
- Two-way/trunking/ digital radio models
- AC and DC controlled power supply
- 6.5 or 10 Ah Backup battery, smart battery charger
- GPS and NTP for time synchronization
- System building tool for configuration and programming
- Remote firmware and program download
- Compatible with MOSCAD family of RTUs

Non-Licensed Spread Spectrum Ethernet Radio Transceivers

The Master RTU’s shall communicate to the radio network with non-licensed spread spectrum Ethernet radio transceivers as shown on the drawings. The radios shall be the iNet 900 manufactured by Microwave Data Systems. MDS iNET 900 shall be provided with Access Point/Remote Dual Gateway, which provides both serial and Ethernet connections, and shall be configurable as either an access point or a dual gateway. The transceiver shall include all available diagnostics capabilities and software.

Directional Yagi Antenna for Remote Station Radio Modem

Directional Antennas shall meet the following requirements:

1. Frequency range: Appropriate to frequency of operation.
2. Gain: 10 dB, minimum, verify requirements with radio path study.
3. Maximum Power Input: 150 watts.
4. Lightning Protection: Direct ground protection to ground and Polyphaser surge arrester before entering the enclosure with radio.
5. Front-to-Back Ratio: 20 dB, minimum.
6. Connector: Type N, female.

7. Provide 316 stainless steel mounting hardware: Clamps, standoff hardware as required for the installation to tank, mast, tower, or building.
8. Shall be manufactured by Decibel Products or an approved equal.

Antenna Mast

Free standing tower mounted:

1. 10'-0" x 1 ¼" galvanized steel mast.
2. Shall be Rohn 161005GS or approved equal.

Rack or wall mounted:

1. Provide height as required.
2. Aluminum mast.
3. Shall be Universal Towers or approved equal.

All required mounting hardware and wall mount standoffs, shall be constructed of stainless steel.

Transmission Cable & Miscellaneous Radio Items

1. Provide cable connecting the radio antenna port to the antenna, which is low-loss foam-dielectric type, 0.5 inch to 1.25 inch in diameter as required.
2. Provide weatherproof transmission cable, suitable for direct environmental exposure. Use "O" ring seals on connections.
3. Provide cable grounding kits, etc. as appropriate for particular installation.
4. Utilize appropriate bulkhead RF transmission cable surge suppression devices at cable entrances, Polyphaser or equivalent.
5. Provide cable as manufactured by Andrew Corp. or approved equal.

5.11.10 Execution

1. The Remote Terminal Unit (RTU) and Pump Control Panel (PCP) shall be supplied complete including all necessary equipment to provide a complete and functioning system. Where applicable, all control by the SCADA System shall be distributed to the local RTU and shall be capable of operating in an automatic mode completely independent of the HMI.
2. The associated SCADA System Master Radio and Motorola FIU shall be programmed as required to poll and report the monitored signals to the HMI at the existing WTP.
3. All of the SCADA System HMI Workstations shall be configured to monitor the pump station. The pump station shall be added to the graphics, live and historical trends, motor run time displays, alarm summary and paging controls and routines, etc.
4. The existing Data Management Software database, SCADA interface drivers and operation reports shall be modified to include the Pump Station's monitored equipment, signals and alarms. Existing the SCADA System to the Data Management Software shall be configured

5. The existing CMMS software database, O&M scheduler, and SCADA interface drivers shall be modified to include the Pump Station equipment.

5.11.11 RTU I/O and HMI Monitoring Requirements

The following minimum outputs are required:

- Indicate motor run status or each pump.
- Indicate pump fail status for each pump.
- Motor Moisture/Seal Failure for each pump
- Motor High Temperature Monitoring for each pump
- Indicate power problem alarm.
- Indicate pump control panel common alarm.
- Indicate high well level alarm.
- Indicate H-O-A switch position for each pump.
- Indicate generator run status (if present).
- Indicate generator common alarm (if present).
- Indicate transfer unit breaker or switch position (if present).
- Indicate instantaneous wet well level (if present) or all float switches.
- Indicate instantaneous flow (if present) or calculated flow.
- Indicate Loss of Power (Internal to RTU).
- Indicate Loss of Communication (Internal to RTU).

5.12 ENCASEMENT PIPE

Encasement pipe be uncoated steel pipe conforming to the standards of AWWA C200. Pipe sections shall be joined by a continuous weld. The minimum wall thickness shall be as follows:

<u>Encasement Pipe Dia.</u>	<u>Wall Thickness</u>
14"	0.216"
16" – 24"	0.250"
30"	0.312"
36"	0.375"
42"	0.438"
48"	0.500"

Encasement pipe install under a railroad shall meet the minimum wall thickness requirements as set forth by the governing railroad authority.

5.13 GENERATOR

This section is reserved or future use.

SECTION 6.0

TESTING REQUIREMENTS

6.1 GENERAL

All items which require testing shall be promptly cleaned and ready for testing after installation. Meeting all testing requirements specified herein shall be a condition of acceptance of the item by the City of New Bern. In no case shall an item be accepted into the City of New Bern municipal water or sanitary system without passing the required testing. A representative of the City of New Bern Engineering Department must be on site to witness all required testing procedures. The City of New Bern Engineering Department (252-639-7526) requires a 48 hour notice for each test.

6.2 WATER MAINS

6.2.1 Leakage Testing

All proposed water mains shall be subjected to a leakage test under the specified hydrostatic pressure. The pressure shall be maintained constant at one hundred fifty pounds per square inch (150 psi) (plus or minus five psi) during the entire time that line leakage measurements are being made.

The water lines are to be flushed thoroughly to remove all dirt and debris which may have collected in the line. After flushing has been completed, the pipelines shall be tapped on top at a point furthest from the point that the lines are to be filled with water. The valve at the end of the line shall be left open, and the valve between the new water line and the City Water System opened slightly to allow the water to enter the new pipe slowly. Once the pipe is full, the valve at the end of the line shall be left open until the valve between the new water line and the City Water System is completely shut off. At no time shall the City Water System valve be open with out an outlet in the new pipe system. A representative of the City of New Bern is the only authorized operator of valves within the City Water System.

Leakage measurements shall not be started until a constant test pressure has been established; compression of air trapped in unvented pipes or fittings will give false leakage readings under changing pressure conditions. After the test pressure to be used has been established and stabilized, the line leakage shall be measured by means of a water meter installed on the line side of the force pump, and the leakage test shall extend over a total period of not less than four (4) hours.

Line leakage is defined as the total amount of water introduced into the line as measured by the meter during the leakage test. The pipeline or section being tested will not be accepted if it has a leakage rate in excess

of:

$$L = \frac{S \times D \times (\text{square root of } P)}{133,200}$$

where L = allowable leakage in gallons per hour, S = length of pipe in feet, D = nominal diameter of the pipe in inches, and P = average test pressure during the leakage test in pounds per square inch (150 psi).

All visible leaks shall be repaired. The Contractor shall locate and repair leaking joints to the extent required to reduce the total leakage to an acceptable amount. All joints in piping shall be watertight and free from visible leaks during the prescribed test. Each leak which is discovered within one year after final acceptance of the work shall be located and repaired by and at the expense of the Contractor.

6.2.2 Disinfection

After passing the leakage test, all water mains shall be disinfected in accordance with AWWA C-651, and as specified herein. The valve at the end of the line shall be left open, and the valve between the new water line and the City Water System opened slightly to allow the water to enter the new pipe slowly. Chlorine is then to be applied under pressure by an ejector pump (or equal) to the water entering the new pipeline. Chlorine will be added in sufficient quantities to give an overall chlorine residual to the water of at least fifty (50) parts per million. Once the pipe is fully chlorinated, a representative of the City of New Bern Engineering Department shall be contacted to perform a high chlorine test. At no time during testing shall the City Water System valve be open with out an outlet in the new pipe system. A representative of the City of New Bern is the only authorized operator of the valves within the City Water System.

After the water main passes the high chlorine test the pipeline is to be valved off and the chlorinated water allowed to remain in the line for twenty four (24) hours. After the twenty four (24) period, the chlorine residual in the line must be at least ten (10) parts per million. After passing the chlorine residual test, the pipe line is to be thoroughly flushed until no evidence of chlorine exists as determined by the Orthotolidine Test.

After flushing the line, the Contractor shall furnish sterilized bottles and take water samples from various points along the line as directed and witnessed by the City of New Bern. A minimum of two samples shall be taken in any instance. The Contractor shall send the samples to an approved testing laboratory, for bacteriological analysis. If the analysis reveals that no bacteria is present and the requirements for final inspection have passed, the pressure pipe system may be placed into service upon written notification from the City Engineer.

The City of New Bern reserves the right to modify and/or change the test,

test procedures, and/or passing level results without prior notice.

6.3 SANITARY SEWER MAINS

6.3.1 Gravity Sewer Mains

Each section of proposed gravity sewer shall be promptly cleaned and tested after installation. The following test shall be performed on proposed gravity sewer mains:

Air Test – All proposed gravity sewer mains shall be air tested in accordance with ASTM C-828, ASTM C-924 and the following. Such tests shall consist of securely plugging the sewer line between manholes, pumping the section full of air to 4.0 psi and holding this pressure for at least two (2) minutes. Then the pressure should be reduced to 3.5 psi and the time recorded for the pressure to drop 1.0 psi to the new pressure of 2.5 psi. If groundwater is present, all test pressures shall be adjusted by adding 0.43 psi for each foot of groundwater head that exist above the pipe invert. The time required for the pressure drop shall exceed the minimum test time given in the chart below,

Pipe Diameter (in)	Minimum Test Time (Min)	Length for Minimum Test Time (ft)	Time for Longer Lengths (sec)	Specification Time for Length (L) Shown (min:sec)								
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	
4	3:46	597	.380 (L)	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46	3:46
6	5:40	398	.854 (L)	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:24
8	7:34	298	1.520(L)	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24	
10	9:26	239	2.374(L)	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48	
12	11:20	199	3.418(L)	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38	
15	14:10	159	5.342(L)	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04	
18	17:00	133	7.692(L)	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41	

Deflection Test - A Deflection test shall be performed on all sanitary sewer mains constructed of non-ferrous materials. This test shall be performed after all grading, paving, and compaction work has been completed. The allowable deflection shall be 4.5% of the nominal inside diameter of the pipe. The deflection shall be measured by the use of the mandrel test.

Closed Circuit T.V. Inspection – All proposed gravity sewer mains shall undergo a closed circuit T.V. inspection prior to being accepted by the City of New Bern. The City of New Bern will conduct the inspection. Any slumps, high points, low points, swells, standing water, accumulations of dirt and debris, rolled gaskets, leaks or other defects shall be corrected by the Contractor prior to any other test being performed. The City Engineer shall have the final decision on all discrepancies.

6.3.2 Sewer Force Mains

All proposed sewer force mains shall be subjected to a leakage test under the specified hydrostatic pressure. The test pressure shall be one and one-half times the maximum working pressure of the pipe segment, and in no case shall be less than 150 psi. The test pressure shall be maintained constant (plus or minus five psi) during the entire time that line leakage measurements are being made.

The water lines are to be flushed thoroughly to remove all dirt and debris which may have collected in the line. After flushing has been completed, the force main shall be filled slowly with water. One end of the pipe shall be vented to allow the release of air during filling. Once the force main is full of water all vents shall be closed and a pump shall be used to increase the pressure in the force main to the required test pressure.

Leakage measurements shall not be started until a constant test pressure has been established; compression of air trapped in unvented pipes or fittings will give false leakage readings under changing pressure conditions. After the test pressure to be used has been established and stabilized, the line leakage shall be measured by means of a water meter installed on the line side of the force pump, and the leakage test shall extend over a total period of not less than four (4) hours.

Line leakage is defined as the total amount of water introduced into the line as measured by the meter during the leakage test. The pipeline or section being tested will not be accepted if it has a leakage rate in excess of:

$$L = \frac{S \times D \times (\text{square root of } P)}{133,200}$$

Where L = allowable leakage in gallons per hour, S = length of pipe in feet, D = nominal diameter of the pipe in inches, and P = average test pressure during the leakage test in pounds per square inch.

All visible leaks shall be repaired. The Contractor shall locate and repair leaking joints to the extent required to reduce the total leakage to an acceptable amount. All joints in piping shall be watertight and free from visible leaks during the prescribed test. Each leak which is discovered within one year after final acceptance of the work shall be located and repaired by and at the expense of the Contractor.

6.3 MANHOLES

All manholes on proposed sewer main extensions shall be vacuum tested as specified herein. Manholes shall be tested after complete assembly. Stub-outs,

manhole boots and pipe plugs shall be secured to prevent movement while the vacuum is drawn. A measured vacuum of 10 inches of mercury shall be established in the manhole. Acceptance standards for leakage shall be established from the elapsed time for a negative pressure change from 10 inches to nine inches of mercury. The maximum allowable leakage rate for a four-foot diameter manhole shall be in accordance with the following:

Minimum Elapsed Time for a

<u>Manhole Depth</u>	<u>Pressure Change of 1" Hg</u>
10 ft. or less	60 seconds
> 10 ft. but < 15 ft.	75 seconds
> 15 ft. but < 25 ft.	90 seconds

For manholes five feet in diameter, add an additional 15 seconds and for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four foot diameter manholes.

If the manhole fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test. The extent and type of repairs that may be allowed shall be subject to the approval of the City Engineer. Leaks shall be repaired on the outside of the manhole unless otherwise approved by the City Engineer.

If manhole joint mastic is completely pulled out during the vacuum test, the manhole shall be disassembled and the mastic replaced.

6.4 PUMP STATION TESTING AND START-UP

Prior to the acceptance of a pump station, a run test and start-up shall be completed by a representative of the pump manufacturer. During the start-up the pump station will be required to operate under the anticipated loading and system conditions. All pumps and control functions shall be tested during the start-up procedure. All possible run situations shall be tested to ensure proper flow is maintained at actual system pressures.

6.5 S.T.E.P. SYSTEM TANKS

All S.T.E.P. system tanks shall be vacuum tested by the manufacturer prior to delivery. Upon delivery all tanks shall be set in place and vacuum tested again by the tank installer to insure that no seals were damaged in the delivery and installation of the tank. The onsite test shall be performed in the presence of the City of New Bern Sewer Enforcement Officer. Tanks shall be tested with the riser and manhole ring installed. All testing equipment shall be supplied by the tank provider.

All tank inlets and outlets shall be sealed and a measured vacuum of 4 inches of mercury shall be established in the tank and held for a period of five (5) minutes. During the test period no leakage shall be allowed. If the tank fails the test,

necessary repairs shall be made and the vacuum test and repairs shall be repeated until the tank passes the test. The extent and type of repairs that may be allowed shall be subject to the approval of the City Engineer.

6.6 TAPPING SLEEVES

Prior to making any tap on an existing City of New Bern water or sewer main, the tapping sleeve or saddle shall pass a pressure test. The tapping sleeve shall be hydrostatically tested through the test plug for a period of five (5) minutes. During the test period, no leakage shall be allowed. Air testing of tapping sleeves shall not be permitted.

SECTION 7.0

REQUIREMENTS DURING CONSTRUCTION AND PROJECT CLOSEOUT

7.1 PRIOR TO CONSTRUCTION

The following shall be completed prior to any construction commencing on water or sewer extension projects:

7.1.1 Notice to Proceed Issued The City of New Bern

Once the City of New Bern Engineering Department has approved the proposed design and confirmed that all required permits, encroachment agreements, and utility easements have been executed and issued by the appropriate agencies, a notice to proceed will be issued by the City to the Contractor.

7.1.2 Material Inspection

Once all materials are on site, the Contractor shall contact the City of New Bern Utility Construction Inspector (252-639-7523) to schedule an on site inspection of all proposed construction materials. No material shall be used in utility construction until the material inspection has been preformed.

7.1.3 Shop Drawing Submittal

Shop Drawings shall be submitted to the City of New Bern Engineering Department for review of the following items:

- Pumps
- Control Panels
- Lift Station Electrical Components
- Generator
- Booster Pumps
- RPZ
- Automatic Air Release Valves

7.1.4 N.C. ONE CALL

The NC One Call Center (1-800-632-4949) shall be contacted a minimum of forty-eight (48) hours prior to beginning excavation. The Contractor shall be responsible for keeping locate tickets current and contacting the One Call Center if unmarked utilities should be encountered.

7.1.5 Contractor to Notify The City of New Bern

At least forty-eight (48) hours prior to the start of any construction, the contractor shall notify the City of New Bern Engineering Department (252-639-7526). Depending on the nature of the project the City Engineer may require that a preconstruction conference be held to discuss the details of the project.

7.2 DURING CONSTRUCTION

7.2.1 Notices to Property Owners and Local Utilities

The Contractor shall notify adjacent property owners and utilities when the project execution may affect adjacent properties. The contractor shall notify the appropriate authorities when the project operations will interrupt access or utility service to the property owner or tenant. Utilities and other agencies shall be contacted at least twenty four (24) hours prior to cutting or closing streets, or excavating near underground utilities or pole lines.

7.2.2 General Safety Requirements

Excavations shall provide adequate working space and clearance as necessary to provide proper pipe installation and work safety. Excavations performed on NCDOT rights of way shall be protected from traffic utilizing the NCDOT Uniform Traffic Control Manual (latest edition). Minimum requirements shall include proper signage, flagmen, protective vests and hardhats as outlined in the manual. The Contractor shall provide a Competent Person for trench construction on site, as outlined in OSHA regulations, for all excavations that exceed four feet (4') in depth. The City Engineer may stop work for any violation of the aforementioned regulations when the safety of any person acting as a representative, agent, or employee of the Contractor is considered in imminent danger. Work may continue only after the violation has been rectified and the City Engineer grants permission to proceed.

7.2.3 Connections to Existing Water or Sewer Mains

The Contractor shall make all necessary connections to existing water lines, unless otherwise directed by the City of New Bern. The City shall be notified at least twenty four (24) hours prior to making such connections. Taps shall be made only in the presence of the City of New Bern Utility Construction Inspector or a duly assigned representative of the City of New Bern Engineering Department. At all times, the Contractor shall protect existing facilities against adverse conditions or substances and damage.

Connections to existing water and sewer lines shall be planned in advance with all required equipment, materials, and labor on hand prior to undertaking the connections. Work shall proceed continuously around the

clock if necessary to complete connections in minimum time. Operation of valves or other equipment on the existing water system shall be under the direct supervision of the City of New Bern.

7.2.4 Site Administration

The Contractor shall be responsible for all areas of the site under construction or occupied for administrative or storage purposes. The Contractor shall be responsible for all Subcontractors in their performance on the project. The Contractor will be responsible for the actions of all employees and other persons on the project to insure proper use and preservation of property and existing facilities, except when these responsibilities are specifically reserved to others. The Contractor has the right to exclude from the construction site any persons who are not directly related to the construction process or the inspection of the work by the Owner. The contractor may require all persons on the construction site to observe all operational or safety regulations required of his employees. The Contractor shall keep the project site free from accumulations of waste materials and rubbish at all times.

7.2.5 Project Inspections

For all proposed water and sewer extension projects, the Developer shall provide complete engineering services which shall include construction observation. It shall be the responsibility of the Project Engineer and ultimately the Developer, to insure that all construction is completed as shown on the plans which have been approved for construction by the City of New Bern.

The City of New Bern Utility Construction Inspector will periodically visit the site during construction and will be on site for all testing and inspections as required by the City of New Bern. It is NOT the duty of the City of New Bern Utility Construction Inspector to direct construction, provide solutions to design problems or maintain record drawings. These services shall be provided by the Project Engineer.

7.3 PROJECT CLOSEOUT

7.3.4 General

All items listed in this section must be completed before the City of New Bern will accept any new construction as part of the City's municipal water and sewer system.

7.3.5 Final Inspection

Upon completion of construction and all required testing, the Contractor shall contact the City of New Bern Utility Construction Inspector to schedule a final inspection. During the final inspection the Utility

Construction Inspector will insure that all aspects of the water and sewer construction have been completed in compliance with the current City standards. The Contractor shall provide all personal and tools which will be required for opening manholes, exercising valves, and flowing hydrants. **The City of New Bern prefers for the streets within the development to be paved at the time of final inspection. If the streets have not been paved, then all structures within the street shall be set in place with concrete prior to requesting the final inspection. Valve boxes shall be set in a minimum of an 18"x18"x18" block of concrete and manhole rings shall be set in a minimum of a 36"x36"x18" block of concrete.**

During the final inspection, the Utility Construction Inspector will create a punch-list if any deficiencies are discovered. The Contractor shall complete all items described on the punch-list prior to requesting a re-inspection.

7.3.6 Record Drawings

Upon completion of all utility projects, the Project Engineer shall submit an "As Built" set of plans to the City of New Bern Engineering Department. All As Built information on the plans shall be clearly identified (bold text, different text, boxed-out, etc.). Proposed information which has changed shall be marked through. The "As Built" plans shall indicate the horizontal and vertical location of all installed utilities. All bends, reducers, and valves shall be located with at least two (2) measurements to existing features (back of curb, utility pole, hydrant, etc.). Horizontal pipe location shall be shown at one hundred foot intervals along the pipe as measured from the back of curb or the edge of pavement. **For sewer force mains the elevation of the installed pipeline shall be indicated on the record drawings in 50' intervals. All elevations shown shall be based on a datum elevation from an existing USGS monument.** The record drawings shall be submitted in the following formats:

1. (1) – Set of Plans 24" x 36" on Mylar
2. (2) – Sets of Plans 24" x 36" on Standard Bond Paper
3. **(1) – Compact Disk containing the project drawing files in PDF format.**

7.3.7 Utility Easements

Prior to project acceptance, a final plat of the development shall be recorded with the Craven County Register of Deeds. The final development plat shall clearly illustrate all proposed utility easements.

7.3.8 Engineer's Certification

For projects which involve the extension of the City of New Bern water

system the Project Engineer shall submit to the City a copy of the Engineer's Certification stating that the completed water system extension conforms to the approved plans and specifications as required by the North Carolina Division of Environmental Health.

For projects which involve the extension of the City of New Bern sewer system the Project Engineer shall submit to the City a copy of the Engineer's Certification stating that the completed sewer system extension conforms to the approved plans and specifications as required by the North Carolina Division of Water Quality.

7.3.9 Total Project Cost

Upon completion of all construction, the Project Engineer shall submit to the City of New Bern Engineering Department the total cost all improvements related to the water and sewer system. This submittal shall include the Contractor's original Bid and all additional Change Orders.

7.3.10 Warranty

The Developer shall warrant all water and sewer work to be free of defects in materials or workmanship for a period of one (1) year. The warranty period shall begin from the date of City's acceptance of the project for permanent operation and maintenance.