DIVISION 1

General Requirements

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 LOCATION OF WORK: The project site is located in Amelia Island just south of the City of Fernandina Beach in Nassau County, Florida.

1.02 DESCRIPTION OF WORK: The work consists of furnishing all labor, materials and equipment necessary to construct the infrastructure improvements to serve the Gateway to Amelia project as follows:

A. PART A - WATER FACILITIES: The work consists of constructing the off-site and on-site water facilities as shown on the drawings and specified including audio-visual taping, water main site work, piping, fittings, valves, fire hydrants, services, testing, and disinfection for the water main.

Part A work includes: clearing and rough grading of the right-of-way as necessary for the construction of the water main; the construction of the 4" services to each of the two restaurant sites, the 6" service to the hotel site, the 1" service to the pump station site; the fire hydrants that will serve the two restaurants and one hotel site; off-site restoration including fine grading and grass sodding or stabilized road restoration along the entire length of the off-site water main; and on-site restoration including fine grading and grass sodding along the entire length of the on-site water main, 20 feet wide and the other water services which are shown on the drawings up to a point beyond the main road pavement.

B. PART B - SEWER FACILITIES: The work consists of constructing the on-site and off-site sewer facilities as shown on the drawings and specified including all audio-visual taping, construction of the pump station and off-site force main. Part B work includes clearing and rough grading of the remainder of the right-of-way which was not performed under Part A; clearing, fine grading, grass sodding and landscaping of the pump station site; clearing and fine grading, and restoration along the force main route; sewer services to the two restaurant sites; sewer service to the hotel site; and the other services which are shown on the drawings up to a point beyond the main road pavement.

C. PART C - STREET IMPROVEMENTS: The work consists of constructing the street improvements as shown on the drawings and specified including audio-visual taping, traffic control, earthwork, demolition, roadbed, pavement, pavement marking, signage, curbing, storm

drainage, fine grading, testing and grass sod restoration.

Part C work includes all off-site street improvements located in the A1A right-of-way and all street improvements located in the Amelia Island Parkway right-of-way. Construction of the on-site street improvements will be performed by others.

1.03 CONTRACTOR'S DUTIES: Except as specifically noted, the Contractor shall provide and pay for the following:

A. All labor, materials and equipment.

B. Tools, construction equipment and machinery.

C. Utilities required for construction.

D. Other services and facilities necessary for the proper execution of work completion including incidental items not detailed or called for, but which are required for the proper completion of the project.

E. All legally required sales, consumer and use taxes.

F. All applicable permits, government fees and licenses.

G. Survey services for construction layout and record drawings.

1.04 CONTRACTOR SHALL ALSO BE REQUIRED TO PERFORM THE FOLLOWING:

A. Comply with all codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on the performance of work.

B. Promptly submit written notice to the Engineer of observed variances of Contract Documents from legal requirements; it is not the Contractor's responsibility to make certain drawings and specifications comply with codes and regulations.

C. Enforce strict discipline and good order among employees. Do not employ unfit persons or those not skilled in assigned tasks.

1.05 WORK SEQUENCE:

A. Coordinate with Owner and Engineer. Contractors are hereby noticed that other contractors will be on-site constructing other components of the project at the same time. Timing of various components of the construction will be dependent upon work by others.

B. Contractor's construction schedule will be subject to approval by the Engineer and updated on a monthly basis.

C. Notify Engineer and Owner 96 hours (minimum) in advance of removing any facility from service, permanently or temporarily.

1.06 CONTRACTOR'S USE OF PREMISES:

A. Do not unreasonably encumber sites with materials or equipment.

B. Assume full responsibility for protection and safekeeping of products stored on premises.

C. Move any stored products interfering with operation of Owner.

END OF SECTION

SECTION 01060

REGULATORY REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS: The general provisions of the Contract, including General and Supplementary Conditions apply to the work specified in this section.

1.02 SPECIFIED CODES:

A. The design of the work is based on the requirements of the latest edition of the Southern Standard Building Code, National Electric Code and National Fire Protection Association Requirements, whichever is most stringent.

B. The site work is based on the latest edition of the Florida Department of Transportation, Standard Specifications for Road and Bridge Construction, hereinafter referred to as the Florida DOT Specifications or DOT Spec.

C. The Contractor shall ensure the work complies to the aforementioned codes and regulations as they apply to the project whether or not specifically referenced elsewhere.

1.03 REFERENCE STANDARDS:

A. Except as otherwise required by Paragraph 1.02 all products and workmanship shall conform to best quality materials and practices recognized by agencies, associations, councils, etc., specified in individual sections.

B. In the absence of specified agencies, associations, councils, etc., the Contractor shall conform to the requirements of the most widely recognized standards for each particular portion of the work.

1.04 PERMITS: Florida Department of Environmental Protection Water System Permit Nos. 0080313-044-DSGP (on-site) and 0080313-040-DSGP (off-site); Florida Department of Environmental Protection Wastewater System Permit No. 0003175-002-DWC, Florida Department of Transportation Driveway Connection Permit No. (pending), and St. Johns River Water Management District Drainage Permit No. 40-089-707271 are included on the following pages as a part of these specifications. Construction of the infrastructure improvements shall be done so as to allow the Owner to meet the requirements and stipulations of these permits.

END OF SECTION

Department of Environmental Protection

Jeb Bush
Governor

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

David B. Struhs
Secretary

Mr. Ron Flick, President
Compass Group, Inc.
1890 South 14th Street, Building 100 Suite 102
Amelia Island, Florida 32034

Date: August 20, 2001
County: Nassau
Project: Gateway to Amelia
Water Plant(s): Florida Public Utilities – FB

Re: General Permit Notice - File No. 0080313 – 044 – DSGP (On-site Water)

Dear Mr. Flick:

On August 7, 2001 the Florida Department of Environmental Protection received your "Notification for Use of the General Permit for Construction of an Extension to a Public Drinking Water Distribution System" {DEP Form No. 62-555.900(7)}, under the provisions of Florida Administrative Code (F.A.C.) Rule 62-4.530 and Chapter 62-555.

After reviewing the notice, it appears that your project will have minimal adverse environmental effect and apparently can be constructed pursuant to a general permit as described in Chapter 62-555, F.A.C.

Any activities performed under this general permit are subject to the general conditions required in Rules 62-4.540 (attached) and 62-555.410, F.A.C., and are also subject to the following specific conditions as required by Rule 62-555.540, F.A.C.

(a) The water treatment plant to which this distribution system shall be connected shall have the capacity to provide the potable water demand required by this project which is in compliance with the standards and water quality set forth in Chapters 62-550, 62-555, and 62-560, F.A.C., for public water systems.

(b) Prior to placing this project into service, Permittee shall submit a "Certification of Construction Completion and Request for a Letter of Clearance to Place a Public Drinking Water Facility into Service" {DEP Form 62-555.900(9)} along with a copy of two consecutive days of satisfactory bacteriological analytical results to the Department for evaluation and approval for operation, as provided in Rules 62-555.340 and 62-555.345, F.A.C. In order to facilitate the issuance of a letter of clearance, the Department requests that all of the above information be submitted as one package.

Assuming you have properly qualified for this general permit, please note that the permit expires on August 20, 2006. If you wish to continue this general permit beyond the expiration date, you shall notify the Department at least 30 days before its expiration.

Your construction activity must conform to the description contained in your notice. Any substantial deviation may subject the Permittee to enforcement action and possible penalties.

If you have any questions concerning the use of the general permit, please contact this office.

Sincerely,

Jerry M. Owen, P. E.
Water Facilities Administrator

JMO:EDC:BW:JDA:ja

Cc: Mr. Michael P. Tibble, Professional Engineer, Mittauer & Associates, Inc.
Carl W. Anderson, Potable Water Engineer, Florida Public Utilities

Department of Environmental Protection

Jeb Bush
Governor

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

David B. Struhs
Secretary

Mr. Patrick M. Foster, P.E.
Florida Public Utilities Company
Post Office Box 418
Fernandina Beach, Florida 32035

Date: February 28, 2001
County: Nassau
Project: Install New Water Main to Gateway to Amelia
Water Plant(s): St. Johns North Utilities

Re: General Permit Notice - File No. 0080313-040-DSGP (OFF-SITE WATER)

Dear Mr. Foster:

On February 14, 2001 the Florida Department of Environmental Protection received your "Notification for Use of the General Permit for Construction of an Extension to a Public Drinking Water Distribution System" {DEP Form No. 62-555.900(7)}, under the provisions of Florida Administrative Code (F.A.C.) Rule 62-4.530 and Chapter 62-555.

After reviewing the notice, it appears that your project will have minimal adverse environmental effect and apparently can be constructed pursuant to a general permit as described in Chapter 62-555, F.A.C.

Any activities performed under this general permit are subject to the general conditions required in Rules 62-4.540 (attached) and 62-555.410, F.A.C., and are also subject to the following specific conditions as required by Rule 62-555.540, F.A.C.

(a) The water treatment plant to which this distribution system shall be connected shall have the capacity to provide the potable water demand required by this project which is in compliance with the standards and water quality set forth in Chapters 62-550, 62-555, and 62-560, F.A.C., for public water systems.

(b) Prior to placing this project into service, Permittee shall submit a "Certification of Construction Completion and Request for a Letter of Clearance to Place a Public Drinking Water Facility into Service" {DEP Form 62-555.900(9)} along with a copy of two consecutive days of satisfactory bacteriological analytical results to the Department for evaluation and approval for operation, as provided in Rules 62-555.340 and 62-555.345, F.A.C. In order to facilitate the issuance of a letter of clearance, the Department requests that all of the above information be submitted as one package.

Assuming you have properly qualified for this general permit, please note that the permit expires on February 28, 2006. If you wish to continue this general permit beyond the expiration date, you shall notify the Department at least 30 days before its expiration.

Your construction activity must conform to the description contained in your notice. Any substantial deviation may subject the Permittee to enforcement action and possible penalties.

If you have any questions concerning the use of the general permit, please contact this office.

Sincerely,

Jerry M. Owen, P. E.
Water Facilities Administrator

EC:BW:REM:rm

Cc: Nassau County Department of Health

Department of Environmental Protection

Jeb Bush
Governor

Northeast District
7825 Baymeadows Way, Suite B200
Jacksonville, Florida 32256-7590

David B. Struhs
Secretary

PERMITTEE:
Ron Flick
President
Compass Group, Inc.
1890 S. 14th St, Bldg. 100, Ste. 102
Amelia Island, Florida 32034

I.D. Number:
Permit/Cert Number: 0003175-002-DWC
Date of Issue: September 13, 2001
Date of Expiration: September 12, 2006
Lat/Long:
Section/Township/Range:
Project: Gateway to Amelia Dryline
(sewer collection system)

This permit is issued under the provisions of Chapter 403, Florida Statutes (FS), and Florida Administrative Code (FAC) Rule(s) 62-4, 62-604, 62-301, 62-302, 62-600, 62-601, 62-610, 62-640, 62-650, 62-699, 62-7 and 61E12. The above named Permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawing(s), plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of a sewage collection/transmission system consisting of grativy sewer collection system and pump station and required appurtenances to serve two restaurants, one hotel, one drug store, and four commercial buildings. This wastewater collection/transmission system shall be constructed as a "dry line" system and can not be utilized until the permittee receives written permission from the Department in the form of a letter of acceptance. The average daily flow associated with this project is 39,402 gpd. This sewage collection/ transmission system will connect to the Marsh Cove Condominium WWTF.

The project will be located in the vicinity of Amelia Island, Nassau County.

In accordance with the application received August 8, 2001.

PERMITTEE:
Ron Flick
President
Compass Group, Inc.
1890 S. 14th St, Bldg. 100, Ste. 102
Amelia Island, Florida 32034

I.D. Number:
Permit/Cert Number: 0003175-002-DWC
Date of Issue: September 13, 2001
Date of Expiration: September 12, 2006
Project: Gateway to Amelia Dryline

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations and restrictions set forth in this permit, are "permit conditions" and are binding and enforceable pursuant to Sections 403.141, 403.727, or 403.859 through 403.861, F.S. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in subsections 403.087(6) and 403.722(5), F.S., the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement federal, state, or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in this permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgment of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed and used by the permittee to achieve compliance with the conditions of this permit, are required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law

and at reasonable times, access to the premises where the permitted activity is located or conducted to:

a. Have access to and copy any records that must be kept under conditions of the permit;

b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

   a. A description of and cause of noncompliance; and

   b. The period of noncompliance, including dates and times; or, if not corrected, the anticipated time the noncompliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the noncompliance. The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Section 403.111 and 403.73, F.S. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance; provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules. A reasonable time for compliance with a new or amended surface water quality standard, other than those standards addressed in Rule 62-302.500, shall include a reasonable time to obtain or be denied a mixing zone for the new or amended standard.

11. This permit is transferable only upon Department approval in accordance with Rule 62-4.120 and 62-730.300 F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:
    a. Determination of Best Available Control Technology (BACT)
    b. Determination of Prevention of Significant Deterioration (PSD)
    c. Certification of compliance with state Water Quality Standards (Section 401, PL 92-500)
    d. Compliance with New Source Performance Standards

14. The permittee shall comply with the following:

    a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

    b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

    c. Records of monitoring information shall include:
        - the date, exact place, and time of sampling or measurements;
        - the person responsible for performing the sampling or measurements;
        - the dates analyses were performed;
        - the person responsible for performing the analyses;
        - the analytical techniques or methods used;
        - the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware the relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

PERMITTEE:
Ron Flick
President
Compass Group, Inc.
1890 S. 14th St, Bldg. 100, Ste. 102
Amelia Island, Florida 32034

I.D. Number:
Permit/Cert Number: 0003175-002-DWC
Date of Issue: September 13, 2001
Date of Expiration: September 12, 2006
Project: Gateway to Amelia Dryline

SPECIFIC CONDITIONS:

1. A collection/transmission system addressed under Section 62-604.400, FAC, shall not be placed into operation without prior approval of the Department. A "Certificate of Completion of Construction", DEP Form 62-604.300(7)(b), shall be submitted for Department approval along with the record drawings by an engineer.

2. The collection/transmission system shall be operated and maintained so as to provide uninterrupted service as required by Section 62-604.400, FAC.

3. All equipment necessary for the collection/transmission of domestic wastewater, including equipment provided pursuant to Rule 62-604.400(2), FAC, shall be maintained so as to function as intended. In the event odor, noise or lighting adversely affect neighboring developed areas at levels prohibited by Rule 62-604.400(2)(c), FAC, corrective action (which may include modifications of the collection/transmission system) shall be taken by the Permittee. Other corrective action may be required to ensure compliance with rules of the Department.

4. Copies of record drawings pursuant to Rule 62-604.600(2)(d), FAC, and the approved operation and maintenance manual pursuant to Rule 62-604.600(2)(f), FAC, shall be kept available at a site acceptable to the Department for use by operation and maintenance personnel and for inspection by Department personnel.

5. This wastewater collection/transmission system shall be constructed as a "dry line" system and can not be utilized until the permittee receives written permission from the Department in the form of a letter of acceptance. Failure of the wastewater facilities (WWF) to be in clear compliance with operational, hydraulic capacity and/or water quality requirements shall be considered when consent for service and/or system connection is requested. If the WWF is overloaded hydraulically at the time of connection request, the Department may not issue a letter of acceptance to give permission to use the system until it receives the Certification of Completion (DEP 62-600.910(3)) for the expansion of the WWF.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL PROTECTION

Jerry M. Owen, P.E.
Water Facilities Administrator

ST. JOHNS RIVER WATER MANAGEMENT DISTRICT

POST OFFICE BOX 1429 PALATKA, FLORIDA 32178-1429
TELEPHONE 904-329-4500 SUNCOM 904-860-4500
TDD 904-329-4450 TDD SUNCOM 860-4450
FAX (Executive) 329-4125 (Legal) 329-4485 (Permitting) 329-4315 (Administration/Finance) 329-4508

SERVICE CENTERS

618 E. South Street
Orlando, Florida 32801
407-897-4300
TDD 407-897-5960

7775 Baymeadows Way
Suite 102
Jacksonville, Florida 32256
904-730-6270
TDD 904-448-7900

PERMITTING:
305 East Drive
Melbourne, Florida 32904
407-984-4940
TDD 407-722-5368

OPERATIONS:
2133 N. Wickham Road
Melbourne, Florida 32935-8109
407-752-3100
TDD 407-752-3102

June 14, 2001

RECEIVED
JUN 26 2001
MITTAUER & ASSOCIATES, INC.

Compass Group Inc
~~1890 S. 14th St. Bldg 100 Apt. 102~~
Fernandina Beach, FL 32034

SUBJECT: Permit Number 40-089-70727-1
Gateway to Amelia

Dear Sir/Madam:

Enclosed is your general permit as authorized by the staff of the St. Johns River Water Management District on June 14, 2001.

This permit is a legal document and should be kept with your other important documents. The attached MSSW/Stormwater As-Built Certification Form should be filled in and returned to the Palatka office within thirty days after the work is completed. By so doing, you will enable us to schedule a prompt inspection of the permitted activity.

In addition to the MSSW/Stormwater As-Built Certification Form, your permit also contains conditions which require submittal of additional information. All information submitted as compliance to permit conditions must be submitted to the Palatka office address.

Permit issuance does not relieve you from the responsibility of obtaining permits from any federal, state and/or local agencies asserting concurrent jurisdiction for this work.

Please be advised that the District has not published a notice in the newspaper advising the public that it is issuing a permit for this proposed project. Publication, using the District form, notifies members of the public (third parties) of their rights to challenge the issuance of the general permit. If proper notice is given by publication, third parties have a 21-day time limit on the time they have to file a petition opposing the issuance of the permit. If you do not publish, a party's right to challenge the issuance of the general permit extends for an indefinite period of time. If you wish to have certainty that the period for filing such a challenge is closed, then you may publish, at your own expense, such a notice in a newspaper of general circulation. A copy of the form of the notice and a list of newspapers of general circulation is attached for your use.

In the event you sell your property, the permit will be transferred to the new owner, if we are notified by you within thirty days of the sale and if you provide the information required by 40C-1.612, F.A.C. Please assist us in this matter so as to maintain a valid permit for the new property owner.

Thank you for your cooperation, and if this office can be of any further assistance to you, please do not hestitate to contact us.

Sincerely,

Gail L. Boone

Gail L Boone
Sr.Permit Data Technician
Division of Permit Data Services

Enclosures: Permit with As-built Certification Form
Notice of Rights
List of Newspapers for Publication

cc: District Permit File

Agent: Mittauer & Associates Inc
4611-4 US Highway 17
Orange Park, FL 32073

ST. JOHN[illegible]RIVER WATER MANAGEMENT DIS[illegible]CT
Post Office Box 1429
Palatka, Florida 32178-1429

PERMIT NO. 40-089-70727-1 **DATE ISSUED:** June 14, 2001

PROJECT NAME: Gateway to Amelia

A PERMIT AUTHORIZING:

Construction of three wet detention stormwater facilities to accommodate the development of a 12.69 acre commercial site which will include seven buildings, a paved access road, parking facilities and associated utilities.

LOCATION:

Section(s): 5 Township(s): 2N Range(s): 28E
Nassau County

ISSUED TO:
Compass Group Inc
1890 S. 14th St. Bldg 100 Apt. 102
Fernandina Beach, FL 32034

Permittee agrees to hold and save the St. Johns River Water Management District and its successors harmless from any and all damages, claims, or liabilities which may arise from permit issuance. Said application, including all plans and specifications attached thereto, is by reference made a part hereof.

This permit does not convey to permittee any property rights nor any rights of privileges other than those specified therein, nor relieve the permittee from complying with any law, regulation or requirement affecting the rights of other bodies or agencies. All structures and works installed by permittee hereunder shall remain the property of the permittee.

This permit may be revoked, modified or transferred at any time pursuant to the appropriate provisions of Chapter 373, Florida Statutes:

PERMIT IS CONDITIONED UPON:

See conditions on attached "Exhibit A", dated June 14, 2001

AUTHORIZED BY: St. Johns River Water Management District
Department of Resource Management

By: David L. Miracle

(Service Center Director - Jacksonville)
David L Miracle

"EXHIBIT A"
CONDITIONS FOR ISSUANCE OF PERMIT NUMBER 40-089-70727-1
COMPASS GROUP INC
DATED JUNE 14, 2001

1. All activities shall be implemented as set forth in the plans, specifications and performance criteria as approved by this permit. Any deviation from the permitted activity and the conditions for undertaking that activity shall constitute a violation of this permit.

2. This permit or a copy thereof, complete with all conditions, attachments, exhibits, and modifications, shall be kept at the work site of the permitted activity. The complete permit shall be available for review at the work site upon request by District staff. The permittee shall require the contractor to review the complete permit prior to commencement of the activity authorized by this permit.

3. Activities approved by this permit shall be conducted in a manner which do not cause violations of state water quality standards.

4. Prior to and during construction, the permittee shall implement and maintain all erosion and sediment control measures (best management practices) required to retain sediment on-site and to prevent violations of state water quality standards. All practices must be in accordance with the guidelines and specifications in chapter 6 of the Florida Land Development Manual: A Guide to Sound Land and Water Management (Florida Department of Environmental Regulation 1988), which are incorporated by reference, unless a project specific erosion and sediment control plan is approved as part of the permit, in which case the practices must be in accordance with the plan. If site specific conditions require additional measures during any phase of construction or operation to prevent erosion or control sediment, beyond those specified in the erosion and sediment control plan, the permittee shall implement additional best management practices as necessary, in accordance with the specifications in chapter 6 of the Florida Land Development Manual: A Guide to Sound Land and Water Management (Florida Department of Environmental 1988). The permittee shall correct any erosion or shoaling that causes adverse impacts to the water resources.

5. Stabilization measures shall be initiated for erosion and sediment control on disturbed areas as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 7 days after the construction activity in that portion of the site has temporarily or permanently ceased.

6. At least 48 hours prior to commencement of activity authorized by this permit, the permittee shall submit to the District a Construction Commencement Notice Form No.

40C-4.900(3) indicating the actual start date and the expected completion date.

7. When the duration of construction will exceed one year, the permittee shall submit construction status reports to the District on an annual basis utilizing an Annual Status Report Form No. 50C-4.900(4). These forms shall be submitted during June of each year.

8. For those systems which will be operated or maintained by an entity which will require an easement or deed restriction in order to provide that entity with the authority necessary to operate or maintain the system, such easement or deed restriction, together with any other final operation or maintenance documents as are required by subsections 7.1.1 through 7.1.4 of the Applicant's Handbook: Management and Storage of Surface Waters, must be submitted to the District for approval. Documents meeting the requirements set forth in these subsections of the Applicant's Handbook will be approved. Deed restrictions, easements and other operation and maintenance documents which require recordation either with the Secretary of State or the Clerk of the Circuit Court must be so recorded prior to lot or unit sales within the project served by the system, or upon completion of construction of the system, whichever occurs first. For those systems which are proposed to be maintained by county or municipal entities, final operation and maintenance documents must be received by the District when maintenance and operation of the system is accepted by the local governmental entity. Failure to submit the appropriate final documents referenced in this paragraph will result in the permittee remaining liable for carrying out maintenance and operation of the permitted system.

9. Each phase or independent portion of the permitted system must be completed in accordance with the permitted plans and permit conditions prior to the initiation of the permitted use of site infrastructure located within the area served by the portion or phase of the system. Each phase or independent portion of the system must be completed in accordance with the permitted plans and permit conditions prior to transfer of responsibility for operation and maintenance of that phase or portion of the system to local government or other responsible entity.

10. Within 30 days after completion of construction of the permitted system, or independent portion of the system, the permittee shall submit a written statement of completion and certification by a registered professional engineer or other appropriate individual as authorized by law, utilizing As Built Certification Form 40C-1.181(13) or 40C-1.181(14) supplied with this permit. When the completed system differs substantially from the permitted plans, any substantial deviations shall be noted and explained and two copies of as-built drawings submitted to the District. Submittal of the completed from shall serve to notify the District that the system is ready for inspection. The statement of completion and certification shall be based on on-site observation of construction

(conducted by the registered professional engineer, or other appropriate individual as authorized by law, or under his or her direct supervision) or review of as-built drawings for the purpose of determining if the work was completed in compliance with approved plans and specifications. As-built drawings shall be the permitted drawings revised to reflect any changes made during construction. Both the original and any revised specifications must be clearly shown. The plans must be clearly labeled as "as-built" or "record" drawing. All surveyed dimensions and elevations shall be certified by a registered surveyor. The following information, at a minimum, shall be verified on the as-built drawings:

1. Dimensions and elevations of all discharge structures including all weirs, slots, gates, pumps, pipes, and oil and grease skimmers;

2. Locations, dimensions, and elevations of all filter, exfiltration, or underdrain systems including cleanouts, pipes, connections to control structures, and points of discharge to the receiving waters;

3. Dimensions, elevations, contours, or cross-sections of all treatment storage areas sufficient to determine state-storage relationships of the storage area and the permanent pool depth and volume below the control elevation for normally wet systems, when appropriate;

4. Dimensions, elevations, contours, final grades, or cross-sections of the system to determine flow directions and conveyance of runoff to the treatment system;

5. Dimensions, elevations, contours, final grades, or cross-sections of all conveyance systems utilized to convey off-site runoff around the system;

6. Existing water elevation(s) and the date determined; and Elevation and location of benchmark(s) for the survey.

11. The operation phase of this permit shall not become effective until the permittee has complied with the requirements of general condition 9 above, the District determines the system to be in compliance with the permitted plans, and the entity approved by the District in accordance with subsections 7.1.1 through 7.1.4 of the Applicant's Handbook: Management and Storage of Surface Waters, accepts responsibility for operation and maintenance of the system. The permit may not be transferred to such an approved operation and maintenance entity until the operation phase of the permit becomes effective. Following inspection and approval of the permitted system by the District, the permittee shall request transfer of the permit to the responsible approved operation

and maintenance entity, if different from the permittee. Until the permit is transferred pursuant to section 7.1 of the Applicant's Handbook: Management and Storage of Surface Waters, the permittee shall be liable for compliance with the terms of the permit.

12. Should any other regulatory agency require changes to the permitted system, the permittee shall provide written notification to the District of the changes prior implementation so that a determination can be made whether a permit modification is required.

13. This permit does not eliminate the necessity to obtain any required federal, state, local and special district authorizations prior to the start of any activity approved by this permit. This permit does not convey to the permittee or create in the permittee any property right, or any interest in real property, nor does it authorize any entrance upon or activities on property which is not owned or controlled by the permittee, or convey any rights or privileges other than those specified in the permit and chapter 40C-4 or chapter 40C-40, F.A.C.

14. The permittee shall hold and save the District harmless from any and all damages, claims, or liabilities which may arise by reason of the activities authorized by the permit or any use of the permitted system.

15. Any delineation of the extent of a wetland or other surface water submitted as part of the permit application, including plans or other supporting documentation, shall not be considered specifically approved unless a specific condition of this permit or a formal determination under section 373.421(2), F.S., provides otherwise.

16. The permittee shall notify the District in writing within 30 days of any sale, conveyance, or other transfer of ownership or control of the permitted system or the real property at which the permitted system is located. All transfers of ownership or transfers of a permit are subject to the requirements of section 40C-1.612, F.A.C. The permittee transferring the permit shall remain liable for any corrective actions that may be required as a result of any permit violations prior to such sale, conveyance or other transfer.

17. Upon reasonable notice to the permittee, District authorized staff with proper identification shall have permission to enter, inspect, sample and test the system to insure conformity with the plans and specifications approved by the permit.

18. If historical or archaeological artifacts are discovered at any time on the project site, the permittee shall immediately notify the District.

19. The permittee shall immediately notify the District in writing of any previously submitted information that is later discovered to be inaccurate.

20. This permit for construction will expire five years from the date of issuance.

21. At a minimum, all retention and detention storage areas must be excavated to rough grade prior to building construction or placement of impervious surface within the area to be served by those facilities. To prevent reduction in storage volume and percolation rates, all accumulated sediment must be removed from the storage area prior to final grading and stabilization.

22. All wetland areas or water bodies that are outside the specific limits of construction authorized by this permit must be protected from erosion, siltation, scouring or excess turbidity, and dewatering.

23. Prior to construction, the permittee must clearly designate the limits of construction on-site. The permittee must advise the contractor that any work outside the limits of construction, including clearing, may be a violation of this permit.

24. Prior to the sale of any lot or parcel, or the permittee must record Declarations or Covenants and Restrictions which include a restriction on the real property pursuant to section 704.06, F.S.; prohibiting all construction including clearing, dredging, or filling, except that which is specifically authorized by Environmental Resource permit, within the conservation areas delineated on the final plans and/or mitigation proposal approved by the District. The deed restrictions must contain provisions as set forth in paragraphs 1(a)-(h) of section 704.06, F.S., as well as provisions indicating that they may be enforced by the District or Department of Environmental Protection and may not be amended without District approval. Prior to lot or parcel sales, the restricted area boundaries must be permanently monumented above ground on the project site where each lot intersects the conservation areas.

    Within 30 days of recording, the Permittee must provide the District with a certified copy of the recorded restrictions showing the date it was recorded the official records book and page number, a surveyors sketch of the area included in the legal description, and a surveyors sketch of the restricted area plotted on the appropriate USGS topographic map.

25. The operation and Maintenance entity shall submit inspection reports to the District two years after the operation phase permit becomes effective and every two years thereafter on District Form EN-46. The inspection form must be signed and sealed by an appropriate

registered professional.

26. Construction of the project must be in accordance to the plans received by the District on May 16, 2001 and sheet 7 received by the Disrict on May 30, 2001.

SECTION 01300

SUBMITTALS

PART 1 - GENERAL

1.01 TYPES OF SUBMITTALS:

A. Construction Schedules: The Contractor shall prepare and submit to the Owner and Engineer within two weeks of the "Notice to Proceed" a construction schedule showing the proposed dates for starting and completing each of the various branches of work. The schedule shall be in the form of a bar graph with a representation of the schedule of costs by months.

B. Manufacturer's data shall include all standard published information describing products, systems, methods and performance. Include manufacturer's name and address, and associations with which manufacturer of his products comply.

C. Shop drawings and schedules shall include items, products, materials, methods, anchorages, details, or any other information required to fabricate items of the work and complete the installation which is not specifically stated or described on manufacturer's data. Shop drawings shall specifically address the work of this project.

D. Installation instruction shall include all information required from a manufacturer or fabricator to have his product installed. This may be included as a shop drawing if such are required.

E. Warranties and Guarantees required by the Contract Documents shall begin on the official date of substantial completion of the project or any portion thereof, into which the warranted or guaranteed item was installed, constructed, or otherwise made operational. All warranties and guarantees shall be in effect for a minimum of one year unless specified for a longer period. Include all specific items covered, company names and addresses and names of persons authorized to warrant or guarantee item(s) if not a blanket coverage.

F. Certifications and test reports of products, materials, and performance for compliance with specified requirements shall specifically address the work and shall contain the name and signature and address of persons authorized to make such certifications.

G. Evidence of compliance to instructions shall be copies of transmittal letters or letter of verification duly signed by authorized persons.

H. Operation and Maintenance Manuals shall include all literature required to properly operate and maintain any

equipment installed in the work and shall include names and addresses of manufacturers and authorized service and/or parts representatives, and dealers and shall be delivered on or before data of beneficial occupancy.

I. Samples required shall be as specified and shall include identifications of the specific item and specification section to which the sample applies.

1.02 COPIES OF SUBMITTALS:

A. The minimum number of copies of submittals shall be submitted as follows and does not include numbers of copies required by the Contractor for his distribution purposes.

1.	Manufacturers Data:	4	
2.	Shop Drawings and Schedules:	4	
3.	Installation Instructions:	4	
4.	Warranties and Guarantees:	4	
5.	Certifications and Test Reports:	4	
6.	Evidences:	4	
7.	Operation and Maintenance Manuals:	10	
8.	Samples:	3	
9.	Progress Schedule:	4	Monthly

B. Any copies submitted in addition to those required will be processed and returned to the Contractor. Additional copies may be in the form of a reproducible copy.

C. Submittals received by the Engineer with less than the specified number of copies included will be immediately returned to the Contractor not reviewed and without action.

D. As soon as practicable after the date of execution of the Owner/Contractor Agreement and within 30 days, the Contractor will make all required submittals.

1.03 REVIEW OF SUBMITTALS:

A. All submittals required by the Contract Documents shall be sent to the Engineer.

B. Copies of submittals to be returned for the Contractor's use will be processed and mailed to the Contractor within 14 days of receipt of each submittal by the Engineer.

C. Review of submittals is only for conformance with the design concept of the project or work and does not

relieve the Contractor of responsibility for any deviation from the requirements of the Contract Documents nor from responsibility for errors and omissions in the submittals.

D. Submittals received without the Contractor's signed "Checked and Approved" stamp on each copy will be returned without action and noted as such or "RWA."

E. Any submittals or portions thereof which are processed and returned to the Contractor will be marked "Approved," "Approved as Noted," "Revised and Resubmit," or "Not Approved."

F. Submittals which refer to information or data not included in the submittal (excluding the Contract Documents) will not be checked.

1.04 WRITTEN DOCUMENTS:

A. All written documents including letters, letters of transmittal and request, generated by the Contractor shall be on standard letter or legal size paper and include Contractor's name, the Owner's project number, Engineer's project number, date and be signed by authorized personnel.

B. Letters of transmittal whether written or of standard form, shall also clearly identify each part of the submittal with specification section number and indicate the number of copies of each part. Letter requesting substitutions shall contain the same information.

C. All submittals for approval shall be individually numbered by the Contractor in sequence of order of submission. Resubmittal of revised submittals shall bear the same numbers and be clearly marked Resubmittal No. _____.

D. All copies shall be neatly prepared, easily readable, bound and transmitted. Facsimile copies or reproductions of facsimile copies will not be accepted.

1.05 COLORS:

A. The Engineer in noting and marking submittals will use the color green.

B. The Contractor in noting and marking submittals shall use the color red.

C. Marks or notations of any other color on submittals shall be disregarded.

1.06 ON-SITE RECORDS:

A. The Contractor shall have at least one set of complete, approved submittals and shop drawings on the job site at all times when such work is in progress.

END OF SECTION

SECTION 01370

SCHEDULE OF VALUES

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Work Included: Provide a detailed breakdown of the agreed Contract Sum showing values allocated to each of the various parts of the work, as specified herein, and in other provisions of the Contract Documents.

B. Related Work: Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 QUALITY ASSURANCE:

A. Use required means to assure arithmetical accuracy of the sum described.

B. When so required by the Engineer, provide copies of the subcontracts or other data acceptable to the Engineer substantiating the sums described.

1.03 SUBMITTALS:

A. Prior to first application for payment, submit a proposed schedule of values to the Engineer.

1. Meet with the Engineer and determine data, if any, required to be submitted.

2. Secure the Engineer's approval of the values prior to submitting first application for payment.

END OF SECTION

SECTION 01390

AUDIOVISUAL DOCUMENTATION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: Prior to commencing the Work, the Contractor shall have a continuous audio-video tape recording of the Project to serve as a record of preconstruction conditions. The scope of the video shall include all on-site work as well as all off-site construction activities along A1A, the Amelia Parkway, and the force main route.

1.02 APPROVAL: No construction shall begin prior to review and approval of the tapes covering the construction area by the Engineer. The Engineer shall have the authority to reject all or any portion of a video tape not conforming to specifications and order that it be redone at no additional charge. The Contractor shall reschedule unacceptable coverage within five (5) days after being notified. The Engineer shall designate those areas, if any, to be omitted from or added to the audio-video coverage. Tape recordings shall not be made more than ninety (90) days prior to construction in any area.

1.03 QUALITY ASSURANCE: The Contractor shall engage the services of a professional electrographer. The color audio-video tapes shall be prepared by a responsible commercial firm known to be skilled and regularly engaged in the business of preconstruction color audio-video tape documentation.

PART 2 - PRODUCTS

2.01 GENERAL: All equipment, accessories, materials, and labor to perform this service shall be furnished by the Contractor.

2.02 QUALITY: The total audio-video system shall reproduce bright, sharp, clear pictures with accurate colors and shall have minimal distortion, tearing, rolls, or other imperfections. The audio portion of the recording shall reproduce the commentary of the camera operator with proper volume and clarity and be free from distortion and interruptions.

2.03 CAMERA: The color video camera used in the recording system shall have a horizontal resolution of 300 lines at center, a luminance signal-to-noise ratio of 45 Db, and a minimum illumination requirement of 25 foot-candles.

2.04 TAPES: Audio-video tapes shall be new. Reprocessed tapes will not be acceptable. The tapes shall be one-half inch, high energy, extended still frame capable, video cassette; shall be interchangeable with any VHS color video cassette player; and shall be compatible for playback with any VHS player-receiver.

PART 3 - EXECUTION

3.01 VIDEOTAPING PROCEDURES:

A. Each tape shall begin with the current date, project name, and municipality and be followed by the general location, i.e., name of street, house address, viewing side, and direction of progress. The audio track shall consist of an original live recording. The recording shall contain the narrative commentary of the electrographer, recorded simultaneously with his fixed elevation video record of the zone of influence of construction. The tape shall be filmed in a forward-motion progression toward the objects being recorded.

B. All video recordings must, by electronic means, periodically display transparent digital information to include the date and time of recording, and station numbers, if shown on the Drawings. The date information shall contain the month, day, and year. The time information shall contain the hour, minutes, and seconds. Additional information shall include but not be limited to project name, contract number, name of street, house address, direction of travel, and the viewing side. The transparent information shall appear on the extreme upper left hand third of the screen.

C. All taping shall be done during times of good visibility. No taping shall be done during precipitation, mist, or fog. The recording shall be done only when sufficient sunlight is present to properly illuminate the subjects of recording and to produce bright, sharp video recordings of those subjects.

D. The rate of speed on the general direction of travel of the vehicle used during taping shall not exceed 44 feet per minute. Panning, zoom-in and zoom-out rates shall be sufficiently controlled to maintain a clear view of the object.

E. Tape coverage shall include all surface features located within the zone of influence of construction supported by appropriate audio coverage. Such coverage shall include, but not be limited to, existing valves, meter boxes, fire hydrants, driveways, sidewalks, curbs, pavements, striping, ditches, mailboxes, landscaping, culverts, fences, signs, walls, etc., within the area covered.

F. When conventional wheeled vehicles are used, the distance from the camera lens to the ground shall not be less than twelve (12) feet. In some instances, audio-video tape coverage may be required in areas not accessible by conventional wheeled vehicles. Such coverage shall be obtained by walking or special conveyance approved by the Engineer.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 - GENERAL

1.01 DESCRIPTION OF REQUIREMENTS: Definitions: Specified quality control requirements for the work are indicated throughout the Contract Documents and are not repeated herein. The requirements of this Section are primarily related to performance of the work beyond furnishing of manufactured products. The term "Quality Control" includes, but is not necessarily limited to, inspection and testing and associated requirements. This Section does not specify or modify Engineer's duties relating to quality control and Contract enforcement.

1.02 RESPONSIBILITY FOR INSPECTIONS AND TESTS:

A. Unless otherwise noted all testing and inspections required by these specifications shall be performed by a properly certified entity. All cost associated with the testing and inspections shall be the Contractor's responsibility. The Contractor shall also be responsible for all tests or inspections required by any entity having jurisdictional control over the work.

B. Costs for those required services by independent testing laboratories are recognized to be included in the Contract Sum.

C. No failure of test agencies, whether engaged by Owner or Contractor, to perform adequate inspections or tests or to properly analyze or report results, shall relieve the Contractor of responsibility for fulfillment or requirements of Contract Documents. It is recognized that required inspection and testing programs are intended to assist the Contractor, Owner, Engineer and governing authorities in nominal determination of probable compliance with requirements for certain elements of work. The program is not intended to limit the Contractor's regular quality control program as needed for general assurance of compliances.

1.03 QUALITY ASSURANCE:

A. General Workmanship Standards: Except as more definitively specified, the Contractor shall comply with recognized workmanship quality standards within the industry as applicable to each unit of work, including ANSI Standards where applicable. It is a requirement that each category of trades person or installer performing the work is prequalified, to the extent of being familiar with applicable and recognized quality standards for that category of work, and being capable of workmanship complying with those standards.

B. Qualification of Quality-Control Agencies: Except where another qualification standard is indicated, and except where it is specifically indicated that use of prime product manufacturer's test facilities is acceptable, engage independent testing laboratories complying with "Recommended Requirements for Independent Laboratory Qualification" as published by American Council of Independent Laboratories, and specializing in type(s) of inspections and tests required.

C. When requested by the Engineer, submit proof of qualification for agency(s) engaged or to be engaged to perform inspection and testing services. If, after review of the submitted information, the Engineer determines that the agency's qualifications are unsatisfactory, the Contractor shall engage an alternate agency at no additional cost to the Owner.

1.04 PRODUCT DELIVERY - STORAGE - HANDLING: Handle, store and protect materials and products, including fabricated components, by methods and means which will prevent damage, deterioration, and losses including theft (and resulting delays), thereby ensuring highest quality results as the performance of the work progresses. Control delivery schedules so as to minimize unnecessary long-term storage at project site prior to installation. Contractor shall provide covered storage for all new equipment on the site which is not intended for outside installation. Electrical, hydraulic and pneumatic connections on all equipment shall be protected from the elements. The Contractor shall store all material in the staging area as shown on the drawings unless specifically authorized otherwise by the Owner.

1.05 WATER-TIGHTNESS: All tanks and other equipment containing liquids that are not subject to specific leakage testing, as may be specified elsewhere, shall be free of all leakage when filled to the maximum pressure of static head that could be applied during operation of the plant.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION

3.01 PREPARATION FOR INSTALLATION:

A. Preinstallation Conferences: Well in advance of installation of every major unit of work which requires coordination with other work, the Contractor shall meet a project site with installers and representatives of manufacturers and fabricators who are involved in or affected by the unit of work, and in its coordination or integration with other work which has preceded or will follow.

B. The Contractor shall advise the Engineer of scheduled meeting dates. At each meeting the Contractor shall review the progress of other work and preparations for the particular work under consideration, including requirements of Contract Documents, product data, quality control samples, possible conflicts, compatibility problems, time schedules, weather limitations, structural limitation, governing regulations, safety, inspection and testing requirements, required performance results, recording requirements, and protection. Record significant discussion of each conference, and agreements and disagreements, along with final plan of action. Distribute a record of the meeting promptly to everyone concerned, including the Engineer.

C. The Contractor shall not proceed with the work if associated preinstallation conference cannot be concluded successfully. The Contractor shall instigate actions to resolve impediments to performance of the work, and meet at earliest date feasible.

D. Installer's Inspection of Conditions: The Contractor shall require the fabricator and installer of each major unit of work to inspect substrate to receive the work, and conditions under which the work will be performed, and to report (in writing to the Contractor and the Engineer) unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the fabricator and installer.

3.02 INSTALLATION QUALITY CONTROL:

A. Manufacturer's Instructions: Where installation includes manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to whatever extent these are more explicit or more stringent than applicable requirements indicated in the Contract Documents.

B. The Contractor shall inspect each item of materials or equipment immediately prior to installation and reject damaged and defective items.

C. Provide attachment and connection devices and methods for securing work properly as it is installed; true to line and level, and within recognized industry tolerances if not otherwise indicated. Allow for expansions and building movements. Provide uniform joint widths in exposed work, organized for best possible visual effect. Refer questionable visual effect choices to Engineer for final decision.

D. The Contractor shall recheck measurements and dimensions of the work as an integral step of starting each installation.

E. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work, in coordination with entire work. Isolate each unit of work for noncompatible work as required to prevent deterioration.

F. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to avoid necessity of uncovering work for that purpose.

G. Mounting Heights: Except as otherwise indicated, mount individual units of work at industry-recognized standard mounting heights, for applications indicated. Refer questionable mounting height choices to Engineer for final decision.

H. Adjust, clean, lubricate restore marred finishes, and protect newly installed work, to ensure that it will remain without damage or deterioration during the remainder of the construction period.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.01 DESCRIPTION: The following criteria shall govern the furnishing of and paying for temporary construction and service items. Such items shall be instituted at the beginning and maintained for the life of the work or until removal or termination is approved by the Engineer.

1.02 TEMPORARY FACILITIES:

A. Drinking Water: The Contractor shall provide cool water with dispensing utilities.

B. Construction Water: The Contractor shall provide construction water including proper back flow devices in order to comply with regulations concerning back flow & cross connection.

C. It shall be the Contractor's responsibility to provide temporary electrical power for construction as required.

D. Toilet Facilities: The Contractor shall furnish a portable, job-site toilet enclosure facility through a local company specializing and licensed in this business. The toilet enclosure shall be located on the plant site at a point approved by the Owner. It shall be maintained daily by the supplying company and removed from the project site upon completion of the project.

E. CONTRACTOR'S FIELD OFFICE:

1. The Contractor shall furnish, equip, and maintain on or near the job site a temporary field office. The location of the field office shall be determined by the contractor and as approved by the Engineer.

2. The office shall be weathertight, with adequate ventilation, heating and cooling, equipped with working telephone, adequate light for reading blueprints, a chart table suitable for 24" x 36" drawings, and storage shelving or cabinet. Location of the field office shall be subject to the Owner's approval. All utility services shall be provided at the Contractor's expense. In addition, there shall be provided satisfactory drinking water and toilet facilities near the field office. Said facilities shall be supplied, maintained in good working condition, and otherwise serviced by the Contractor, and shall be removed by him upon completion of work.

3. A complete first aid kit, suitable for a project of this size, shall be kept in this facility and fully maintained for the duration of this project.

F. ENGINEER'S FIELD OFFICE:

1. The Contractor shall furnish, equip, and maintain at the job site a separate temporary field office for the Engineer.

2. The office shall be weathertight having a minimum area of 250 square feet, with adequate lighting, ventilation, heating and air conditioning equipment.

3. Utilities including electrical power supply and direct line telephone service with telephone, answering machine and fax machine.

4. Furnishings shall include 3' x 5' desk with 3 drawers; 4-drawer legal size filing cabinet; 2 desk chairs; 3' x 6' drawing table; 2 drafting stools; wastepaper basket; plan rack; 2-shelf bookcase; coat rack and hooks.

5. The office and all furnishings shall remain property of the Contractor, and shall be removed by him upon completion of the work.

1.03 SECURITY:

A. General: The Contractor shall provide security, as necessary or required, to protect work and property at all times.

B. Rodents and Other Pests: The Contractor, through debris removal, etc., shall control the creation of rodent or pest problems. Should such develop, the Contractor shall secure services of exterminator to control.

C. Debris Control: Keep premises clean and free from accumulation of debris and rubbish. Provide trash and debris receptacles and require use. Remove from site at least weekly.

D. Cleaning: As work is completed by trades, areas of work shall be cleaned in preparation for next trade, inspections or general safety of property and person.

E. Project Safety: The Contractor shall comply with all applicable governmental and insuring company requirements relative to construction and project safety. Either the superintendent or another company representative on the site during all working hours, shall be trained in project safety and designated as Contractor's Safety Director.

1.04 QUALITY ASSURANCE:

A. Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Building Code Requirements
2. Health and Safety Regulations
3. Utility Company Regulations
4. Police, Fire Department and Rescue Squad Rules
5. Environmental Protection Regulations.

END OF SECTION

SECTION 01570

TRAFFIC REGULATION

PART 1 - GENERAL

1.01 DESCRIPTION: The work to be performed under this Section shall include furnishing all materials and labor necessary to regulate vehicular and pedestrian traffic in accordance with the requirements set forth and as shown on the drawings.

1.02 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS: The work under this Contract shall be in strict accordance with the following codes and standards.

A. Local, County, Municipal and Federal Codes.

B. Florida Department of Transportation (DOT) Specifications.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION

3.01 TRAFFIC AND VEHICULAR ACCESS:

A. Emergency Vehicles: No multi-family residence, apartment, commercial building or place of employment shall be without access to emergency vehicles for a period longer than three hours. The Contractor shall notify in writing the Engineer, the police, fire and other emergency departments and agencies when and where work is to be accomplished that will affect their operations at least two days in advance of such work.

B. Major Roads and Streets: No major roads or streets shall be blocked to traffic without adequate detour facilities for a period of more than 30 minutes or as directed by the governing authority.

C. Commercial Properties: Access to commercial property shall not be blocked for a period of more than 30 minutes during the time such properties are open for business.

D. Residential Property: Access to residential property shall not be blocked for a period of more than 24 hours.

3.02 CONSTRUCTION IN STATE HIGHWAY RIGHT-OF-WAY: Construction within all State Highway Right-of-Way shall be made in full compliance with all requirements and to the satisfaction of the Florida Department of Transportation. All necessary barricades, flagmen, detours, lights and other protective measures shall be provided for the protection of both pedestrian and vehicular traffic.

3.03 CONSTRUCTION IN OTHER THAN STATE HIGHWAY RIGHT-OF-WAY: Construction within right-of-way other than State Highways shall be made in full compliance with all requirements of the Florida Department of Transportation and to the satisfaction of the local governing bodies. All necessary barricades, flagmen, detours, lights and other protective measures shall be provided for the protection of both pedestrian and vehicular traffic.

END OF SECTION

SECTION 01700

PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Summary of Work: The Contractor shall remove all stains, spots, marks and dirt from all finished surfaces caused by this work. All items shall be cleansed in accordance with the manufacturers' written instructions.

B. Inspection Certificates, Bonds and Guarantees: Upon completion of project, and prior to submission of certificate for final payment, the Contractor shall have the electrical, plumbing and other work, as applicable, inspected by proper authorities as required by the specifications and all applicable codes, laws and ordinances. Before final payment will be made, the Contractor shall submit copies of all bonds and guarantees as required.

C. Operating Manuals Data:

1. The Contractor shall furnish to the Engineer required copies of all maintenance manuals, instruction books, parts lists, and installation drawings bound in ringed binders for all items furnished under this Contract. It shall be the Contractor's responsibility to satisfy the Owner's requirements regarding such data. Manuals, parts list, etc. shall be presented to the Owner at time of final inspection unless specifically requested earlier. All submittals shall be in a binder and neatly indexed and tabbed.

2. Binder: The manuals shall be in a 9-inch by 12-inch, three-ring binder of a size to facilitate easy turning of the pages. The binders shall have a full-size, transparent, built-in, plastic pocket on the front to accommodate a label showing the name and location of the project, date of completion, Engineer/Contractors' names, addresses and phone numbers. On the binding edge the binders shall have a clip-on metal frame or built-in plastic pocket to accommodate a label showing the name and location of the project and the date of completion.

3. Index: The Contractor shall furnish a neatly typed index in alpha-numerical order. Each major division shall list the equipment in alpha-numerical order. Listed under each of these major divisions shall be all items specified on the drawings as furnished with major items listed. These secondary items shall also be listed in alpha-numerical order. To the right of each of

these equipment designations shall be the tab number where the information can be found.

4. Tabs: Behind the index, provide numbered tabs beginning with one through the number required for each type of equipment. Behind the tab, insert all shop drawings, shop-cuts, parts' manuals, installation manuals and operation manuals associated with each item furnished. Only one tab will be required for each different material provided. The index designation shall refer to the tab number behind which the information on the equipment can be found.

PART 2 - PRODUCTS

2.01 RECORD DRAWINGS: The record drawings shall correctly and accurately show all changes from the Contract Documents made during construction and shall reflect surveyed information which shall be performed by a professional engineer or land surveyor registered in the State of Florida. The drawings shall be neat and legible. Show all elevations and horizontal control of all storm sewer, gravity sewers including laterals, electric cables, television cables, telephone cables, force mains, and water mains which are crossed.

A. Water and Force Mains: Record drawings shall show the following field information:

1. Show material used to construct mains.

2. Show location of tees, crosses, bends, terminal ends, valves, fire hydrants, air release valves, and sampling points, etc., by distances from known above ground reference points (manholes, catch basins, and bridges).

3. Show location of all sleeves and casing pipes.

4. Show all variations in required cover over pipes.

5. Elevation and horizontal control of all storm sewers, gravity sewers, including laterals, force mains, etc. which are crossed.

6. Elevation and horizontal control of all water and force main stubouts.

7. Location of all services.

B. Gravity Sewer: Record drawings shall show the following surveyed information:

1. Manholes: Elevation of top rim and invert of each influent and effluent line.

2. Show distance between manholes center-to-center.

3. Show material used to construct sewer mains.

4. Show length (center of manhole to end of stub) and elevation of stub-outs.

5. Show which services have 18 ft. length of DIP at water main crossings.

6. Show location and length of sanitary services; station from manhole to wye at property line, perpendicular from sewer main. Particular care in dimensioning needed in special situations, i.e., cul-de-sacs and locations where services are not perpendicular to wye.

7. Show invert of sanitary service at property line.

C. Storm Sewer and Paving: Record drawings shall show the following information:

1. Inlets: Elevation of top of grate and invert(s).

2. Manholes: Elevation of top rim and invert(s).

3. Stub-outs: Length installed.

4. Pipe: Length installed.

5. Paving: As constructed elevations corresponding to plan elevations.

D. Pump/Lift Station, WTP or WWTP: Record drawings shall show elevations for top and invert of wet well along with invert of influent line. Record drawings should also indicate the make, model number, horsepower, impeller and condition point of pumps selected and installed, shape of wet well, location of control panel, location of pump out connection, any deviation from the plans, and serial number of the pumps.

PART 3 - EXECUTION

3.01 RECORDS: Daily records of changes in location of piping, fixtures and other items shall be kept and recorded on the record drawings. The Contractor shall review the completed record drawings and ascertain that all data furnished is accurate and truly represents the work actually installed. No Record Drawing Information will be accepted from subcontractors.

3.02 SUBMITTAL: The Project shall not be considered to be in substantial completion until record drawings have been submitted and accepted by the Engineer. Prior to final payment the record drawings shall be revised by the Contractor to reflect any changes which have occurred since the substantial completion submittal.

3.03 FINAL INSPECTION:

A. Final inspection will be held upon completion of the project. The Contractor shall notify the Owner, upon completion, to arrange an inspection tour of the completed project.

B. The Contractor, and the Owner's Representative, shall be present for the inspection.

3.04 RELEASE OF LIEN STATEMENT: The Contractor shall submit with his request for final payment sworn statements on the Owner's form from himself and each subcontractor; material or labor suppliers who have filed a "Notice to Owner" that all work has been completed and that all bills for labor, materials and subcontractor's work on the project have been paid in full.

END OF SECTION

DIVISION 2

Site Work

SECTION 02011

SOIL BORINGS

PART 1 - GENERAL

1.01 DESCRIPTION:

A. Soil borings are provided for the Contractor's information only. The Contractor shall satisfy himself as to the character and amount of different soil materials, groundwater and subsurface conditions to be encountered in the work to be performed. Subsurface information included in these specifications is the result of borings made at the exact locations shown only. While the borings show the subsurface conditions at their respective exact locations, local variations in soils and groundwater conditions will be encountered.

B. It is to be expressly understood that the Owner or Engineer will not be responsible for any interpretation or conclusion drawn therefrom.

END OF SECTION

UNIVERSAL
ENGINEERING SCIENCES

PRELIMINARY GEOTECHNICAL EXPLORATION

GATEWAY TO AMELIA
NASSAU COUNTY, FLORIDA

January 24, 2001

PROJECT NO. 90576-009-01
REPORT NO. 11566

Prepared For:

Mr. Ron Flick
COMPASS GROUP, INC.
1890 South 14th Street, Building 100, Suite 102
Amelia Island, Florida 32034

Prepared By:

UNIVERSAL ENGINEERING SCIENCES
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January 24, 2001

Compass Group, Inc.
1890 South 14th Street
Building 100, Suite 102
Amelia Island, Florida 32034

Attention: Mr. Ron Flick

Reference: **REPORT OF A PRELIMINARY GEOTECHNICAL EXPLORATION**
Gateway to Amelia
Amelia Island, Florida
UES Project No. 90576-009-01 and Report No. 11566

Dear Mr. Flick:

Universal Engineering Sciences, Inc. has completed the preliminary subsurface investigation for the proposed development in Amelia Island, Florida. This report contains the results of our investigations, an engineering interpretation of these results with respect to the project characteristics described to us, and preliminary recommendations for groundwater control, foundation design, pavement design and site preparation. A summary of our findings is as follows:

- The borings generally encountered very loose to loose sand (SP) and sand with silt (SP-SM) to depths of approximately 3 feet followed by medium dense sand (SP) to depths of 16½ to 17½ feet. Very soft silty clay and medium dense clayey sand was then encountered to depths of 22 feet. Loose to medium dense sands were then encountered to a depth of 27 feet, underlain with very loose sand with silt (SP-SM) to a depth of 33 feet, in turn underlain with very loose to loose clayey sand to the deepest boring depth of 40-feet.

- We measured groundwater levels at the boring locations ranging from 2.7 to 3.6 feet below the existing grade. We estimate the normal seasonal high groundwater level will be encountered within 1.0 to 1.5 feet of the existing site grades with the exception of an isolated low area along SR AIA which will have a seasonal high groundwater level at the existing grade.

- Assuming the building areas will be constructed with appropriate earthwork procedures, we have preliminarily recommended the proposed structures be supported on conventional, shallow spread foundations with allowable soil bearing pressures ranging from 2,000 to 3,000 pounds per square foot. Design allowable bearing pressures can be confirmed during the final geotechnical report.

- Due to the presence of a very soft clay layer at the site, surcharging or a waiting period between completion of structural fill placement and beginning vertical construction may be warranted depending on final grades.

- Pavements should be designed as a function of the anticipated traffic loadings. We have recommended using a flexible pavement section consisting of stabilized subgrade, limerock base course and an asphalt concrete surface course in the proposed parking and drive areas.

- It should be noted the preliminary recommendations presented in this report are based on the limited field investigation performed. It is recommended that a final geotechnical exploration be performed, consisting of additional SPT borings in the building areas consolidation testing on the very soft clays, and auger borings in the pavement areas to confirm the final design parameters and site work recommendations.

We trust this report meets yours needs and addresses the preliminary geotechnical issues associated with the proposed construction. We appreciate the opportunity to have worked with you on this project and look forward to a continued association. Please do not hesitate to contact us if you should have any questions, or if we may further assist you as your plans proceed.

Respectfully submitted,

UNIVERSAL ENGINEERING SCIENCES, INC.

Stephen R Weaver, P.E.
Senior Geotechnical Engineer
FL. P.E. Number 37389

Jeffrey S, Pruett, P.E.
Branch Manager
FL. P.E. Number 50775

SRW/JSP/ag

cc: Mr. Mike Tibble, Mittauer and Associates

TABLE OF CONTENTS

LIST OF APPENDICES

1.0 INTRODUCTION

In this report, we present the results of the preliminary subsurface investigation of the site for the proposed Gateway to Amelia development at the intersection of SR AIA and Amelia Island Parkway in Nassau County, Florida. We have divided this report into the following sections:

- SCOPE OF SERVICES - Defines what we did
- FINDINGS - Describes what we encountered
- RECOMMENDATIONS - Describes what we encourage you to do
- LIMITATIONS - Describes the restrictions inherent in this report
- APPENDICES - Presents support materials referenced in this report

2.0 SCOPE OF SERVICES

2.1 PROJECT DESCRIPTION

Project information has been provided in recent conversations. We were provided with a Site Plan of the site prepared by Mittauer and Associates, Inc. dated January 12, 2001. The plan shows the boundary limits for the property, the layout of the proposed construction, and the roadways located adjacent to the site.

The project consists of a mixed use development including a hotel, restaurants, and office buildings. It is anticipated the structures will be one or two stories in height. Detailed structural loading information has not been provided, therefore, we have assumed maximum wall and column loads will not exceed 5 klf and 100 kips, respectively. The project will include surrounding pavement areas and retention areas for stormwater management.

Once detailed structural information and finish grading information becomes available, it should be provided to UES to determine if additional recommendations or borings are needed. Our preliminary recommendations are based upon the above considerations. If any of this information is incorrect, or if you anticipate any changes, please inform Universal Engineering Sciences so that we may review our recommendations.

2.2 PURPOSE

The purposes of this preliminary investigation were:

- to investigate the general subsurface conditions at the site;

- to interpret and review the subsurface conditions with respect to the proposed construction; and

- to provide preliminary geotechnical engineering recommendations for groundwater control, foundation design, pavement design, and site preparation.

Our investigation was confined to the zone of soil likely to be stressed by the proposed construction. Our work did not address the potential for surface expression of deep geological conditions. This evaluation requires a more extensive range of field services than performed in this study. We will be pleased to conduct an investigation to evaluate the probable effect of the regional geology upon the proposed construction, if you desire.

2.3 FIELD INVESTIGATION

2.3.1 General

We performed our field investigation at the subject site during the period of January 18-19, 2001. No site survey control was available for our field investigation, therefore the indicated locations and depths should be considered approximate. Our drilling crew located the borings based upon estimated distances and relationships to obvious landmarks. Further, the boring locations were planned to obtain general site information. Samples of the soils encountered will be held at our laboratory for your inspection for 60 days unless we are notified otherwise.

2.3.2 Test Borings

As requested, to explore the subsurface conditions in proposed building areas, we located and performed two Standard Penetration Test (SPT) borings, drilled to depths of 25 to 40 feet below the existing ground surface in general accordance with ASTM D 1586. We performed two SPT borings in the proposed retention areas to depths of 15 feet below the existing ground surface. In the proposed pavement areas, we located and performed one auger boring drilled to a depth of 5 feet below the existing ground surface in general accordance with ASTM D 1452. We obtained two shelby tube samples from the proposed retention areas for laboratory falling-head permeability testing. A summary of the field procedures used is included in Appendix A. Soil samples recovered during the performance of the borings were visually classified in the field, and representative portions of the samples were transported to our laboratory for further evaluation.

2.4 LABORATORY INVESTIGATION

The soil samples recovered from the soil borings were returned to our laboratory where they were visually examined and classified by a geotechnical engineer in general accordance with ASTM D 2488 (Unified Soil Classification System). Two falling-head permeability tests were conducted on disturbed soil samples from the retention pond areas. These tests were performed to help establish soil permeability values and subsurface drainage characteristics. The results of these tests are presented on the Boring Logs in Appendix A. A brief description of the laboratory procedures used is also provided in Appendix A.

3.0 FINDINGS

3.1 SURFACE CONDITIONS

A Universal Engineering Sciences engineer performed a visual site inspection of the subject property to gain a "hands-on" familiarity with the project area. The site is located in the southwest quadrant of the intersection of SR AIA and Amelia Island Parkway in Nassau County, Florida. The subject property is generally wooded with pine trees and palmettos along Amelia Parkway and with oak trees and palmettos over the remainder of the site. An isolated low area was observed along SR AIA. A ditch and power line easement were observed on the eastern portion of the subject property. Also, two structures occupied by Amelia Island Realty were located on the northern portion of the subject property along SR AIA. No surface water was noted at the time of our investigation.

3.2 SUBSURFACE CONDITIONS

3.2.1 Soil Conditions

The boring locations and detailed subsurface conditions are illustrated on the Boring Location Plan and Boring Logs in Appendix A. The classifications and descriptions shown on the logs are generally based upon visual characterizations of the recovered soil samples and a limited number of laboratory tests. Also, see Appendix A: Soils Classification Chart, for further explanation of the symbols and placement of data on the Boring Logs. Generally, the borings encountered the soil conditions as presented below in Table 1.

TABLE 1
General Soil Profile

Typical Depth (ft)		Soil Descriptions	Unified Soil Classification
From	To		
0	3 - 4½	Very Loose to Loose Sand, Sand with Silt	SP; SP-SM
3 - 4½	12 - 17½	Loose to Medium Dense Sand	SP
12 - 17½	22	Very Soft Clay, Medium Dense Clayey Sand	CH-CL, SC
22	33	Very Loose to Medium Dense Sand, Sand with Silt	SP; SP-SM
33	40	Very Loose to Loose Clayey Sand, with shell below 37 feet	SC

3.2.2 Groundwater Level

At the time of drilling, we measured groundwater levels at the boring locations at depths ranging from 2.7 to 3.6 feet below the existing grade. It should be noted the borings were performed following a period of low rainfall amounts.

3.2.3 Normal Seasonal High Groundwater Level

The normal seasonal high groundwater level typically occurs in the June to September period at the end of the rainy season. The seasonal high groundwater level is affected by a number of factors. The drainage characteristics of the soils; the land surface elevation; relief points such as drainage ditches, lakes, rivers, swamp areas; and distance to relief points are some of the more important factors influencing the seasonal high groundwater level.

Based on our review of the site conditions, including the information obtained from the boring logs and a review of the Soil Survey of Nassau County, we estimate the normal seasonal high groundwater level will range from 1.0 to 1.5 feet below the existing ground surface with the exception of the isolated low area along SR AIA which will have a seasonal high water level at the existing grade. It is possible that higher groundwater levels may exceed the estimated normal seasonal high groundwater level as a result of significant or prolonged rains. Design for normal seasonal high groundwater conditions instead of the extreme conditions is generally more appropriate.

4.0 PRELIMINARY RECOMMENDATIONS

4.1 GENERAL

Our preliminary geotechnical engineering evaluation of the site and subsurface conditions at the property with respect to the anticipated construction are based upon (i) our site observations, (ii) the limited field and laboratory data obtained, and (iii) our understanding of the project information as presented in this report. As the project progresses and more definitive information is available concerning the locations and proposed final grades for the buildings and pavement areas and detailed structural loadings, we recommend conducting additional SPT borings in the building areas, consolidation tests on the very soft clays and auger borings in the pavement areas to provide detailed foundation design and site preparation/earthwork construction recommendations prior to final design.

4.2 PRELIMINARY SHALLOW FOUNDATION DESIGN RECOMMENDATIONS

Based on the above preliminary evaluation of the site and subsurface conditions with respect to the anticipated construction, it appears structures could be constructed on conventional shallow foundation systems subsequent to performing the necessary site preparation and earthwork construction procedures. It appears maximum allowable soil bearing pressures for shallow foundations supporting the proposed structures will be on the order of 2,000 to 3,000 psf. Based on the soils encountered, at least 6 to 12 inches of topsoil material will require removal and backfilling with structural fill. Additionally, depending on the finished site grades, a program of surcharging or waiting between completion of structural fill placement and proceeding with vertical construction may be warranted. We emphasize the necessary site preparation and earthwork construction procedures would be primarily dependent on the finished grades and the maximum anticipated structural loads applied to the foundations.

4.3 PRELIMINARY PAVEMENT DESIGN

4.3.1 General

We recommend a flexible pavement section be used on this project. Flexible pavements combine the strength and durability of several layer components to produce an appropriate and cost-effective combination of available construction materials. We have provided a pavement section with a 20-year design life.

Because traffic loadings are commonly unavailable, we have generalized our preliminary pavement design into two groups. The group descriptions and the recommended component thicknesses are presented in Table 2: Pavement Component Recommendations. The structural numbers in Table 2 are based on a structural number analysis with the stated estimated daily traffic volume for a 20-year placement design life.

TABLE 2
Summary of Pavement Component Recommendations

Traffic Group	Structural Number	Component Thickness (inches)		
		Stabilized Subgrade	Base Course	Surface Course
Parking lots and driveways - light duty	2.7	12	6	1.5
Parking lots and driveways - heavy duty	3.2	12	8	2.0

The Design Traffic Groups are defined below:

Parking lots and driveways - **light duty:** 1,000 cars and light panel and pickup trucks per day, (average gross weight of 4,000 pounds), two tractor-trailer trucks per week (H-20 loading), and two trash trucks per week (46,000 pound gross weight)

Parking lots and driveways - **heavy duty:** Shopping center driveways and access pavements; twenty 18-wheel tractor-trailer trucks per day (H-20 loading)

4.3.2 Stabilized Subgrade

We recommend that subgrade materials be compacted in place according to the requirements in the "Site Preparation" section of this report. Further, beneath the limerock base course, stabilize the subgrade materials to a minimum Limerock Bearing Ratio (LBR) of 40 as specified by Florida Department of Transportation requirements. The subgrade material should be compacted to 98 percent of the Modified Proctor maximum dry density (ASTM D 1557, AASHTO T-180) value.

The stabilized subgrade can be a blend of existing or imported granular soils and stabilizing material, as needed, such as limerock or clay. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions.

The primary function of stabilized subgrade beneath the base courses is to provide a stable and firm subgrade so that the base course can be properly and uniformly placed. Depending upon the soil type, the subgrade material may have sufficient stability to provide the needed support without additional stabilizing material. Generally sands with silt or clay should have sufficient stability and may not require additional stabilizing material. Conversely, relatively "clean" sand may not provide sufficient stability in order to adequately construct the limerock base course. Universal Engineering Sciences should review the soils exposed on the finish grades in order to evaluate whether or not additional stabilization will be required beneath base course.

4.3.3 Base Course

We recommend the base course be limerock or crushed concrete.

4.3.3.1 Limerock Base

Limerock should have a minimum LBR of 100 percent and should be mined from an FDOT approved source. Place limerock in maximum 6-inch lifts and compact each lift to a minimum density of 98 percent of the Modified Proctor maximum dry density.

Perform compliance testing for limerock at a frequency of one test per 10,000 square feet, or at a minimum of two test locations, whichever is greater.

4.3.3.2 Crushed Concrete Base

Crushed concrete should be supplied by an approved plant with quality control procedures. The crushed concrete stockpiled should be free of sandy pockets, foreign materials, or uncrushed particles. We recommend the following specifications be enforced.

A) Crushed concrete shall not contain extremely hard pieces, lumps, balls or pockets of sand or clay sized material in sufficient quantity as to be detrimental to the proper binding, finishing or strength of the crushed concrete base.

B) Samples of base course materials shall be supplied to the engineer prior to use in the work. Additional samples shall be furnished during construction, as necessary.

C) At least 97 percent (by weight) of the material shall pass a 3-½ inch sieve and the material shall be graded uniformly down to dust. The fine material shall consist entirely of dust or fracture. All crushing or breaking-up which might be necessary in order to meet such size requirements shall be done before the material is placed within the area to be paved.

D) The base shall be bladed and shaped to conform to the typical sections shown on the plans. Then the base shall be compacted by rolling with a combination of steel wheel and rubber tired rollers until an average density of 98 percent of the maximum density obtainable under AASHTO Method T-180 is reached. The base shall have an average LBR of not less than 100. The LBR value of material produced at a particular source shall be determined in accordance with an approved quality control procedure.

E) Testing shall be performed at the following frequency:

1) Perform in-place density on crushed concrete base at a frequency of 1 test per 300 lineal foot of roadway or 5,000 square feet of pavement.

2) Perform LBR tests at a frequency of 1 test per visual change in material and a minimum of 1 test per 15,000 square feet of pavement.

3) Engineer should perform a final visual base inspection prior to placement of prime or tack coat and paving.

4.3.4 Wearing Surface

The wearing surface should consist of Florida Department of Transportation Type S asphaltic concrete having a minimum Marshall Stability of 1,500 lbs. Specific requirements for asphaltic concrete wearing surface are outlined in the Florida Department of Transportation, Standard Specifications for Road and Bridge Construction.

After placement and field compaction, core the wearing surface to evaluate material thickness and to perform laboratory densities. Obtain cores at frequencies of at least one core per 3,000 square feet of placed pavement or a minimum of two cores per day's production.

4.3.5 Effects of Groundwater

One of the most critical influences on the pavement performance in Northeast Florida is the relationship between the pavement subgrade and the seasonal high groundwater level. Many roadways and parking areas have been destroyed as a result of deterioration of the base and the base/surface course bond. Regardless of the type of base selected, we recommend that the seasonal high groundwater and the bottom of the base course be separated by at least 24 inches.

4.3.6 Curbing

We recommend that curbing around the landscaped sections adjacent to the parking lots and driveways be constructed with full-depth curb sections. Using extruded curb sections which lie directly on top of the final asphalt level, or eliminating the curbing entirely, can allow migration of irrigation water from the landscape areas to the interface between the asphalt and the base. This migration often causes separation of the wearing surface from the base and subsequent rippling and pavement deterioration.

4.3.7 Construction Traffic

Light duty roadways and incomplete pavement sections will not perform satisfactorily under construction traffic loadings. We recommend that construction traffic (construction equipment, concrete trucks, sod trucks, garbage trucks, dump trucks, etc.) be re-routed away from these roadways or that the pavement section be designed for these loadings.

4.4 PRELIMINARY SITE PREPARATION

We recommend normal, good practice site preparation procedures. These procedures include: stripping the site of existing buildings, pavements, vegetation and topsoil, backfilling to grade with engineered fill and compacting the subgrade. A more detailed synopsis of this work is as follows:

1. Prior to construction, the location of any existing underground utility lines within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. It should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which may subsequently lead to excessive settlement of the overlying structures.

2. Strip the proposed construction limits of all grass, roots, topsoil, existing construction and other deleterious materials within and 5 feet beyond the perimeter of the proposed building areas and within and 3 feet beyond the perimeter of all paved areas. Expect clearing and grubbing to average depths of 6 to 12 inches in most areas of the site.

3. The groundwater level was encountered at depths of 2.7 to 3.6 feet below the existing ground surface at the time of our exploration. Because of the need for compaction of the soils within the upper 2 feet below the surface in the proposed building areas, and the potential for the groundwater to be nearer the ground surface during seasonally wet times, it may be necessary to install temporary groundwater control measures. If needed, the dewatering method should be maintained until backfilling has reached a height of two feet above the groundwater level at the time of construction.

4. Following the backfilling operations, proof-roll the subgrade with a heavily loaded, rubber-tired vehicle under the observation of a Universal Engineering Sciences geotechnical engineer or his representative. Proof-rolling will help locate any zones of especially loose or soft soils not encountered in the soil test borings. Then undercut, or otherwise treat these zones as recommended by the engineer.

5. Compact the subgrade from the surface using a vibratory roller until you obtain a minimum density of 95 percent of the Modified Proctor maximum dry density (ASTM D-1557) to a depth of 1 foot below the base of the foundations in the building limits. The 12 inches of soil directly beneath the pavement base should be compacted to 98 percent of the Modified Proctor maximum dry density. The use of heavy vibratory equipment is not recommended due to the potential for pumping of near-surface moisture sensitive clays at the site.

   Should the bearing level soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated and (1) the disturbed soils removed and backfilled with dry structural fill soils which are then compacted, or (2) the excess moisture content within the disturbed soils allowed to dissipate before recompacting.

   Care should be exercised to avoid damaging any nearby structures while the compaction operation is underway. Prior to commencing compaction, occupants of adjacent structures should be notified and the existing conditions of the structures should be documented with photographs and survey (if deemed necessary). Compaction should cease if deemed detrimental to adjacent structures and Universal Engineering Sciences should be contacted immediately. It is recommended the vibratory roller remain a minimum of 50 feet from existing structures. Within this zone, use of a bulldozer or a vibratory roller operating in the static mode is recommended.

6. Test the subgrade for compaction at a frequency of not less than one test per 2,500 square feet per foot of fill depth.

7. Place fill material, as required. The fill should consist of "clean," fine sand with less than 5 percent soil fines. You may use fill materials with soil fines between 5 and 10 percent, but strict moisture control may be required. Place fill in uniform 10- to 12-inch loose lifts and compact each lift to a minimum density of 95 percent of the Modified Proctor maximum dry density. The last 12 inches of fill beneath the parking areas should be compacted to 98 percent of the Modified Proctor maximum dry density. Stabilize this zone with clay or limerock as recommended in Section 4.3.2, as necessary, to obtain an LBR value of 40.

8. Perform compliance tests within the fill at a frequency of not less than one test per 2,500 square feet per lift in the building areas, or at a minimum of two test locations per building, whichever is greater. In paved areas, perform compliance tests at a frequency of not less than one test per 10,000 square feet per lift, or at a minimum of two test locations, whichever is greater.

10. If warranted, surcharge the building areas, or provide a minimum recommended time period between completion of structural fill placement and proceeding with vertical construction. This recommendations can be evaluated in further detail upon completion of an additional geotechnical exploration at the site.

11. Test all footing cuts for compaction to a depth of 1 foot. Additionally, we recommend you test one out of every four column footings, and perform one test per every 100 lineal feet of wall footing.

4.5 RETENTION POND CONSIDERATIONS

4.5.1 Hydraulic Conductivity Testing

The results of the vertical permeability tests performed on relatively undisturbed samples obtained from borings LA1 and LA2 at a depth range of approximately 2.0 to 2.5 feet and 3.0 to 3.5 feet, respectively, indicated hydraulic conductivity rates of 3.3 ft/day and 11.3 ft/day, respectively. The measured permeability rates are intended to provide an indication of the soils drainage characteristics and should not be misconstrued to represent a design exfiltration rate. The actual exfiltration rate may be different due to pond geometry, retention volume and groundwater mounding effects.

4.5.2 Borrow Suitability

Borings LA1 and LA2 were planned, in part, to provide an indication of the suitability of excavated soils from the proposed pond as suitable fill soil. Based on the boring results and classification of the soil samples, the soils in the profile encountered below the surficial topsoils (upper 6 to 12 inches) are generally suitable for use as fill with the exception the silty clays encountered in boring LA1 between a depth range of 12 to 15 feet are unsuitable due to the materials excessive fines content.

It should be anticipated the soils in the proposed pond area that are below the groundwater level will have moisture contents in excess of the Modified Proctor optimum moisture content and will require stockpiling or spreading to bring the moisture content within 2 percent of the soil's optimum moisture content corresponding to the required degree of compaction.

4.6 CONSTRUCTION RELATED SERVICES

We recommend the owner retain Universal Engineering Sciences to perform construction materials tests and observations on this project. Field tests and observations include verification of foundation and pavement subgrades by performing quality assurance tests on the placement of compacted structural fill and pavement courses. We can also provide concrete testing, pavement section testing, structural steel testing, and general construction observation services.

The geotechnical engineering design does not end with the advertisement of the construction documents. The design is an on-going process throughout construction. Because of our familiarity with the site conditions and the intent of the engineering design, we are most qualified to address problems that might arise during construction in a timely and cost-effective manner.

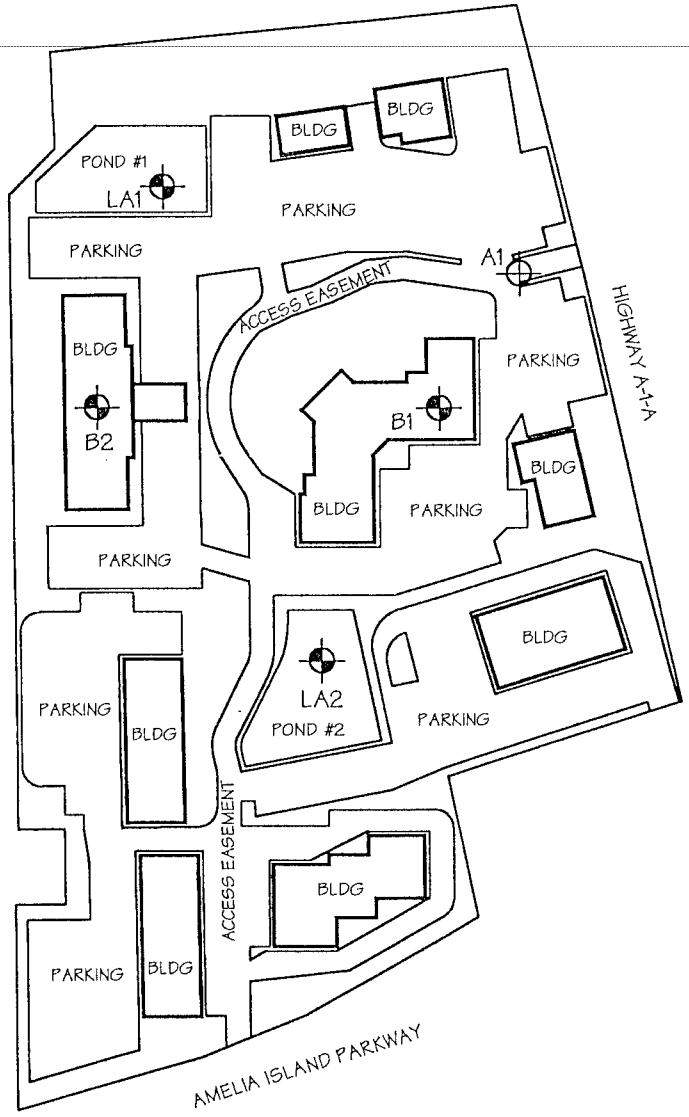
5.0 LIMITATIONS

During the early stages of most construction projects, geotechnical issues not addressed in this report may arise. Because of the natural limitations inherent in working with the subsurface, it is not possible for a geotechnical engineer to predict and address all possible problems. An Association of Engineering Firms Practicing in the Geosciences (ASFE) publication, "Important Information About Your Geotechnical Engineering Report" appears in Appendix B, and will help explain the nature of geotechnical issues.

Further, we present documents in Appendix B: Constraints and Restrictions, to bring to your attention the potential concerns and the basic limitations of a typical geotechnical report.

APPENDIX A

BORING LOCATION PLAN
BORING LOGS
SOILS CLASSIFICATION CHART
FIELD EXPLORATION PROCEDURES
DESCRIPTION OF LABORATORY TEST PROCEDURES



UNIVERSAL
ENGINEERING SCIENCES

GEOTECHNICAL EXPLORATION
GATEWAY TO AMELIA
NASSAU COUNTY, FLORIDA

BORING LOCATION PLAN

N

DRAWN BY:	LML	DATE:	1/23/01	CHECKED BY:	SRW	DATE:	1/23/01
SCALE:	1"=200'	ORDER NO:	90576-009-01	REPORT NO:	11566	PAGE NO:	A-1

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	90576-009-01
REPORT NO.:	11566
PAGE:	A-2

PROJECT: GATEWAY TO AMELIA
HWY A-1-A & AMELIA ISLAND PKWY
NASSAU COUNTY, FLORIDA

CLIENT: COMPASS GROUP, INC.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: B1 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.6
DATE OF READING: 1/19/01
EST. W.S.W.T. (ft):

DATE STARTED: 1/19/01
DATE FINISHED: 1/19/01
DRILLED BY: UES
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Loose dark gray SAND with Silt (SP-SM) with some Roots						
		1-3-4	7			Loose grayish-brown to dark brown SAND (SP)						
		4-5-4	9	▼								
		4-6-8	14			Medium dense brown to light brown SAND (SP)						
5		5-8-10	18									
		5-8-11	19									
		7-9-9	18									
10		3-6-9	15									
15		6-6-8	14									
						Very soft gray Silty CLAY (CH-CL)						
20		WOH=18"	0									
						Loose to very loose gray SAND with Silt (SP-SM)						
25		3-5-4	9									
30		1-1-1	2									
						Very loose gray Clayey SAND (SC)						
35		1-12"-1	1									
						Loose gray Clayey SAND with Shell (SC)						
40		3-4-6	10									

BORING_LOG 11566GAT.GPJ UNIENGSC.GDT 1/25/01

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	90576-009-01
REPORT NO.:	11566
PAGE:	A-3

PROJECT: GATEWAY TO AMELIA
HWY A-1-A & AMELIA ISLAND PKWY
NASSAU COUNTY, FLORIDA

CLIENT: COMPASS GROUP, INC.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: B2 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.6
DATE OF READING: 1/18/01
EST. W.S.W.T. (ft):

DATE STARTED: 1/18/01
DATE FINISHED: 1/18/01
DRILLED BY: UES
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Very loose dark gray SAND with Silt (SP-SM) with some Roots						
		1=12"-2	2			Very loose light grayish-brown SAND (SP)						
		2-3-5	8	▼		Loose dark brown SAND with Silt (SP-SM)						
		3-6-7	13			Medium dense to loose light brown to dark brown to grayish-brown SAND (SP)						
5		5-6-7	13									
		5-7-9	16									
		7-8-9	17									
10		3-4-5	9									
15		4-6-7	13			Bluish-gray Silty CLAY (CH-CL)						
						Medium dense bluish-gray Clayey SAND (SC)						
20		2-3-10	13									
						Medium dense gray SAND with seams of Clay (SP-SC)						
25		3-7-7	14									

BORING_LOG 11566GAT.GPJ UNIENGSC.GDT 1/25/01

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	90576-009-01
REPORT NO.:	11566
PAGE:	A-4

OJECT: GATEWAY TO AMELIA
HWY A-1-A & AMELIA ISLAND PKWY
NASSAU COUNTY, FLORIDA

IENT: COMPASS GROUP, INC.

CATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: LA1 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): 2.7
DATE OF READING: 1/18/01
EST. W.S.W.T. (ft):

DATE STARTED: 1/18/01
DATE FINISHED: 1/18/01
DRILLED BY: UES
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Very loose dark gray SAND with Silt (SP-SM) with Roots						
		1-2-1	3			Very loose to loose brown SAND (SP) to SAND with Silt (SP-SM)					3.3	
		2-3-3	6	▼		Loose to medium dense light grayish-brown to light brown SAND (SP)						
		4-6-4	10									
5		4-4-9	13									
		6-8-9	17									
		7-7-5	12									
10		2-4-5	9									
						Very soft bluish-gray Silty CLAY (CH-CL)						
15		1-1-1	2									

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	90576-009-01
REPORT NO.:	11566
PAGE:	A-5

PROJECT: GATEWAY TO AMELIA
HWY A-1-A & AMELIA ISLAND PKWY
NASSAU COUNTY, FLORIDA

CLIENT: COMPASS GROUP, INC.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: LA2 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.5
DATE OF READING: 1/18/01
EST. W.S.W.T. (ft):

DATE STARTED: 1/18/01
DATE FINISHED: 1/18/01
DRILLED BY: UES
TYPE OF SAMPLING: ASTM D 1586

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0						Very loose dark gray SAND with Silt (SP-SM) with Roots						
		1-2-1	3			Very loose light brown SAND (SP)						
		3-3-4	7	▽		Loose dark brown SAND with Silt (SP-SM)					11.3	
		4-5-5	10			Loose dark brown Silty SAND (SM)						
						Loose dark reddish-brown weakly cemented SAND (SP - Hardpan)						
5		4-6-7	13			Medium dense brown to light brown SAND (SP)						
		7-9-12	21									
		7-10-13	23									
10		4-7-8	15									
15		5-7-10	17									

BORING LOG 11566GAT.GPJ UNIENGSC.GDT 1/25/01

UNIVERSAL ENGINEERING SCIENCES
BORING LOG

PROJECT NO.:	90576-009-01
REPORT NO.:	11566
PAGE:	A-6

PROJECT: GATEWAY TO AMELIA
HWY A-1-A & AMELIA ISLAND PKWY
NASSAU COUNTY, FLORIDA

CLIENT: COMPASS GROUP, INC.

LOCATION: SEE BORING LOCATION PLAN

REMARKS:

BORING DESIGNATION: A1 SHEET: 1 of 1
SECTION: TOWNSHIP: RANGE:

G.S. ELEVATION (ft):
WATER TABLE (ft): 3.0
DATE OF READING: 1/19/01
EST. W.S.W.T. (ft):

DATE STARTED: 1/19/01
DATE FINISHED: 1/19/01
DRILLED BY: UES
TYPE OF SAMPLING: ASTM D 1452

DEPTH (FT.)	SAMPLE	BLOWS PER 6" INCREMENT	N (BLOWS/ FT.)	W.T.	SYMBOL	DESCRIPTION	-200 (%)	MC (%)	ATTERBERG LIMITS LL	ATTERBERG LIMITS PI	K (FT./ DAY)	ORG. CONT. (%)
0				▼		Light brown SAND (SP)						
						Dark brown to brown SAND (SP)						
						Brown SAND (SP)						
5												

BORING_LOG 11566GAT.GPJ UNIENGSC.GDT 1/25/01

Field Exploration Procedures

Standard Penetration Test Borings

The penetration borings were made in general accordance with the latest revision of ASTM D 1586, "Penetration Test and Split-Barrel Sampling of Soils". The borings were advanced by rotary drilling techniques using a circulating bentonite fluid for borehole flushing and stability. At 2 ½ to 5 foot intervals, the drilling tools were removed from the borehole and a split-barrel sampler inserted to the borehole bottom and driven 18 inches into the soil using a 140 pound hammer falling on the average 30 inches per hammer blow. The number of blows for the final 12 inches of penetration is termed the "penetration resistance, blow count, or N-value". This value is an index to several in-place geotechnical properties of the material tested, such as relative density and Young's Modulus.

After driving the sampler 18 inches (or less if in hard rock-like material), the sampler was retrieved from the borehole and representative samples of the material within the split-barrel were placed in glass jars and sealed. After completing the drilling operations, the samples for each boring were transported to our laboratory where they were examined by our engineer in order to verify the driller's field classification.

Auger Borings

The auger borings were performed mechanically by the use of a continuous-flight auger attached to the drill rig and in general accordance with the latest revision of ASTM D 1452, "Soil Investigation and Sampling by Auger Borings". Representative samples of the soils brought to the ground surface by the augering process were placed in glass jars, sealed and transported to our laboratory where they were examined by our engineer to verify the driller's field classification.

DESCRIPTION OF LABORATORY TESTING PROCEDURES

Falling Head Permeability

An undisturbed Shelby tube sample of the soil encountered in the area of the propose retention pond was collected for permeability testing. The Shelby tube and sample were sealed in a permeameter and saturated. The sample diameter was about 2.8 inches with a height of approximately 5 inches. The hydraulic head ranged from 33 to 13 inches during testing. Several tests were performed to verify the initial results. The testing procedures used were in substantial accordance with methodology for laboratory permeability testing described in ASTM D-2434.

APPENDIX B

CONSTRAINTS AND RESTRICTIONS
IMPORTANT INFORMATION ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

IMPORTANT INFORMATION
ABOUT YOUR
GEOTECHNICAL ENGINEERING REPORT

More construction problems are caused by site subsurface conditions than any other factor. As troublesome as subsurface problems can be, their frequency and extent have been lessened considerably in recent years, due in large measure to programs and publications of ASFE/ The Association of Engineering Firms Practicing in the Geosciences.

The following suggestions and observations are offered to help you reduce the geotechnical-related delays, cost-overruns and other costly headaches that can occur during a construction project.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

A geotechnical engineering report is based on a subsurface exploration plan designed to incorporate a unique set of project-specific factors. These typically include: the general nature of the structure involved, its size and configuration; the location of the structure on the site and its orientation; physical concomitants such as access roads, parking lots, and underground utilities, and the level of additional risk which the client assumed by virtue of limitations imposed upon the exploratory program. To help avoid costly problems, consult the geotechnical engineer to determine how any factors which change subsequent to the date of the report may affect its recommendations.

Unless your consulting geotechnical engineer indicates otherwise, *your geotechnical engineering report should not be used*:

- When the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership, or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems which may develop if they are not consulted after factors considered in their report's development have changed.

MOST GEOTECHNICAL "FINDINGS" ARE PROFESSIONAL ESTIMATES

Site exploration identifies actual subsurface conditions only at those points where samples are taken, when they are taken. Data derived through sampling and subsequent laboratory testing are extrapolated by geotechnical engineers who then render an opinion about overall subsurface conditions, their likely reaction to proposed construction activity, and appropriate foundation design. Even under optimal circumstances actual conditions may differ from those inferred to exist, because no geotechnical engineer, no matter how qualified, and no subsurface exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock and time. The actual interface between materials may be far more gradual or abrupt than a report indicates. Actual conditions in areas not sampled may differ from predictions. *Nothing can be done to prevent the unanticipated, but steps can be taken to help minimize their impact.* For this reason, *most experienced owners retain their geotechnical consultants through the construction stage*, to identify variances, conduct additional tests which may be needed, and to recommend solutions to problems encountered on site.

SUBSURFACE CONDITIONS CAN CHANGE

Subsurface conditions may be modified by constantly-changing natural forces. Because a geotechnical engineering report is based on conditions which existed at the time of subsurface exploration, *construction decisions should not be based on a geotechnical engineering report whose adequacy may have been affected by time.* Speak with the geotechnical consultant to learn if additional tests are advisable before construction starts.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical report. The geotechnical engineer should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Geotechnical engineers' reports are prepared to meet the specific needs of specific individuals. A report prepared for a consulting civil engineer may not be adequate for a construction contractor, or even some other consulting civil engineer. Unless indicated otherwise, this report was prepared expressly for the client involved and expressly for purposes indicated by the client. Use by any other persons for any purpose, or by the client for a different purpose, may result in problems. *No individual other than the client should apply this report for its intended purpose without first conferring with the geotechnical engineer. No person should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.*

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid these problems, the geotechnical engineer should be retained to work with other appropriate design professionals to explain relevant geotechnical findings and to review the adequacy of their plans and specifications relative to geotechnical issues.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE ENGINEERING REPORT

Final boring logs are developed by geotechnical engineers based upon their interpretation of field logs (assembled by site personnel) and laboratory evaluation of field samples. Only final boring logs customarily are included in geotechnical engineering reports. *These logs should not under any circumstances be redrawn* for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, *give contractors ready access to the complete geotechnical engineering report* prepared or authorized for their use. Those who do not provide such access may proceed under the *mistaken* impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes which aggravate them to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical consultants. To help prevent this problem, geotechnical engineers have developed model clauses for use in written transmittals. These are *not* exculpatory clauses designed to foist geotechnical engineers' liabilities onto someone else. Rather, they are definitive clauses which identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report, and you are encouraged to read them closely. Your geotechnical engineer will be pleased to give full and frank answers to your questions.

OTHER STEPS YOU CAN TAKE TO REDUCE RISK

Your consulting geotechnical engineer will be pleased to discuss other techniques which can be employed to mitigate risk. In addition, ASFE has developed a variety of materials which may be beneficial. Contact ASFE for a complimentary copy of its publications directory.

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ASFE THE ASSOCIATION OF ENGINEERING FIRMS PRACTICING IN THE GEOSCIENCES

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BPCRPT0389SM/RP2MD190

CONSTRAINTS AND RESTRICTIONS

WARRANTY

Universal Engineering Sciences has prepared this report for our client for his exclusive use, in accordance with generally accepted soil and foundation engineering practices, and makes no other warranty either expressed or implied as to the professional advice provided in the report.

UNANTICIPATED SOIL CONDITIONS

The analysis and recommendations submitted in this report are based upon the data obtained from soil borings performed at the locations indicated on the Boring Location Plan. This report does not reflect any variations which may occur between these borings.

The nature and extent of variations between borings may not become known until excavation begins. If variations appear, we may have to re-evaluate our recommendations after performing on-site observations and noting the characteristics of any variations.

CHANGED CONDITIONS

We recommend that the specifications for the project require that the contractor immediately notify Universal Engineering Sciences, as well as the owner, when subsurface conditions are encountered that are different from those present in this report.

No claim by the contractor for any conditions differing from those anticipated in the plans, specifications, and those found in this report, should be allowed unless the contractor notifies the owner and Universal Engineering Sciences of such changed conditions. Further, we recommend that all foundation work and site improvements be observed by a representative of Universal Engineering Sciences to monitor field conditions and changes, to verify design assumptions and to evaluate and recommend any appropriate modifications to this report.

MISINTERPRETATION OF SOIL ENGINEERING REPORT

Universal Engineering Sciences is responsible for the conclusions and opinions contained within this report based upon the data relating only to the specific project and location discussed herein. If the conclusions or recommendations based upon the data presented are made by others, those conclusions or recommendations are not the responsibility of Universal Engineering Sciences.

CHANGED STRUCTURE OR LOCATION

This report was prepared in order to aid in the evaluation of this project and to assist the architect or engineer in the design of this project. If any changes in the design or location of the structure as outlined in this report are planned, or if any structures are included or

added that are not discussed in the report, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and the conclusions modified or approved by Universal Engineering Sciences.

USE OF REPORT BY BIDDERS

Bidders who are examining the report prior to submission of a bid are cautioned that this report was prepared as an aid to the designers of the project and it may affect actual construction operations.

Bidders are urged to make their own soil borings, test pits, test caissons or other investigations to determine those conditions that may affect construction operations. Universal Engineering Sciences cannot be responsible for any interpretations made from this report or the attached boring logs with regard to their adequacy in reflecting subsurface conditions which will affect construction operations.

STRATA CHANGES

Strata changes are indicated by a definite line on the boring logs which accompany this report. However, the actual change in the ground may be more gradual. Where changes occur between soil samples, the location of the change must necessarily be estimated using all available information and may not be shown at the exact depth.

OBSERVATIONS DURING DRILLING

Attempts are made to detect and/or identify occurrences during drilling and sampling, such as: water level, boulders, zones of lost circulation, relative ease or resistance to drilling progress, unusual sample recovery, variation of driving resistance, obstructions, etc.; however, lack of mention does not preclude their presence.

WATER LEVELS

Water level readings have been made in the drill holes during drilling and they indicate normally occurring conditions. Water levels may not have been stabilized at the last reading. This data has been reviewed and interpretations made in this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall, temperature, tides, and other factors not evident at the time measurements were made and reported. Since the probability of such variations is anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based upon such assumptions of variations.

LOCATION OF BURIED OBJECTS

All users of this report are cautioned that there was no requirement for Universal Engineering Sciences to attempt to locate any man-made buried objects during the course of this exploration and that no attempt was made by Universal Engineering Sciences to locate any such buried objects. Universal Engineering Sciences cannot be responsible for

any buried man-made objects which are subsequently encountered during construction that are not discussed within the text of this report.

TIME

This report reflects the soil conditions at the time of investigation. If the report is not used in a reasonable amount of time, significant changes to the site may occur and additional reviews may be required.

SECTION 02110

SITE CLEARING, STRIPPING AND GRUBBING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. The General Requirements are made a part of this section as fully as if repeated herein.

B. Work includes but is not limited to:

1. Site clearing.

2. Stripping and removal or stockpiling topsoil.

3. Grubbing and removal of vegetation within site boundaries or within limits shown on drawings.

4. Tree removal within building and paving limits and as indicated.

5. Protection of existing trees to remain.

6. Protection of streets, roads, adjacent property, and other facilities to remain.

7. Disposal of all cleared materials.

8. Disposal of all grubbed materials.

1.02 SUBMITTALS: Permit for transportation and disposal of debris.

1.03 DISPOSITION OF MATERIAL: Remove all cleared and grubbed materials from project site.

PART 2 PRODUCTS
(Not Applicable)

PART 3 - EXECUTION

3.01 CLEARING:

A. Limits of Clearing: Remove trees and materials only as required for construction of the project.

B. Remove all trees within areas designated for clearing.

C. Remove all rubbish, debris, weeds, vines and undergrowth to ground level.

D. Remove all other obstructions resting on or protruding through surface of existing ground.

3.02 STRIPPING TOPSOIL:

A. Remove all topsoil from areas of proposed building and paving construction.

B. Remove topsoil from site or stockpile on site as directed by Engineer.

3.03 GRUBBING:

A. Remove all stumps, roots over 2 inches in diameter and matted roots to following depths:

1. Footings, slabs on grade, bottom slabs of structures: 18 inches.

2. Walks: 12 inches.

3. Roads and parking areas: 18 inches.

4. Areas to be grassed or landscaped: 8 inches.

B. In case of footings, slabs on grade, bottom slabs of structures, roads and parking areas, or other construction on fills, greater depth shall apply.

C. Unless further cut is required, fill depressions made by grubbing and compact to density of surrounding soil.

3.04 PROTECTION OF TREES:

A. Protect trees which might be damaged during clearing, stripping and grubbing.

1. Trees on site located outside limits of clearing are to remain.

B. Prevent damage to branches, bark and root system.

C. Provide barricades or other protective measures if necessary.

D. Restore trees damaged or scarred by clearing operations to healthy growing condition or replace as directed by the Engineer.

3.05 CLEAN-UP:

A. Debris and Rubbish: Remove and transport debris and rubbish in manner that will prevent spillage on streets or adjacent areas.

1. Clean-up spillage from streets and adjacent areas.

2. Comply with Federal, State and local hauling and disposal regulations.

B. Do not burn materials on site.

END OF SECTION

SECTION 02115

LANDSCAPE AND TREE PROTECTION

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: Contractor shall make every reasonable effort to protect all landscaping and trees in the area of his operations. Trees and landscaping damaged or destroyed as a result of Contractor's operations shall be replaced with plants of identical species and of similar size, unless directed otherwise by Engineer. Contractor shall make every possible effort to save any tree of four-inch diameter or larger, including minor adjustment to the pipe routing. Changes in pipe routing must be approved by the Engineer. Any tree which is not designated for removal but which will significantly interfere with construction shall be trimmed by a qualified tree surgeon. Contractor shall minimize tree removal and tree trimming operations to as great an extent as possible. All costs associated with tree and landscape protection and/or replacement shall be borne by the Contractor.

1.02 QUALITY ASSURANCE: Engage a qualified tree surgeon to perform the following work:

A. Remove branches from landscaping and trees which are to remain, if required for new construction.

B. Recommend procedures to compensate for loss of roots and perform initial pruning of branches and stimulation of root growth where removed to accommodate new construction.

C. Perform repair work for damages incurred by new construction.

1.03 JOB CONDITIONS: Provide temporary fencing, barricades, or guards to protect trees and other plants which are to remain, from damage.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. Tree Pruning Compound: Waterproof, antiseptic, elastic, and free of kerosene, coal tar, creosote, and other substances harmful to plants. Pruned or damaged trees shall be treated with the following:

1. Pine trees (all species): A mixture of twelve percent (12%) Benzene Hexachloride (BHC) emulsifiable concentrate shall be mixed at the rate

of one (1) pint of BHC per gallon of #2 fuel oil. Spray damaged area liberally. Spray the rest of the tree from ground level to a height of six feet (6'). Spraying of damaged trees shall be completed within five (5) days after injury occurs.

2. Hardwood (all species except pine): An application of asphalt-type tree pruning paint will be applied to the damaged area. The paint shall be applied in sufficient quantity so as to form an airtight seal. Spraying or painting of damaged trees shall be performed within twenty-four (24) hours after the injury occurs. In the case of damage to "specimen" hardwoods, the inspecting Engineer may require the Contractor to retain a skilled and licensed tree surgeon to properly treat the damage. No compensation shall be made to the Contractor for treating damaged trees.

B. Root Protection Compound: Where the roots of trees 4 inches or more in diameter are cut due to Contractor's operations, exposed roots shall receive an application of Subdue 2E Fungicide as manufactured by Ciba-Geigy. Application of fungicide shall be in strict accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.01 GENERAL:

A. Protection of Landscaping: Contractor may, in lieu of replacing disturbed/damaged landscaping and trees, store landscaping and trees removed by his operations in suitable containers for replanting. Containers shall be adequately sized to contain the plant's root mass. Suitable topsoil shall be packed into container in sufficient quantity to cover the plant's root system. Contractor shall water containerized plants as necessary to keep them healthy. A record of each containerized plant's original location prior to removal shall be kept by the Contractor so that each plant may be replanted in its proper location. Any replaced or replanted landscaping which, in the opinion of the Engineer, appears unhealthy shall be replaced with similar size and species of plant by the Contractor at no cost to the Owner for a period of up to 90 days after the date of contract completion.

B. Repair and Replacement of Trees: Repair trees damaged by construction operations, in a manner acceptable to the Engineer. Make repairs promptly after damage occurs to prevent progressive deterioration of damaged trees. Remove and replace dead and damaged trees which are determined by the tree surgeon to be incapable of

restoration to normal growth pattern. If trees over six inches in caliper measurement (taken 12 inches above grade) are required to be replaced, provide new trees of six inches caliper size, and of the same species. Any replaced or replanted trees which, in the opinion of the Engineer, appear unhealthy shall be replaced with similar size and species of tree by the Contractor at no cost to the Owner for a period of 365 days after the date of contract completion.

C. Cleanup and Disposal: Remove excess excavation, displaced trees, and trimmings, and dispose of off the Owner's property in a manner approved by local agencies.

END OF SECTION

SECTION 02200

EARTHWORK

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK:

A. Scope of Work: All labor, materials and equipment to complete the earthwork. Includes but is not limited to:

1. Compaction of on-site material.
2. Grading and reshaping site.
3. Importing and compacting fill as required.
4. Compaction of material beneath building and paving.
5. Removal of unsuitable material.
6. Excavation and construction of drainage ditch.
7. Utility Trench Earthwork.

B. Supervision and Testing: All work specified herein shall be under the supervision of a Soils Engineer. The Contractor shall pay for all testing specified in this Section of the Specifications.

C. Field Engineering: The Owner has established lot lines and bench mark datum. The Contractor shall employ and pay for the services of a licensed surveyor who shall make all required surveys for establishing all points, lines, grades and levels, and otherwise fully and completely lay out all the work required by the Contract.

D. Unusual Conditions: Should any unusual conditions arise, the Engineer shall be contacted for instructions prior to continuation of earthwork operations.

PART 2 - PRODUCTS
(Not Applicable)

PART 3 - EXECUTION

3.01 PROCEDURE:

A. General Excavation: Upon completion of site clearing, the area of the proposed structures shall be excavated to the subgrade elevation where excavation is required.

B. Removal of Unsuitable Material - Included in Base Bid: Where soft material occurs at subgrade elevations within the limits of construction, the Contractor shall excavate such material down to suitable foundation material or to a depth of two feet, whichever is less, and backfill with suitable material obtained from grading operations or borrow. Backfill shall be deposited in successive layers of not more than eight inches in thickness. Each layer shall be compacted to 95% as hereinafter specified.

C. Foundation Preparation: The term "95% relative compaction" shall mean soils densification to 95% of the materials theoretical maximum dry density as determined by Modified Proctor Test (ASTM D-1557).

1. The foundation area should be cut to proposed base of slab/foundation elevation. The foundation area should then be moisture conditioned and rolled with pneumatic-tired or vibratory compaction equipment until the underlying soils have been densified to 95% relative compaction to a tested depth of two (2) feet below the base of the slab/foundation including a distance 5' horizontally beyond the new construction in all directions.

D. Mulching and Seeding: The Contractor shall mulch and seed areas disturbed by construction.

1. Mulch material and grass seed shall meet the requirements of Section 981, "Grassing and Sodding Materials" of the Florida Department of Transportation, DOT, Standard Specifications. Fertilizer shall be applied at the rate of 800 pounds per acre.

2. Approximately two inches of dry, loose mulch shall be spread over the grass area, and the material cut into the soil to produce a loose mulch thickness of three to four inches.

3. After the mulch material has been cut into the soil, and while the soil is still loose and moist, the seed shall be scattered uniformly over the grassing area. The rate of spread for the seed shall be 60 pounds per acre.

4. In the period from March 15 to October 15 the seed mixture shall be 30 pounds of Argentina Bahia and 30 pounds of Bermuda. In the remainder of the year, the mixture shall be 20 pounds each of Argentina Bahia, Bermuda and Rye Seed.

5. Immediately after completion of the seeding, the entire grassed or mulched area shall be rolled thoroughly. At least two trips over the entire area will be required.

6. The Contractor shall provide routine maintenance of the seeded area after the rolling operations have been completed until a full stand of grass has been obtained at the site. The Contractor shall mow the grass and clean up debris prior to final acceptance.

E. Grass Sodding: The Contractor shall sod areas as shown on the drawings or as required to control erosion:

1. Grass sod shall be Argentine Bahia Sod, meeting the requirements of Section 981, "Grassing and Sodding Materials" of the Florida Department of Transportation, DOT, Standard Specifications. Fertilizer shall be applied at the rate of 800 pounds per acre.

2. Approximately two inches of organic top soil shall be spread over the area to be sodded. The area shall be uniformly graded and hand raked prior to the installation of the sod.

3. Sod shall be placed tightly against adjacent pieces in order to provide a uniform surface, free of voids.

4. The Contractor shall provide routine maintenance of the sodded area until a full stand of grass has been obtained at the site. The Contractor shall mow the grass and clean up any debris prior to final acceptance.

3.02 TESTING:

A. Soil test shall be made as follows:

1. For each type of fill material used, obtain a moisture density relationship determination test in accordance with the Modified Proctor Method ASTM D1557.

2. Obtain in-place density test using the Sandcone or Shelby Tube Method. Two density tests shall be obtained in every lift for each structure. Areas which fail to meet the compaction requirements shall be re-compacted then retested until passing results are achieved. Density tests for pipeline trenches shall be the isolated footings and at three hundred foot intervals in the trench.

B. Location of in-place density tests shall be referenced to column lines, and to elevation datum. Reports shall be furnished to the Engineer as specified in the Section "Submittals."

END OF SECTION

SECTION 02260

FINISH GRADING

PART 1 - GENERAL

1.01 DESCRIPTION: To bring to finished elevations all earth materials as called for in drawings. This general work includes the completion of finish grading so that surfaces of compacted material are correctly oriented with the requirements of the slabs, sidewalks, roadways, drainage facilities, as existed prior to construction, or as proposed on the drawings.

PART 2 - PRODUCTS

2.01 MATERIALS:

A. All fill shall be clean sand, free from debris, vegetable matter and other deleterious substances.

B. Topsoil: All topsoil material on the site that is determined by the Engineer to be satisfactory for landscaping and/or grassing operations shall be stockpiled near the excavation limits for such use unless otherwise directed by the Engineer.

PART 3 - EXECUTION

3.01 SURVEYING: Where existing drainage swales are encountered, Contractor is responsible for restoring drainage swales to preconstruction condition. Surveying for elevation and slope of adjoining drainage swales is advised to document preconstruction swale condition. Surveying of drainage swales shall be at Contractor's expense.

3.02 GRADING: Fill, backfill and rough grade as necessary to bring entire site level with elevations of undersides of concrete slabs, walks, paving and finished landscaping as indicated on drawings or in specifications.

3.03 FINISH GRADING:

A. Where elevations are indicated on plans, obtain such finish elevations, and establish uniform slopes of finish grades between indicated elevations.

B. Where elevations are not indicated, establish and obtain uniform slope from finished spot elevations at the exterior face of the building out to the nearest indicated elevations for finished grades as shown on the plans.

C. Where drainage swales are encountered, establish and obtain elevations and slopes that existed prior to construction. Swales shall be finish graded to ensure proper drainage and avoid high and low points along the swale profile.

END OF SECTION

SECTION 02401

DEWATERING

PART 1 - GENERAL

1.01 DESCRIPTION: The Work to be performed under this section shall include furnishing all equipment and labor necessary to remove storm or subsurface waters from excavation areas in accordance with the requirements set forth and as shown on the drawings.

1.02 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS: The dewatering of any excavation areas and the disposal of the water shall be in strict accordance with the latest revision of all local and state government rules and regulations. The Contractor shall obtain any required dewatering permit from the appropriate agencies prior to commencing dewatering operations.

PART 2 - PRODUCTS
(Not applicable)

PART 3 - EXECUTION

3.01 DEWATERING: The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate in the excavation. If subsurface water is encountered, the Contractor shall utilize suitable equipment to adequately dewater the excavation so that it will be dry for work and pipe laying. A wellpoint system or other Engineer approved dewatering method shall be utilized if necessary to maintain the excavation in a dry condition for preparation of the foundation and for pipe laying. Dewatering by trench pumping will not be permitted if migration of fine grained natural material from bottom, side walls or bedding material will occur. In the event that satisfactory dewatering cannot be accomplished due to subsurface conditions or where dewatering could damage existing structures, the Contractor shall obtain the Engineer's approval of wet trench construction procedure before commencing construction. Dewatering shall cease in a manner to allow the subsurface water to slowly return to normal levels.

3.02 DISPOSAL: Water pumped from the trench or other excavation shall be disposed of in storm sewers having adequate capacity, canals or suitable disposal pits. Contractor is responsible for acquiring all permits required to discharge the water and shall protect waterways from turbidity during the dewatering operation. In areas where adequate disposal sites are not available, partially backfilled trenches may be used for water disposal only when the Contractor's plan for trench disposal is approved in writing by the Engineer. The Contractor's plan shall include temporary culverts, barricades and other

protective measures to prevent damage to property or injury to any person or persons. No flooding of streets, roadways, driveways or private property will be permitted. Engines driving dewatering pumps shall be equipped with residential type mufflers.

END OF SECTION

SECTION 02485

GRASSING

PART 1 - GENERAL

1.01 DESCRIPTION: The Contractor shall furnish all labor, equipment, and materials necessary for grassing all areas disturbed by his operations and any other areas on the plans indicated to receive grassing. It is the intent of this specification that damaged areas are to be replaced in kind, with sod to be used for all maintained yard areas. If not so indicated on drawings, Engineer shall designate those areas to receive seed and those areas to receive sod. Engineer shall also designate the type of seed/sod to be used in each area. Contractor shall take all steps practical to minimize the area required to be sodded or seeded. All grassing shall be in accordance with Section 570-1 through 570-5 or Section 575-1 through 5705-3 of the 1996 FDOT Standard Specifications for Road and Bridge Construction, except as modified herein.

1.02 STORAGE OF MATERIALS: The Contractor shall provide space for storage of sod prior to placement in a manner that will not endanger or restrict pedestrian or vehicular traffic or interfere with other aspects of the work.

PART 2 - PRODUCTS

2.01 SOD:

A. Types: Sod shall be St. Augustine Floratam, Argentine Bahia, Centipede, or Bermuda, depending on type of existing sod in adjacent area to be matched. Sodding required in non-maintained areas shall be Argentine Bahia. Sod shall be well matted with roots. Where sodding will adjoin, or be in sufficient proximity to, private lawns, types of sod other than those listed above may be required. Sod shall be delivered in commercial-sized rectangles, preferably 12-inch by 24-inch or larger.

B. Condition: The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh, and uninjured at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses. It shall be planted as soon as possible after being dug and shall be kept moist from the time it is dug until it is planted.

2.02 SEED:

A. General: All seed shall meet the requirements of State Department of Agriculture and Consumer Services and all applicable State laws. The seed shall have been harvested from the previous year's crop. When a low

percentage of grass seed or native seed germination causes the quality of the seed to fall below the minimum pure live seed percentage as specified below, the Contractor may elect, subject to the approval of the Engineer, to increase the rate of application sufficiently to obtain the minimum germination rate specified. No payment will be made for the added seed.

B. Delivery and Storage: Each of the species or varieties of seed shall be furnished and delivered in separate labeled bags. During handling and storing, the seed shall be cared for in such a manner that it will be protected from damage by heat, moisture, rodents, and other causes. All permanent and temporary grass seed shall have been tested within a period of six months of the date of planting.

C. Purity and Germination: All permanent and temporary grass seed shall have a minimum percent of purity and germination as follows:

1. Argentine Bahia Grass Seed shall have a minimum pure seed content of 95 percent with a minimum germination of 90 percent.

2. Pensacola Bahia Grass Seed shall have a minimum pure seed content of 95 percent with a minimum active germination of 40 percent and a total germination of 80 percent including firm seed.

3. Bermuda Grass Seed shall be of common variety with a minimum pure seed content of 95 percent with a minimum germination of 85 percent.

4. Annual Type Rye Grass Seed shall have a minimum pure seed content of 95 percent with a minimum germination of 90 percent.

2.03 MULCH: The mulch material used shall normally be dry mulch. Dry mulch shall be straw or hay, consisting of oat, rye, or wheat straw, or of pangola, peanut, coastal Bermuda or Bahia grass hay. Only undeteriorated mulch which can readily be cut into the soil shall be used.

2.04 GRASSING EQUIPMENT:

A. Seed Spreader: The seed spreader shall be an approved mechanical hand spreader or other approved type of spreader.

B. Equipment for Cutting Mulch into Soil: The mulching equipment shall be of a type capable of cutting the specified materials uniformly into the soil and to the required depth. Harrows will not be allowed.

C. Rollers: A cultipacker, traffic roller, or other suitable equipment will be required for rolling the grassed areas.

PART 3 - EXECUTION

3.01 GENERAL CONSTRUCTION METHODS: Whenever a suitable length of right-of-way or adjacent areas has been graded, it shall be made ready and grassed in accordance with these specifications. Grassing shall be incorporated into the project at the earliest practical time in the life of the contract.

3.02 SODDING:

A. Preparation of Area to be Sodded: The ground which is to receive sod shall have been graded to proper elevations to match preconstruction conditions or proposed grades. All disturbed swales and ditches shall have been restored to their preconstruction condition or better. The prepared soil shall be loose and reasonably smooth. It shall be reasonably free of large clods, roots, patches of existing grass, and other material which will interfere with the sod-laying operations or subsequent mowing and maintenance operations.

B. Laying of Sod: Sod shall be installed in all areas indicated on drawings or so designated by Engineer. Sod shall be carefully placed so that each piece abuts flush to all surrounding sod, regardless of whether surrounding sod is new or existing. Where new sod is to be placed adjacent to existing sod, the new sod must be cut in to match the elevation of the existing sod. Uneven sod which might cause mowing problems will be rejected. New sod laid on top of existing sod will also be rejected. All sod placed on steep slopes (greater than 1:1) shall be pinned with a wooden pin to keep it in place.

C. Rolling: Immediately after completion of the sod laying, the entire sodded area shall be rolled thoroughly with the equipment specified. At least two trips over the entire area will be required.

D. Watering: Newly-sodded areas are to be watered by Contractor as necessary to keep sod alive until the Contract is closed out. Dead sod shall be replaced by Contractor prior to contract closeout.

3.03 SEEDING:

A. General: Seeding or mulching operations will not be permitted when wind velocities exceed 15 miles per hour. Seed shall be sown only when the soil is moist and in proper condition to induce growth. No seeding shall be done when the ground is frozen, unduly wet, or otherwise not in a tillable condition. The operations involved in the work shall proceed in the following sequence: preparation of the ground, seeding, spreading, and cutting in mulch.

B. Preparation of Area to be Seeded: The ground over which the seed is to be sown shall be prepared by disk-

harrowing and thoroughly pulverizing the soil to a suitable depth. The prepared soil shall be loose and reasonably smooth. It shall be reasonably free of large clods, roots, and other material which will interfere with the work or subsequent mowing and maintenance operations.

C. Application of Seed: While the soil is still loose, the seed shall be scattered uniformly over the grassing area and immediately mixed into the seed bed to a depth of one-half inch. Unless other types of seed are called for, permanent-type grass seed shall be a mixture of 20 parts of Bermuda seed and 80 parts of Pensacola Bahia seed. Quick-growing-type grass seed shall be a species which will provide an early ground cover during the particular season when planting is done and will not later compete with permanent grass. The separate types of seed used shall be thoroughly dry-mixed immediately before sowing. Seed which has become wet shall not be used.

D. Mulching: When mulching is called for, approximately two inches, loose thickness, of the mulch material shall then be applied uniformly over the seeded area, and the mulch material cut into the soil with the equipment specified, so as to produce a loose mulched thickness of three to four inches. Care shall be exercised that the materials are not cut too deeply into the soil. No artificial watering of the mulch shall be done before it is applied.

E. Rolling: Immediately after completion of the seeding, the entire grassed or mulched area shall be rolled thoroughly with the equipment specified. At least two trips over the entire area will be required.

F. Watering: Newly-seeded areas are not to be watered to force the seed germination but only to sustain grass growth. Water will be used on vegetated areas only when permitted by the Engineer.

G. Operations on Steep Slopes: On steep slopes when mulching is called for, the mulch material may be anchored down in lieu of being cut into the soil by use of a machine. Anchoring may be done by either of the following methods:

1. Placing a layer of soil, approximately two inches thick by nine inches wide, along the upper limits of the mulch, and spotting soil piles over the rest of the area at a maximum spacing of four feet.

2. Spreading a string net over the mulch, using stakes driven flush with the top of the mulch, at six-foot centers, and stringing parallel and perpendicular, with diagonals in both directions.

3.04 MAINTENANCE: The Contractor shall, at his expense, maintain grassed areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include the filling, leveling, and repairing of any washed or eroded areas, as may be necessary. The Engineer, at any time, may require replanting of any areas in which the establishment of the grass stand does not appear to be developing satisfactorily. If a planted area must be replanted due to the Contractor's negligence, carelessness, or failure to provide routine maintenance of such area, such replacement shall be at the Contractor's expense. If replanting is necessary due to factors determined to be beyond the control of the Contractor, payment for replacement will be made under the appropriate contract pay items.

END OF SECTION

SECTION 02513

ASPHALTIC CONCRETE PAVING

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: The extent of asphaltic concrete paving work is shown on the drawings.

1.02 SUBMITTALS:

A. Material Certificates: Provide copies of material certificates including design mixes, signed by the Contractor, certifying that each specified material complies with, or exceeds requirements.

1.03 JOB CONDITIONS:

A. Weather Limitations: Apply prime and tack coats only when ambient temperature is above 50 degrees F and when temperature has not been below 35 degrees F for 12 hours immediately prior to application. Do not apply when base contains an excess of moisture.

B. Construct asphalt concrete surface only when atmospheric temperature is above 40 degrees F and when base is dry. Base course may be placed when air temperature is above 30 degrees F and rising.

PART 2 - PRODUCTS

2.01 MATERIAL:

A. Subgrade: Stabilized subgrade, as required, shall comply with the FDOT Specifications covering the type of stabilization shown on the drawings.

B. Base Course: Material shall be as specified in the FDOT Specifications for the type of base course shown on the drawings.

C. Asphaltic Concrete Pavement: Asphalt pavement shall conform to the FDOT Specifications for the type of structural and friction courses called for on the drawings.

D. Priming: Prime coat shall be emulsified asphalt of a grade applicable to the base used. Cover material for prime coat shall be hot asphalt coated sand.

E. Pavement: Marking and striping shall utilize traffic paint meeting or exceeding requirements as specified in the FDOT Specifications for the type shown on the drawings.

PART 3 - EXECUTION

3.01 BEARING: Bearing values shall be determined by the limerock bearing ratio method in accordance with FDOT Specification Research Bulletin 22-B, dated May 1972.

3.02 INSTALLATION:

A. Subgrade: Stabilized subgrade, as required, shall be compacted to a depth of 12 inches and a limerock bearing ration of 40.

B. Limerock Base Course: Thickness shall be as shown on the drawings and shall be constructed as specified in Section 200 of FDOT Specifications.

C. Asphaltic Concrete Pavement: Asphalt pavement shall be in accordance with Section 320 and construction shall be in accordance with Section 330 of FDOT Specifications.

D. Priming: Prime coat shall be applied in accordance with Section 300 of FDOT Specifications. Cover material for prime coat shall be applied with approved distributor.

3.03 FIELD QUALITY CONTROL: All work shall meet the requirements of the FDOT.

END OF SECTION

SECTION 02600

PRECAST CONCRETE MANHOLES

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: The work under this section shall include the furnishing of all labor, materials and equipment necessary for the construction and installation of all manholes and drainage structures as called for on the drawings.

1.02 QUALITY ASSURANCE:

A. Manufacture of precast concrete covered in this section shall have a minimum of 5 years experience in the design and construction of wire wound circular precast structures.

B. Manufacture of top and frames specified herein shall have a minimum of five years experience in the manufacture of like product.

C. Submittals:

1. Provide shop drawings showing dimensions, finishes, reinforcement and connections details.

2. Provide erection layout and details.

3. Provide cut sheets of catalog cuts and details of all accessories.

4. Provide test results for concrete.

D. Standards: Latest edition of the Florida Department of Transportation Standard Specification for Bridge and Roadway Construction.

1.03 PRODUCT DELIVERY AND HANDLING: Handle and store materials to prevent damage and deterioration.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE MANHOLES: Manhole bases, sections and cones shall conform to the requirements of ASTM C478-72, Specification for Precast Reinforced Concrete Manhole Sections with the exception of Section 10 (a), except as modified herein. Cement shall meet the requirements of ASTM C150-71, Specification for Portland Cement, Type II. Concrete shall have a minimum compressive strength of 4,000 psi. Minimum wall thickness shall be 1/12 the inside diameter in inches plus 1 inch. The required minimum strength of concrete shall be confirmed by making and testing four standard cylinders at seven days in accordance with Division 3 Concrete Work. Rings

shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations.

A. Bases: Bases for manholes shall be cast integrally with the bottom manhole section. The base section shall be set in a 2-inch leveling course of Class C concrete poured directly on the prepared subgrade as shown on the drawings. In order to permit adjustment of the precast base section and insure full bearing on the leveling course, said section shall be placed just prior to initial set of the Class C concrete leveling course.

B. Joints: Joint contact surfaces shall be formed with machined castings; they shall be exactly parallel with 2 degree slope and nominal 1/16-inch clearance with the tongue-equipped with a proper recess for the installation of an O-ring rubber gasket, conforming to ASTM C443-72, Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber gasket, or RAMNEK premolded Plastic Joint Sealer with joints preprimed.

C. Coating: With the exception of joint contact surfaces, and the interior surfaces of all openings to receive the pipe and a one inch annular ring around the interior and exterior of said openings, the interior and exterior surfaces of each manhole shall be given two coats of Farbertite as manufactured by Briggs Bituminous Composition Company, Philadelphia, Pa., a subsidiary of Penn Crete Products Co., Inc.; no substitutes. Total minimum dry film thickness shall be 12 mils. Each coat shall be applied at a rate not to exceed one gallon per 100 square feet. The waterproofing materials shall be applied by brush or spray and in accordance with the instruction of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat. Special precaution shall be taken not to coat joint contact surfaces, as Farbertite is not a joint prepriming material.

D. Manhole Adjustment Materials:

1. Bricks: The brick shall be sound, hard and uniformly burned brick, regular and uniform in shape and size, of compact texture and satisfactory to the Engineer. Brick shall comply with the ASTM Standard Specifications for Sewer Brick (Made from Clay or Shale), Designation C-32, latest, Grade MM. Each brick shall be laid in a full bed and joint of mortar without requiring subsequent grouting, flushing, or filling, and shall be thoroughly bonded as directed. Only clean brick shall be used in brickwork. The bricks shall be moistened by suitable means, as directed, until they are neither so dry as to absorb water from the mortar, not so wet as to be slippery when laid. Outside faces of brick masonry shall be plastered with mortar from 1/4-inch or 3/8-inch thick. If required, the

masonry shall be properly moistened prior to application of the mortar. The plaster shall be carefully spread and troweled so that all cracks are thoroughly worked out. After hardening, the plaster shall be carefully checked, by being tapped, for bond and soundness. Unbound or unsound plaster shall be removed and replaced. Brick masonry and plaster shall be protected from too rapid drying by the use of burlaps kept moist, or by other approved means, and shall be protected from the weather and frost.

2. Rejected brick shall be immediately removed from the work and brick satisfactory to the Owner substituted.

3. Mortar for Brickwork: The mortar shall be composed of portland cement and sand. Mortar shall be one part cement and two parts sand; lime shall not be used.

4. Cement: Portland, ASTM C150-71, Specification for Portland Cement, Type I.

5. Sand: Washed silica sand, ASTM C144-70, Specification for Aggregate for Masonry Mortar.

6. Non-shrink Mortar: Embeco No. 167 and No. 381 Mortar as manufactured by the Master Builders Co. rapid drying by the use of burlaps kept moist, or by other approved means, and shall be protected from the weather and frost.

2.02 CAST IRON FRAMES, GRATINGS AND COVERS: Castings shall be made of good quality, strong, tough, even grained cast iron and shall be smooth, free from scale, lumps, blisters, sandholes and defects of any nature which would render them unfit for the service for which they are intended. They shall be thoroughly cleaned and subjected to a careful hammer inspection. Castings shall meet the requirements of ASTM A48-64, Specifications for Gray Iron Castings, Class No. 30, or Grade 65-45-12, Ductile Iron meeting the requirements of ASTM A536-70, Standard Specification for Ductile Iron Castings. In either case, manhole frame and cover shall be designed to withstand an HS20-44 loading defined in the AASHTO Specifications. Frames and covers shall be machined or ground at touching surfaces so as to seat firmly and prevent rocking. Any set not matching perfectly shall be removed and replaced at no additional cost.

2.03 FLEXIBLE MANHOLE CONNECTOR: Where the sewer pipe enters the precast manhole, a flexible pipe to manhole connector shall be used. The connector shall be the "Kor-N-Seal" as manufactured by National Pollution Control Systems, Inc., Milford, New Hampshire. The connector shall be the sole element to assure a flexible watertight seal of the pipe to the manhole.

A. Material: The Neoprene-EPDM material the connector is manufactured from shall conform to ASTM C-443 and shall be a minimum of 3/8 inches (9.4MM) thick or greater. The material shall be resistant to ozone, weathering, aging, chemicals, including acids, alkalis, animal and vegetable fats, oils and petroleum products.

2.04 BANDS: The stainless steel band and worm screw assembly shall be totally non magnetic series 304 stainless steel. The worm screw for tightening the stainless steel band shall be torqued by a break-away torque wrench available from the precast manhole supplier and set for a torque pressure of 60-70 inch/pounds.

2.05 CONNECTOR: The connector shall be of a size specifically designed for the specified pipe material and size. Also, the connector shall be installed in the manhole wall by the precast manufacturer in strict accordance with the recommendations of the connector manufacturer. During the invert construction stage, the interior annular space between the exterior of the pipe and the interior of the connector shall be filled with a Type II Lean Cement Grout by the Contractor.

PART 3 - EXECUTION

3.01 INSTALLING SECTIONS: Precast concrete sections shall be set so the manhole will be vertical and with sections in true alignment. Joint surfaces of the base of previously set section shall have an O-ring installed in the recess or shall be sealed with pre-molded plastic joint sealer "RAMNEK." If "RAMNEK" is used, joints shall be pre-primed.

3.02 METALLIC NON-SHRINK MORTAR: All holes in sections used for their handling, and the annular space between the wall and entering pipes shall be thoroughly plugged with Embeco No. 167, or No. 381 as manufactured by the Master Builders Company, or Thoroset (RM) as manufactured by the Standard Dry Wall products Inc., or any approved equal non-shrinking mortar or grout, applied and cured in strict conformance with the manufacturer's recommendations, so that there will be zero leakage through openings and around pipes. The mortar shall be finished smooth and flush with the adjoining interior and exterior manhole wall surfaces.

3.03 MEMBRANE CURING COMPOUND: As soon as mortar is hydrated to the point where it will not be marred by such application, and within two (2) hours after installing mortar, the Contractor shall apply an approved membrane curing compound, conforming to ASTM C-309-74, Type 1, Class B, to the finished mortar surfaces both inside and outside the manhole. Embeco mortar shall be coated with Master Builder's Masterseal; Thoroset (RM) grout shall be coated with Standard Dry Wall Products' Thorocure. Submission of alternate mortars or grouts should include an alternate membrane curing compound or indicate which of the above approved products is proposed for use.

3.04 GRADE ADJUSTMENT: For grade adjustment in setting the manhole frame, brick masonry shall be used on top of manhole slabs and precast concrete manhole cones in accordance with the drawings. Mortar shall be one part cement and two parts sand; lime shall not be used.

3.05 SETTING MANHOLE FRAMES: Manhole frames and covers shall be set to conform accurately to the finished ground or pavement surface as established by the Contract Drawings, unless otherwise directed by the Owner. Frames on manhole cones shall be set concentric with the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flanges of the frame shall be completely filled and made water tight. A ring of mortar at least one inch thick and pitched to shed water away from the frame shall be placed around the outside of the bottom flange. Mortar shall extend to the outer edge of the masonry and shall be finished smooth and flush with the top of the flange.

3.06 FLOW CHANNELS: Flow Channels in manhole base shall be formed of Class "C" concrete and/or brick rubble and mortar, while the manholes are under construction. Cut off pipes at inside face of the manhole and construct the invert to the shape and sizes of pipe indicated. All inverts shall follow the grades of the pipe entering the manholes. Changes in direction of the sewer and entering branch or branches shall be laid out in smooth curves of the longest possible radius which is tangent to the centerlines of adjoining pipelines.

3.07 CLEANUP: The Contractor shall maintain the site of the work in a neat condition. The Contractor shall remove all excess materials, excess excavated materials and all debris resulting from his operations.

END OF SECTION

SECTION 02601

PRECAST CONCRETE WETWELLS

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK: The work under this section shall include the furnishing of all labor, materials and equipment necessary for the construction and installation of all precast wetwells as called for on the drawings.

1.02 QUALITY ASSURANCE:

A. Manufacturer of precast concrete covered in this section shall have a minimum of 5 years experience in the design and construction of wire wound circular precast structures.

B. Submittals:

1. Provide shop drawings showing dimensions, inverts, finishes, reinforcement and connections details.

2. Provide erection layout and details.

3. Provide cut sheets of catalog cuts and details of all accessories.

4. Provide test results for concrete.

C. Standards: Latest edition of the Florida Department of Transportation Standard Specification for Bridge and Roadway Construction.

1.03 PRODUCT DELIVERY AND HANDLING: Handle and store materials to prevent damage and deterioration.

PART 2 - PRODUCTS

2.01 PRECAST CONCRETE WETWELLS: Wetwell bases, sections and cones shall conform to the requirements of ASTM C478, Specification for Precast Reinforced Concrete Manhole Sections with the exception of Section 10 (a), except as modified herein. Cement shall meet the requirements of ASTM C150, Specification for Portland Cement, Type II. Concrete shall be 4,000 psi. Minimum wall thickness shall be 1/12 the inside diameter in inches but not less than 6". The required minimum strength of concrete shall be confirmed by making and testing four standard cylinders at seven days in accordance with Division 3, Concrete, work. Rings shall be custom-made with openings to meet indicated pipe alignment conditions and invert elevations.

A. Bases: Bases for wetwells shall be cast integrally with the bottom wetwell section. The base section shall be

set in a 2-inch leveling course of 3000 psi concrete poured directly on the prepared subgrade as shown on the drawings. In order to permit adjustment of the precast base section and insure full bearing on the leveling course, said section shall be placed just prior to initial set of the 3000 psi concrete leveling course.

B. Joints: Joint contact surfaces shall be formed with machined castings. They shall be exactly parallel with 2 degree slope and nominal 1/16-inch clearance with the tongue equipped with a proper recess for the installation of an O-ring rubber gasket, conforming to ASTM C443-72, Joints for Circular Concrete Sewer and Culvert Pipe Using Rubber gasket, or RAMNEK premolded Plastic Joint Sealer with joints preprimed.

C. Coating: With the exception of joint contact surfaces, and the interior surfaces of all openings to receive the pipe and a one inch annular ring around the interior and exterior of said openings, the interior and exterior surfaces of each wetwell shall be given two coats of Farbertite as manufactured by Briggs Bituminous Composition Company, Philadelphia, Pa., a subsidiary of Penn Crete Products Co., Inc., or equal. Total minimum dry film thickness shall be 12 mils. Each coat shall be applied at a rate not to exceed one gallon per 100 square feet. The waterproofing materials shall be applied by brush or spray and in accordance with the instruction of the manufacturer. Time shall be allowed between coats to permit sufficient drying so that the application of the second coat has no effect on the first coat. Special precaution shall be taken not to coat joint contact surfaces, as Farbertite is not a joint prepriming material.

2.02 ACCESS COVER: Shall be double door supplied by single manufacturer.

A. Provide extruded aluminum frame.

B. Doors shall be 1/4" aluminum checker plate reinforced to withstand 300 lb/ft^2 live load and shall open to 90° and lock automatically.

C. Provide all stainless steel fasteners, hardware and accessories throughout.

D. Hinges shall be bolted to underside.

E. Equip doors with barlock and chain.

F. Apply bituminous coating to exterior of frame prior to casting in concrete wetwell tap.

G. Sizes shall be as indicated on drawings.

H. Acceptable Manufacturers: Bilco, U.S. Foundry HPD, Halliday S2R or equal.

2.03 FLEXIBLE WETWELL CONNECTOR: Where the sewer pipe enters the precast wetwell, a flexible pipe to manhole connector shall be used. The connector shall be the "Kor-N-Seal" as manufactured by National Pollution Control Systems, Inc., Milford, New Hampshire. The connector shall be the sole element to assure a flexible watertight seal of the pipe to the manhole.

A. Material: The Neoprene-EPDM material the connector is manufactured from shall conform to ASTM C-443 and shall be a minimum of 3/8 inches (9.4MM) thick or greater. The material shall be resistant to ozone, weathering, aging, chemicals, including acids, alkalis, animal and vegetable fats, oils and petroleum products.

2.04 BANDS: The stainless steel band and worm screw assembly shall be totally non magnetic series 304 stainless steel. The worm screw for tightening the stainless steel band shall be torqued by a break-away torque wrench available from the precast manhole supplier and set for a torque pressure of 60-70 inch/pounds.

2.05 CONNECTOR: The connector shall be of a size specifically designed for the specified pipe material and size. Also, the connector shall be installed in the manhole wall by the precast manufacturer in strict accordance with the recommendations of the connector manufacturer. During the invert construction stage, the interior annular space between the exterior of the pipe and the interior of the connector shall be filled with a Type II Lean Cement Grout by the Contractor.

PART 3 - EXECUTION

3.01 INSTALLING SECTIONS: Precast concrete sections shall be set so the wetwell will be vertical and with sections in true alignment. Joint surfaces of the base of previously set section shall have an O-ring installed in the recess or shall be sealed with pre-molded plastic joint sealer "RAMNEK." If "RAMNEK" is used, joints shall be pre-primed.

3.02 METALLIC NON-SHRINK MORTAR: All holes in sections used for their handling, and the annular space between the wall and entering pipes shall be thoroughly plugged with Embeco No. 167, or No. 381 as manufactured by the Master Builders Company, or Thoroset (RM) as manufactured by the Standard Dry Wall products Inc., or any approved equal non-shrinking mortar or metallic non-shrink grout shall be applied and cured in strict conformance with the manufacturer's recommendations, so that there will be zero leakage through openings and around pipes. The mortar shall be finished smooth and flush with the adjoining interior and exterior wetwell wall surfaces.

3.03 MEMBRANE CURING COMPOUND: As soon as mortar is hydrated to the point where it will not be marred by such application, and within two (2) hours after installing mortar, the Contractor shall apply an approved membrane curing compound, conforming to ASTM C-309-74, Type 1, Class B, to the finished mortar surfaces both inside and outside the wetwell. Embeco mortar shall be coated with Master Builder's Masterseal; Thoroset (RM) grout shall be coated with Standard Dry Wall Products' Thorocure. Submission of alternate mortars or grouts should include an alternate membrane curing compound or indicate which of the above approved products is proposed for use.

3.04 SETTING WETWELL FRAMES: Wetwell frames and covers shall be set to conform accurately to the finished ground or pavement surface as established by the Contract Drawings, unless otherwise directed by the Engineer. Frames on wetwells shall be set in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flanges of the frame shall be completely filled and made water tight. A ring of mortar at least one inch thick and pitched to shed water away from the frame shall be placed around the outside of the bottom flange. Mortar shall extend to the outer edge of the masonry and shall be finished smooth and flush with the top of the flange.

3.05 CLEANUP: The Contractor shall maintain the site of the work in a neat condition. The Contractor shall remove all excess materials, excess excavated materials and all debris resulting from his operations.

END OF SECTION

SECTION 02710

PIPE WORK - WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 DESCRIPTION: Work under this Section consists of furnishing all materials, supplies, equipment and labor in accordance with the requirements set forth herein and as shown on the drawings.

1.02 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS: The work under this Contract shall be in strict accordance with the following codes and standards.

A. All Local, County, Municipal and Federal Codes.

B. American National Standards Institute (ANSI).

C. American Society for Testing and Materials (ASTM).

D. American Water Works Association (AWWA).

E. American Association of State Highway and Transportation Officials (AASHTO).

F. Florida Department of Transportation Specifications (DOT).

G. Recommended Standards for Water Works, 10-States Standards.

H. Florida Dept. of Environmental Protection

1.03 QUALITY ASSURANCE STANDARDS:

A. American National Standards Institute, Inc. (ANSI)/ American Water Works Association (AWWA).

1. ANSI/AWWA C104-90, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

2. ANSI/AWWA C105-88, Polyethylene Encasement for Ductile - Iron Piping for Water and Other Liquids.

3. ANSI/AWWA C111-90, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

4. ANSI/AWWA C115-88, Flanged Ductile-Iron Pipe with Threaded Flanges.

5. ANSI/AWWA C150-R86, Thickness Design of Ductile-Iron Pipe.

6. ANSI/AWWA C151-86, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

7. ANSI/AWWA C153-88, Ductile-Iron Compact Fittings, 3 In. Through 16 In., for Water and Other Liquids.

8. AWWA C502-85, Dry-Barrel Fire Hydrants.

9. AWWA C509-87, Resilient-Seated Gate Valves for Water and Sewage Systems.

10. AWWA C600-87, Installation of Ductile-Iron Water Mains and Their Appurtenances.

11. AWWA C651-86, (90), Disinfecting Water Mains.

12. AWWA C701-88, Cold-Water Meters - Turbine Type, for Customer Service.

13. AWWA C800-89, Underground Service Line Valves and Fittings.

14. AWWA C900-89, Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution.

B. American Society for Testing and Materials (ASTM)

1. D1785-76, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.

2. D-2464, Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fillings, Schedule 80.

3. D2467-78, Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

4. D2564-80, Solvent Chemicals for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

5. D2855-81, Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

C. Manufacturer's name and model numbers are listed to establish a standard of quality. Equivalent items of other manufacturers are acceptable.

1.04 SUBMITTALS:

A. Submit manufacturer's certification of materials' conformance to specifications.

B. Submit manufacturer's literature, catalog data and installation instructions.

C. Submit certified field pressure test reports.

1.05 PRODUCT DELIVERY AND HANDLING:

A. Exercise care to prevent damage of product during loading, transporting, unloading and storage.

B. Do NOT drop pipe or fittings.

C. Do not store directly on ground and assure that materials are kept clean.

D. Store material in areas approved by the Owner.

E. Store material in such a manner as to not create a nuisance or safety hazard.

PART 2 - PRODUCTS

2.01 PIPE:

A. General: Pipe shall be furnished free from defects impairing strength and durability and should be of best commercial quality for purpose specified. Structural properties shall be sufficient to safely sustain or withstand strains to which it is normally subjected. All pipe shall bear the National Sanitation Foundation Seal for potable water pipe.

B. Pipe Materials:

1. Ductile Iron (D.I.) ANSI/AWWA C151.:

a. Metal Thickness, ANSI/AWWA C150:

1) 3 and 4 In.: Class 51.
2) 6 in. and Larger: Class 50.
3) Jack and Bore Crossings: Class 52.

b. Interior Lining, ANSI/AWWA C104: mortar lined.

c. Exterior Coating, Bituminous Coating, 1 Mil thick.

2. Polyvinyl Chloride (PVC) 4 In. and Larger:

a. Specification: AWWA C900.

b. Compound: PVC 12454-B, ASTM D 1784.

c. Thickness: Class 150, DR 18.

3. Polyvinyl Chloride (PVC), 3 In. and Smaller:

a. Specification: ASTM D1785.

b. Compound: PVC 12454-B, ASTM D1784.

c. Thickness: Schedule 80.

C. Pipe Joints:

1. Ductile Iron:

a. Mechanical: ANSI/AWWA C111.

b. Push On: ANSI/AWWA C111, single gasket type.

c. Flanged: ANSI B16.1, 125 lb.

d. Restrained: Acceptable: Lock-Fast, American Ductile Iron Pipe; TR Flex, U.S. Pipe; Super-Lock, Clow Corporation.

2. Polyvinyl Chloride, 4 In. and Larger:

a. Push On: ASTM F477 Elastomeric Gaskets

b. Restrained: UNI-BELL B-13, Uni-Flange Restrainer.

3. Polyvinyl Chloride, 3 In. and Smaller:

a. Screwed: ASTM D2464.

b. Solvent Weld: ASTM D2855.

c. Solvent: ASTM D2564.

D. Pipe Fittings:

1. Ductile Iron and Polyvinyl Chloride (PVC) 4 In. and Larger:

a. ANSI/AWWA C153, ductile iron compact fittings.

b. ANSI/AWWA C104, mortar lined.

c. Mechanical: ANSI/AWWA C111.

d. Push On: AWSI/AWWA C111.

e. Flanged: ANSI B16.1, 125 lb.

f. Restrained-Ductile Iron: Same as Ductile Iron Pipe Joints.

g. Restrained-PVC: Same as PVC Pipe Joints.

2. Polyvinyl Chloride (PVC) 3 In. and Smaller:

a. ASTM D2464, Schedule 80 PVC threaded fittings.

b. ASTM D2467, Schedule 80 PVC socket type fittings.

c. ASTM D2855, solvent weld joints.

E. Pipe Marking and Identification:

1. Ductile Iron Pipe: Permanent marking tape, with the words "WATER MAIN" printed along the tape, shall be attached to the pipe for its entire length. In addition, similar marking tape shall be placed in the trench over the pipe, six to twelve inches below finished grade, of the entire length of pipe.

2. PVC Pipe:

a. All non-metallic water main pipe installed underground shall have a #14 gauge THHN trace wire (blue in color) attached for locating purposes. Half hitches shall be made behind each pipe bell and on each side of a valve or fitting. Branch splices shall be made at all tees, fire hydrants, and service lines. Trace wire shall be run into valve boxes. Watertight splicing connectors shall be utilized for all splices. Contractor shall be responsible for continuity of trace wire between valve boxes.

b. All PVC water main pipe shall be manufacturer's standard blue color or shall have permanent marking tape attached with the words "WATER MAIN" printed along the tape. In addition, similar marking tape shall be placed in the trench over the pipe, six to twelve inches below finish grade, for the entire length of pipe.

2.02 GATE VALVES:

A. Three Inch and Larger: Shall be AWWA C509, iron body, resilient seat, non-rising bronze stem with 2" square operating nut on buried valves, turn to left (counter clockwise) to open.

1. Working pressure of 200 psi.

2. Internal Metal Surfaces shall have two-part thermosetting epoxy coating, 4 mils thick.

3. Sealing Mechanism shall have zero leakage at 200 psi with flow in either direction.

4. End Conditions: Fit joints specified and/or required for piping.

5. Acceptable: Mueller Series A-2370, American CRS-80 or equal.

B. Two Inch and Smaller:

1. Type III (double wedge disc, rising stem, inside screw).

2. Class B (150 lb. steam rating).

3. Threaded ends.

2.03 VALVE BOXES:

A. Provide at all manually operated valves installed on underground lines.

B. ASTM A-48, cast iron, Class 30-B, 3-piece extension type, with cover marked "WATER" and flared base to suit valve furnished.

C. Acceptable: Figure No. F-2450, Clow Corporation; Catalog No. H10357, Mueller Co.; Figure No. E-3002, M & H Valve and Fittings Co. or equal.

2.04 FIRE HYDRANTS:

A. AWWA C502 Dry-Barrel type fire hydrant with 5 1/4" main valve.

B. Working Pressure Rating 150 psi.

C. Provided with two 2 ½ Inch hose connections and one 4 ½ In. hose connection.

D. Acceptable: American Darling B-62-B; Clow Medallion Hydrant, Mueller BSR 5 1/4" or equal.

2.05 TAPPING SADDLES:

A. For Ductile Iron Mains: Service Saddles shall be made of malleable or ductile iron with a 4-bolt, stainless steel, ductile iron, cast brass or bronze strap.

B. For Polyvinyl Chloride (PVC) Mains: Service Saddles shall be made of cast brass or bronze with a 4-bolt stainless steel, cast brass or bronze strap.

C. The backside face of the saddle shall be provided with an extra-wide neoprene-rubber gasket.

D. The inside diameter of the saddle shall match that of the pipe outside diameter for a size-size match.

2.06 CORPORATION STOPS: Corporation Stops shall be Mueller, Hayes or Ford threaded on the inlet side with Mueller threads and the outlet side fitted with connections to suit the connecting pipe.

2.07 CURB STOPS:

A. Curb stops shall be Mueller, Hayes or Ford.

B. All curb stops shall have a locking wing.

2.08 PLASTIC LOCATING AND MARKING TAPE: Tape shall be plastic coated foil with a minimum width of 2 inches. Tape shall be highly visible and shall have the words "WATER MAIN" in at least 1" letters printed at least every 36 inches along the tape. Tape shall be located one foot below ground surface directly above the centerline of the pipe. Tape shall be Allen Marking Tape or equal.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. General: The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths indicated on the drawings or as necessary. This shall include all necessary clearing and grubbing of any foreign substance encountered within the structure or trench area. Excavated material suitable for backfill shall be piled in an orderly manner at a sufficient distance from the trench to prevent slides or cave-ins.

B. Protection of Existing Facilities and Utilities: All existing improvements such as pavements, conduit, poles, pipes and other structures, shall be carefully supported and fully protected from injury and, in case of damage, they shall be restored, pressure tested and disinfected by the Contractor without compensation. Existing utilities and other underground obstructions are shown on the plans, but the accuracy of the locations an depths is not guaranteed. The Contractor shall contact all utilities prior to construction and arrange for the necessary assistance in locating and protecting the existing utilities. The Contractor shall be responsible for damages to these existing utilities and shall, in case they are damaged, restore them to their original condition.

C. Trench Excavation: The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint plus 8 in. each side of pipe for unsheeted or sheeted trench, with the maximum width of trench, measured at the top of the pipe, not to exceed the outside pipe diameter, plus 24 in., unless otherwise shown on the drawings. Trench walls shall be maintained vertical from the bottom of the trench to a line measured at the top of the pipe. From the top of the pipe to the surface of the trench walls shall be as vertical as possible under soil conditions.

No more than 300 linear feet of trench shall be open in advance of the completed pipe laying operation without prior approval of the Engineer. Pipe trenches across roadways and driveways shall be backfilled as soon as the pipe is installed. Where, in the opinion of the Engineer, adequate detour facilities are not available, no trench shall be left open across a roadway or commercial property driveway where adequate detour routes

are not available for a period in excess of 30 minutes, or as directed by the governing authority. No trench shall be left open across any roadway or driveway for more than 24 hours. It shall be the Contractor's responsibility to provide traffic control and barricades as necessary.

D. Shoring, Sheeting and Bracing: The Contractor shall do all shoring, sheeting and bracing or provide other approved facilities required to perform and protect the excavation and as necessary for the safety of the public, the employees, and the preservation of existing roads, structures and other utilities. The top of such sheeting left in place shall be cut off at a minimum elevation of 2.5 ft. below finished grade. All excavation shall be in accordance with the Florida Trench Safety Act.

E. Pavement Removal: The Contractor shall remove pavements as part of the trench excavation. The material from permanent pavement removal shall be carefully separated from trench excavation material and disposed of by the Contractor.

F. Boulder Removal: All rocks, stones, boulders or concrete, having any dimension larger than permitted to be used for backfill in the paragraph entitled "Backfilling" of these Specifications, shall be removed from the site and disposed of by the Contractor.

G. Disposal of Excess Materials: The Contractor shall dispose of the excavated materials not required or suitable for backfill. All surplus excavated material which is suitable for fill shall become property of the Contractor and shall be disposed of by the Contractor at his expense.

H. Unstable Soil Conditions and Over depth Excavation: Where unstable soil conditions are encountered, the excavation shall be increased as directed by the Engineer. The bottom of the excavation shall be brought up to the proper excavation elevation utilizing suitable and properly compacted backfill material.

3.02 INSTALLATION OF WATER MAINS AND SERVICES:

A. General: Unless otherwise noted on the drawings or in other sections of this Specification, the pipe shall be handled and installed in strict accordance with the manufacturer's instructions and with the applicable AWWA or ASTM Standards.

1. Ductile Iron Pipe - AWWA C-600.

2. Polyvinyl Chloride Pipe - ASCE Manual No. 37, ASTM D2321.

3. If a conflict exists between the manufacturer's instructions and the AWWA or ASTM Standards, the manufacturer's instructions shall govern.

4. Examine area to receive pipe work for defects that adversely affect execution of work or cause deviation beyond allowable tolerances for piping clearances.

5. Carefully examine each section of pipe or valve before installation. Do not use defective or damaged pipe or materials. Remove such pipe or material from project site immediately.

B. Preparation: The Contractor shall use every precaution during construction to protect the pipe against the entry of nonpotable water, dirt, wood, small animals and other foreign material that would hinder the operation of the pipeline. Where the groundwater elevation is above the bottom of the trench, the Contractor shall provide suitable dewatering equipment. All piping shall be placed in a dry trench, unless wet trench installation is approved by the Engineer.

C. Depth of Cover: Unless otherwise shown on the drawings, or otherwise authorized by the Engineer, the pipe shall have a minimum cover of 30 inches in unpaved areas and 36 inches in paved areas.

D. Connections to Existing Mains: The Contractor shall make connections to existing mains as shown on the drawings. Connections shall be made only after arrangements have been completed by the Contractor with the Owner of the system and shall be under the System Owner's immediate supervision.

E. Pipe Thrust Restraints: Mechanical restrainers shall be installed as required to properly restrain all piping systems. At a minimum, restrainers shall be provided on all below-grade valves and fittings and at the required number of pipe joints in each direction. Required lengths of restrained pipe shall be as shown in pipe restraint schedule at end of this paragraph for the type of soil encountered. For above-grade piping, all valves and fittings shall be threaded, flanged or solvent welded with supports as required.

PIPE RESTRAINT SCHEDULE

MINIMUM LENGTH OF PIPE (IN FEET) REQUIRED TO BE RESTRAINED ON EACH SIDE OF A VALVE OR FITTING FOR SANDY SOILS (SW, SP, SM, SC)

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	≤22.5° BEND	TEE OR CROSS	VERTICAL		REDUCER[b]	VALVE	DEAD END
						LOW	HIGH			
PVC PIPE	≤4	18	18	18	18	18	22	36	18	52
	6	24	18	18	18	18	30	38	36	73
	8	31	18	18	18	18	40	69	36	96
	10	37	18	18	18	18	48	93	54	115
	12	43	18	18	18	18	56	99	54	136
	14	49	20	18	18	18	64	101	72	155
	16	55	23	18	18	18	72	103	72	174
	18	60	25	18	36	20	80	104	72	192
	20	65	27	18	36	21	87	105	72	211
	24	75	31	18	36	25	102	134	90	246
	30	88	37	18	36	29	122	185	90	295

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	≤22.5° BEND	TEE OR CROSS	VERTICAL		REDUCER[b]	VALVE	DEAD END
						LOW	HIGH			
DUCTILE IRON	≤4	18	18	18	18	18	18	18	18	33
	6	20	18	18	18	18	19	35	36	47
	8	26	18	18	18	18	25	44	36	61
	10	31	18	18	18	18	30	60	54	73
	12	37	18	18	18	18	36	63	54	86
	14	41	18	18	18	18	41	64	72	98
	16	46	19	18	36	18	46	66	72	111
	18	51	21	18	36	18	51	66	72	122
	20	56	23	18	36	18	56	67	72	134
	24	64	27	18	36	21	65	85	90	156
	30	75	31	18	36	25	78	118	90	188

PIPE RESTRAINT SCHEDULE

MINIMUM LENGTH OF PIPE (IN FEET) REQUIRED TO BE RESTRAINED ON EACH SIDE OF A VALVE OR FITTING FOR CLAYEY AND SILTY SOILS (CL, CH, ML, MH)

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	≤22.5° BEND	TEE OR CROSS	VERTICAL OFFSET[a]		REDUCER[b]	VALVE	DEAD END
						LOW	HIGH			
PVC PIPE	≤4	19	18	18	18	18	23	36	18	55
	6	26	18	18	18	18	32	40	36	77
	8	35	18	18	18	18	42	73	36	101
	10	42	18	18	18	18	50	98	54	121
	12	50	21	18	18	18	59	104	54	143
	14	57	23	18	36	20	67	106	72	163
	16	64	27	18	36	23	76	109	72	183
	18	71	29	18	36	25	84	109	72	202
	20	78	32	18	36	28	92	110	72	221
	24	92	38	18	36	33	107	140	90	258
	30	110	46	22	54	40	127	193	90	308

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	≤22.5° BEND	TEE OR CROSS	VERTICAL OFFSET[a]		REDUCER[b]	VALVE	DEAD END
						LOW	HIGH			
DUCTILE IRON	≤4	18	18	18	18	18	18	18	18	35
	6	22	18	18	18	18	20	25	36	49
	8	29	18	18	18	18	27	46	36	64
	10	35	18	18	18	18	32	62	54	77
	12	41	18	18	18	18	37	66	54	90
	14	47	20	18	18	18	43	67	72	103
	16	53	22	18	36	19	48	68	72	115
	18	59	24	18	36	21	53	69	72	127
	20	65	27	18	36	23	58	70	72	140
	24	76	31	18	36	27	67	89	90	162
	30	91	38	18	36	32	80	122	90	194

Assumptions:
1. Pipe Test Pressure = 150 PSI
2. Minimum Pipe Depth = 3.0 Feet
3. Laying Condition = Type 5
4. Safety Factor = 2.0

[a] "Low" represents the minimum length of pipe (in feet) required to be restrained on the low side of the vertical offset, which is typically downstream of the offset fitting. "High" represents the minimum length of pipe (in feet) required to be restrained on the high side of the vertical offset, which is typically upstream of the offset fitting. Required restrained lengths assume an offset angle $\leq 45°$.

[b] Distance represents the linear feet of large diameter pipe upstream of the reducer required to be restrained. Restrain small diameter pipe at reducer at a minimum. If there is an unobstructed run downstream of the reducer (i.e. small diameter pipe) of at least 2.5 times the required length of large diameter pipe to be restrained, then restraint is required only at the reducer fitting. If small end of reducer is more than three pipe sizes smaller than large end, consult Engineer for required length to be restrained.

3.03 BACKFILLING:

A. Material: All backfill shall be excavated material, essentially free of organic material, asphaltic concrete, clay, concrete, boulders and other deleterious material.

1. Bedding and Pipe Embedment: The material in the bedding, around the pipe and to a depth of 1 ft. over the pipe, shall be sand or a mixture of sand, shell or crushed stone properly graded and mixed so that fine grain material from the side walls of the trench or backfill above the embedment will not migrate into the backfill material. The backfill shall meet the following limitations.

a. Ductile Iron Pipe - All material shall pass through a 3/4 in. square opening laboratory sieve.

b. Plastic Pipe - All materials shall pass through a ½ in. square opening laboratory sieve.

2. Above Pipe Embedment: The material shall be sand or a mixture of sandy material with rock, stone and shell. Rock, stone and shell shall pass through a 3-1/2 inch ring.

3. Top of Backfill: The top 12 inches of the backfill shall be topsoil and/or sandy material.

4. Additional Fill: If sufficient suitable backfill material is not available from the excavation, additional fill meeting the above requirements shall be provided by the Contractor.

B. Placing and Compaction:

1. Under Pavement: Where the excavation is made through existing or proposed pavements, including shoulders, curbs, driveways, sidewalks, or structures, the entire backfill to the subgrade of

the pavement or structures shall be made with predominantly sandy material free from rock, stones or organic matter, except that rocks passing a 3-1/2 inch ring will be permitted in the backfill between the elevation one foot above the top of the pipe and the bottom of the pavement subgrade.

The entire backfill material, including the material placed around and one foot above the pipe, shall be compacted to a density of not less than 98% of the maximum density, as determined by AASHTO T-180. Particular care shall be taken to insure that the backfill at the haunch is free from voids and is properly compacted. Compaction by flooding or puddling will be permitted only by written authorization from the Engineer.

Roads, walks and driveways consisting of broken stone, gravel, clay, marl, shell, shellrock, or a conglomerate of such materials, are not considered as being permanent pavement.

2. In Areas Not Under Permanent Pavement: Within right-of-ways or other areas where permanent pavement does not exist or is not proposed, including roads, walks and driveways consisting of broken stone, gravel, clay, marl, shell, shellrock or conglomerate, the entire backfill to the subgrade of the pavement or structures shall be made with predominantly sandy material free from rock, stones or organic matter, except that rocks having a maximum dimension of 3 ½ inch will be permitted in the backfill between the elevation 1 ft. above the top of the pipe and 1 ft. below the surface. Particular care shall be taken to insure that the backfill at the haunch is free from voids and is properly compacted. The bedding and embedment shall be compacted to a density of not less than 98 percent of maximum as determined by AASHTO T-180. The backfill material above 1 ft over the pipe shall be compacted to a density of not less than 85 percent of the maximum density, as determined by AASHTO T-180. Compaction by flooding or puddling will be permitted only by written authorization from the Engineer.

3. Miscellaneous: Backfilling around meter boxes, valve boxes and other structures shall be accomplished in the same manner as the connected pipe. Extreme care shall be used in backfilling wellpoint holes to prevent voids and settlement. If necessary, the holes should be plugged with a concrete slurry, such plugging to be at the expense of the Contractor.

4. Compaction Tests: The Engineer may at any time instruct the Contractor to partially excavate a previously backfilled trench or temporarily

backfilling of a short section of the trench for the purpose of obtaining measurements of the density of the backfill. The testing will be paid for by the Contractor. The cost of the partial excavation and restoration of the backfill will be paid for by the Contractor. Any test failures will be paid by the Contractor. Density and LBR tests shall be taken along the pipe at a maximum distance between tests of 300 feet.

3.04 CULVERT REMOVAL AND REPLACEMENT:

A. Culverts, catch basins and other drainage structures that are removed or damaged during construction shall be replaced with materials and structures equal and similar to those removed or damaged. Manhole covers and gratings shall be set at the original elevations unless otherwise directed.

B. The Contractor shall take precautions against the entry of excavated and other loose material resulting from his operations from entering catch basins, culverts and other drainage structures in the vicinity of his operations. He shall maintain the cleanliness of these drainage structures in a condition equal to that prior to the commencement of his operations during the construction. The Contractor shall be responsible for all damage to persons, roads, buildings, vehicles and other property resulting from the failure of the Contractor to maintain these drainage structures.

3.05 TESTING AND DISINFECTION:

A. Flushing of Completed Pipelines: Each section of completed pipeline shall be as thoroughly flushed as is possible. A minimum flow shall be used for flushing that will insure a velocity in the pipe of 2.5 ft. per second. Water required for testing and flushing shall be furnished by the Contractor and coordinated through the utility company.

B. Leakage Test: Leakage and pressure tests shall be conducted in the presence of the Engineer. The Contractor shall provide all necessary apparatus including a pump, flow measuring device, piping connections and fittings and the necessary labor to conduct the tests. The test shall be of a two hour duration. During the test, the pipe being tested shall be maintained at a pressure of not less than 150 psi. During the second test, the piping being tested shall be maintained at operating pressure. Leakage is defined as the quantity of water added to the pipe being tested during the test period. No pipe installation will be accepted if the leakage exceeds the quantities specified in AWWA C-600, Section 4.2., but in no case shall the leakage exceed 10 gallons per inch piped diameter per mile of pipe per 24 hours. The Contractor shall submit

to the Engineer the testing pattern he proposes to follow prior to testing for the Engineer's approval.

C. Disinfection of Complete Pipeline: Following completion, the Contractor shall disinfect all water distribution mains and service lines in accordance with AWWA C651. Water shall be fed slowly into the system applying sufficient chlorine to produce a dosage in excess of 50 ppm at the farthest point in the system from the point of application. The chlorine solution then shall be retained in the line for a period of 24 hours. At the end of this time if a minimum chlorine residual of 5 ppm is not obtained, the procedure shall be repeated. During the disinfection process all valves shall be operated. After disinfection, the water shall be flushed from the system at its extremities until excessive chlorine residuals are eliminated. Water samples for bacteriological examination shall be taken as directed by HRS Department of Health and submitted to the nearest approved bacteriological laboratory. Disinfection shall not be considered satisfactory until laboratory reports are satisfactory to the State Department of Health.

3.06 RESTORATION OF DAMAGED SURFACES, STRUCTURES AND PROPERTY: Where pavement, trees, shrubbery, fences or other property and surface structures not designated as pay items, have been damaged, removed or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the contract documents, state laws, municipal ordinances or the specific direction of the Engineer, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced and repaired at the expense of the Contractor to a condition equal to that before work began within a time frame approved by the Engineer.

3.07 PROTECTION: At the end of each workday the mains under construction shall be plugged to prevent the entry of small animals or rodents. Temporary plugs shall be provided for this purpose.

3.08 CLEANUP: The Contractor shall maintain the site of the work in a neat condition. The Contractor shall remove all excess materials, excess excavated materials and all debris resulting from his operations within a time frame approved by the Engineer.

END OF SECTION

SECTION 02720

PIPE WORK - GRAVITY SEWERS

PART 1 - GENERAL

1.01 DESCRIPTION: Work under this Section consists of furnishing all materials, supplies, equipment and labor in accordance with the requirements set forth herein and as shown on the drawings.

1.02 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS: The work under this Contract shall be in strict accordance with the following codes and standards.

A. All Local, County, Municipal and Federal Codes.

B. American National Standards Institute (ANSI).

C. American Society for Testing and Materials (ASTM).

D. American Water Works Association (AWWA).

E. American Association of State Highway and Transportation Officials (AASHTO).

F. Florida Department of Transportation Specifications (DOT).

G. Recommended Standards for Wastewater Facilities, (10-States Standards).

H. Florida Dept. of Environmental Protection

1.03 QUALITY ASSURANCE STANDARDS:

A. American National Standards Institute, Inc. (ANSI)/ American Water Works Association (AWWA).

1. ANSI/AWWA C105-88, Polyethylene Encasement for Ductile - Iron Piping for Water and Other Liquids.

2. ANSI/AWWA C110-87, Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In., for Water and Other Liquids.

3. ANSI/AWWA C111-90, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

4. ANSI/AWWA C115-88, Flanged Ductile-Iron Pipe with Threaded Flanges.

5. ANSI/AWWA C150-R86, Thickness Design of Ductile-Iron Pipe.

6. ANSI/AWWA C151-86, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

7. ANSI/AWWA C153-88, Ductile Iron Compact Fittings, 3-inch through 16 inch, for water and other liquids.

8. AWWA C600-87, Installation of Ductile-Iron Water Mains and Their Appurtenances.

B. American Society for Testing and Materials (ASTM)

1. ASTM C828, Standard Practice for Low-Pressure Air Test of Vitrified Clay Pipe Lines.

2. D-2321, Standard Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe.

3. D-3034, Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.

4. ASTM D-3212, Joints for Drain and Sewer Pipes using Flexible Elastomeric Seals.

C. Manufacturer's name and model numbers are listed to establish a standard of quality. Equivalent items of other manufacturers are acceptable.

1.04 SUBMITTALS:

A. Submit manufacturer's certification of materials' conformance to specifications.

B. Submit manufacturer's literature, catalog data and installation instructions.

C. Submit certified field pressure test reports.

1.05 PRODUCT DELIVERY AND HANDLING:

A. Exercise care to prevent damage of product during loading, transporting, unloading and storage.

B. Do NOT drop pipe or fittings.

C. Do not store directly on ground and assure that materials are kept clean.

D. Store material in areas approved by the Owner.

E. Store material in such a manner as to not create a nuisance or safety hazard.

PART 2 - PRODUCTS

2.01 PIPE:

A. General: Pipe shall be furnished free from defects impairing strength and durability and should be of best commercial quality for purpose specified. Structural properties shall be sufficient to safely sustain or withstand strains to which it is normally subjected.

B. Pipe Materials:

1. Ductile Iron (D.I.) ANSI/AWWA C151.:

a. Metal Thickness, ANSI/AWWA C150:
1) 3 and 4 In.: Class 51.
2) 6 in. and Larger: Class 50.
3) Jack and Bore Crossings: Class 52.

b. Interior Lining, ASTM D1248; Polyethylene Lined.

c. Exterior Coating, Bituminous Coating, 1 Mil thick.

2. Polyvinyl Chloride (PVC):

a. Specification: ASTM D-3034.

b. Thickness: SDR 35

C. Pipe Joints:

1. Ductile Iron:

a. Mechanical: ANSI/AWWA C111.

b. Push On: ANSI/AWWA C111, single gasket type.

c. Flanged: ANSI B16.1, 125lb.

d. Restrained: Acceptable: Lock-Fast, American Ductile Iron Pipe; TR Flex, U.S. Pipe; Super-Lock, Clow Corporation.

2. Polyvinyl Chloride:

a. Push On: ASTM D-3212.

D. Pipe Marking and Identification:

1. Ductile Iron Pipe: Pipe shall have permanent marking tape attached with the words "GRAVITY SEWER" along the tape and attached to the pipe for its entire length. In addition, marking tape shall be placed in the trench over the pipe, six to twelve inches below finished grade, for the entire length of pipe.

2. PVC Pipe: All PVC gravity sewer pipe shall be manufacturer's standard green color or shall have permanent marking tape attached with the words "GRAVITY SEWER" printed along the tape and attached to the pipe for its entire length. In addition, marking tape shall be placed in the trench over the pipe, six to twelve inches below finished grade, for the entire length of pipe.

2.02 Pipe Fittings:

A. Ductile Iron:

1. ANSI/AWWA C110, Ductile Iron Fittings.

2. ANSI/AWWA C153, Ductile Iron Compact Fittings.

3. ASTM D1248: Polyethylene Lined.

4. Mechanical: ANSI/AWWA C111.

5. Push On: AWSI/AWWA C111.

6. Flanged: ANSI B16.1, 125 lb.

7. Restrained-Ductile Iron: Same as Ductile IronPipe Joints.

B. Polyvinyl Chloride:

1. ASTM D3034, PVC Bell and Spigot Fittings.

2. ASTM D3212, Joints.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. General: The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths indicated on the drawings or as necessary. This shall include all necessary clearing and grubbing of any foreign substance encountered within the structure or trench area. Excavated material suitable for backfill shall be piled in an orderly manner at a sufficient distance from the trench to prevent slides or cave-ins.

B. Protection of Existing Facilities and Utilities: All existing improvements such as pavements, conduit, poles, pipes and other structures, shall be carefully supported and fully protected from injury and, in case of damage, they shall be restored by the Contractor without compensation. Existing utilities and other underground obstructions are shown on the plans, but the accuracy of the locations an depths is not guaranteed. The Contractor shall contact all utilities prior to construction and arrange for the necessary assistance in

locating and protecting the existing utilities. The Contractor shall be responsible for damages to these existing utilities and shall, in case they are damaged, restore them to their original condition.

C. Trench Excavation: The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint plus 8 in. each side of pipe for unsheeted or sheeted trench, with the maximum width of trench, measured at the top of the pipe, not to exceed the outside pipe diameter, plus 24 in., unless otherwise shown on the drawings. Trench walls shall be maintained vertical from the bottom of the trench to a line measured at the top of the pipe. From the top of the pipe to the surface of the trench walls shall be as vertical as possible under soil conditions.

No more than 300 linear feet of trench shall be open in advance of the completed pipe laying operation without prior approval of the Engineer. Pipe trenches across roadways and driveways shall be backfilled as soon as the pipe is installed. Where, in the opinion of the Engineer, adequate detour facilities are not available, no trench shall be left open across a roadway or commercial property driveway where adequate detour routes are not available for a period in excess of 30 minutes, or as directed by the governing authority. No trench shall be left open across any roadway or driveway for more than 24 hours. It shall be the Contractor's responsibility to provide traffic control and barricades as necessary.

D. Shoring, Sheeting and Bracing: The Contractor shall do all shoring, sheeting and bracing or provide other approved facilities required to perform and protect the excavation and as necessary for the safety of the public, the employees, and the preservation of existing roads, structures and other utilities. The top of such sheeting left in place shall be cut off at a minimum elevation of 2.5 ft. below finished grade. All work shall be in accordance with the Florida Trench Safety Act.

E. Pavement Removal: The Contractor shall remove pavements as part of the trench excavation. The material from permanent pavement removal shall be carefully separated from trench excavation material and disposed of by the Contractor.

F. Boulder Removal: All rocks, stones, boulders or concrete, having any dimension larger than permitted to be used for backfill in the paragraph entitled "Backfilling" of these Specifications, shall be removed from the site and disposed of by the Contractor.

G. Disposal of Excess Materials: The Contractor shall dispose of the excavated materials not required or suitable for backfill. All surplus excavated material which is suitable for fill shall become property of the

Contractor and shall be disposed of by the Contractor at his expense.

H. Unsuitable Soil Conditions and Overdepth Excavation: Where determined by Engineer or his representative that the soils encountered in the utility trench excavation are unsuitable for pipe bedding and/or backfill, the depth of excavation shall be increased as directed by Engineer or his representative. The bottom of the excavation shall be brought up to the proper excavation elevation utilizing suitable and properly-compacted backfill material or bedding material as directed by the Engineer or his representative. Bedding material if required, shall consist of ½" to 1" diameter gravel placed in bottom of trench at a thickness of 4 to 6 inches. Suitable backfill material shall then be installed and compacted over pipe as described in Paragraph 3.03. Contractor shall receive payment for "removal and replacement of unsuitable soils" as described in the Measurement and Payment Section of these specifications.

3.02 INSTALLATION OF GRAVITY SEWERS AND SERVICES:

A. Manufacturer's Instructions: Gravity sewer pipe shall be handled, stored and installed in strict accordance with the pipe manufacturer's instructions. A copy of the manufacturer's instructions shall be kept at the site of the work at all times by the Contractor.

B. Pipe Laying: The trench shall be excavated as specified and the bottom of the trench shall be shaped to give sufficient uniform circumferential support to the lower, one-fourth of each pipe. Pipe laying shall proceed upgrade. Each pipe shall be laid true to line and grade. As the work progresses, the interior of the pipe shall be cleaned of all dirt and superfluous materials.

Where cleaning of the pipe after laying is difficult because of the small diameter, the Contractor shall keep a suitable swab or drag in the pipe and shall pull the swab forward past each joint immediately after the jointing operation. At all times when the work is not in progress on the sewer lines, the Contractor shall securely seal the open ends of all pipes in order to prevent the entrance of foreign matter. Stoppers shall be installed in the ends of all services.

In the event that it is necessary to clean the pipe by flushing with water, no water or debris shall be permitted to enter an existing or previously approved sewer. Under no conditions shall the water and debris be removed with lift station pumps or discharged into or through force mains.

C. Jointing: The bell and spigot surfaces shall be wiped free of dust, dirt, gravel or other foreign material before the application of the lubricant sealer. The

resilient joint shall be connected by first brushing upon the mating surfaces, the proper lubricant sealer as recommended by the pipe manufacturers. The spigot end shall then be centered on grade into the bell end of the last downstream pipe length and shoved home and properly seated with the application of moderate force by a pry or lever device. The pipes shall be jointed no later than five minutes after the application of the lubricant sealer. Jointing for connections with existing mains, or other special joints, shall be approved by the Engineer before use.

D. Wye and Tee Branches and House Services: The Contractor shall install a wye or tee branches where sewer connections are indicated on the drawings or are required by the Engineer. Details of branch installations are shown on the drawings.

E. Connections to Existing Manholes: Pipe connections to existing manholes shall be made so that finished work will conform as nearly as possible to essential requirements for new manhole construction.

F. Quality Assurance: It is the responsibility of the Contractor to install the sewer pipe as shown on the plans. The Contractor shall survey the newly installed line before backfilling to determine the actual invert elevations of the pipe. If the calculated slope is below the minimum acceptable requirements, the Contractor shall remove and relay the sewer pipe at his own expense before further installation continues. The Contractor shall submit the as-built information to the Engineer at the end of each work day. This information will be included in the daily inspection report. Constructed slopes shall not vary more than 5% from the design value.

3.03 BACKFILLING:

A. Material: All backfill shall be excavated material, essentially free of organic material, asphaltic concrete, clay, concrete, boulders and other deleterious material.

1. Bedding and Pipe Embedment: The material in the bedding, around the pipe and to a depth of 1 ft. over the pipe, shall be sand or a mixture of sand, shell or crushed stone properly graded and mixed so that fine grain material from the side walls of the trench or backfill above the embedment will not migrate into the backfill material. The backfill shall meet the following limitations.

a. Ductile Iron Pipe - All material shall pass through a 3/4 in. square opening laboratory sieve.

b. Plastic Pipe - All materials shall pass through a ½ in. square opening laboratory sieve.

2. Above Pipe Embedment: The material shall be sand or a mixture of sandy material with rock, stone and shell. Rock, stone and shell shall pass through a 3-1/2 inch ring.

3. Top of Backfill: The top 12 inches of the backfill shall be topsoil and/or sandy material.

4. Additional Fill: If sufficient suitable backfill material is not available from the excavation, additional fill meeting the above requirements shall be provided by the Contractor.

B. Placing and Compaction:

1. Bedding and Pipe Embedment: The backfill shall be placed by hand under and around the pipe to the springline and compacted. Particular care shall be taken to ensure that the backfill at the pipe haunch is free from voids and is properly compacted. The backfill shall be compacted to a density of not less than 98% of maximum as determined by AASHTO T-180.

   a. Above Pipe Embedment in Areas of Permanent Pavement: The backfill shall be placed in layers having a depth that will permit proper compaction but not exceeding 8" of loose measure. The backfill shall be compacted to a density of not less than 98% of maximum as determined by AASHTO T-180.

   b. Above Pipe Embedment In Areas Not Under Permanent Pavement: Within right-of-ways or other areas where permanent pavement does not exist or is not proposed, including roads, walks and driveways consisting of broken stone, gravel, clay, marl, shell, shellrock or conglomerate, the entire backfill above the pipe embedment to the subgrade of the pavement or structures shall be made with predominantly sandy material free from rock, stones or organic matter, except that rocks having a maximum dimension of 3 ½ inch will be permitted in the backfill between the elevation 1 ft. above the top of the pipe and 1 ft. below the surface. The backfill material above 1 ft. over the pipe shall be compacted to a density of not less than 85 percent of the maximum density, as determined by AASHTO T-180.

2. Miscellaneous: Backfilling around manholes, cleanouts and other structures shall be accomplished in the same manner as the connected pipe. Extreme care shall be used in backfilling wellpoint holes to prevent voids and settlement. If necessary, the holes should be plugged with a

concrete slurry, such plugging to be at the expense of the Contractor.

3. Compaction: Shall be by hand or by mechanical tampers. Care shall be taken that the pipe is not struck by the tamper. Compaction by flooding may be allowed by written authorization of the Engineer although this will not release the Contractor of the responsibility to meet the required density.

4. The Contractor is to compact the backfill in such a manner to prevent settlement. Although the requirements of 3.03 may be met, nonsettlement is not assured and Contractor is not relieved of his responsibility by such compliance.

5. PVC Pipe shall be laid and backfilled so that pipe deflection does not exceed five (5) percent.

6. The Contractor shall perform density tests at 1 foot elevation increments, starting of the base of the pipe at the following locations:

   a. Within 20 feet of each manhole.

   b. At a point halfway between manholes.

   c. At every road lane crossing.

7. The Contractor shall perform LBR Test at a minimum of 300' on center.

3.04 CULVERT REMOVAL AND REPLACEMENT:

A. Culverts, catch basins and other drainage structures that are removed or damaged during construction shall be replaced with materials and structures equal and similar to those removed or damaged. Manhole covers and gratings shall be set at the original elevations unless otherwise directed.

B. The Contractor shall take precautions against the entry of excavated and other loose material resulting from his operations from entering catch basins, culverts and other drainage structures in the vicinity of his operations. He shall maintain the cleanliness of these drainage structures in a condition equal to that prior to the commencement of his operations during the construction. The Contractor shall be responsible for all damage to persons, roads, buildings, vehicles and other property resulting from the failure of the Contractor to maintain these drainage structures.

3.05 TESTING:

A. The Contractor shall furnish all necessary equipment and labor to perform testing of all gravity sewers as set forth in the following and shall conduct such tests in

the presence of the Engineer and other authorized agencies, with five days advance written notice provided.

B. The installed sewers shall be visually inspected by "lamping" between manholes, lampholes or other structures in order to ascertain that they are clear and to correct alignment. The concentricity of the lamp image received shall be such that the diameter of said image shall have no vertical or horizontal reduction from that of the pipe inside diameter.

C. Sanitary sewers shall be tested adjacent to sections as previously approved by the Engineer. Testing shall not proceed until all facilities are complete in place and the concrete is cured. All piping shall be thoroughly cleaned prior to testing to clear the lines of all foreign matter.

D. The watertightness of a sewer which has a crown lying below groundwater level shall be tested by measuring the infiltration. The watertightness of sewers having a crown 1 inch or more above groundwater level shall be tested by filling the pipe with water to produce a hydrostatic head of 2 feet or more above the crown of the sewer at the upper end of the test section or the water table outside of the sewer, whichever is higher, and then measuring the exfiltration. In no case shall the infiltration or exfiltration exceed 75 gallons per mile per inch of diameter of sewer per 24-hour day when field tested by actual infiltration conditions. If exfiltration testing is required an allowance of an additional 10 percent of gallonage shall be permitted for each additional 2-feet head over a basic 2-feet minimum internal head.

E. Leakage testing shall proceed for a continuous period of eight hours with exfiltration or infiltration amounts measured by methods approved by the Engineer. Upon application of internal hydrostatic pressure for exfiltration testing, care shall be taken to preclude unseating the joint gaskets for a specific type of pipe by exceeding the pressure capability thereof.

F. The Contractor may use, as an alternate leakage test, air testing by compressed air from manhole to manhole. Plugs, caps and branch connections must be secured against blow-off during the test. The pipe and manholes shall be free of water during the test.

1. The air testing shall be performed in accordance with ASTM C-828 for Vitrified Clay Pipe of Sizes 4 Inch Through 12 Inch Only. For all other sizes and pipe materials, the exfiltration or infiltration test previously described shall be used.

G. Deflection Testing: The Contractor shall perform deflection tests of the pipe along the entire length of the sewer main. The internal diameter of the barrel

shall not be reduced by more than five percent (5%) of its base inside diameter when measured not less than thirty (30) days following completion of installation. A deflection of more than the specified amount shall be cause for rejection of that particular segment of pipe located between successive manholes. All locations with excessive deflection shall be excavated and repaired by rebedding or replacement of the pipe. A properly sized nine (9) point go-no-go mandrel shall be used for testing the sewer.

H. Should any of the test fail, necessary repairs shall be accomplished by the Contractor and the test repeated until within the established limits. The Contractor shall furnish the necessary labor, and all other items required to conduct the required testing, and shall perform the necessary system repairs required to comply with the specified test.

3.06 RESTORATION OF DAMAGED SURFACES, STRUCTURES AND PROPERTY: Where pavement, trees, shrubbery, fences or other property and surface structures not designated as pay items, have been damaged, removed or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the contract documents, state laws, municipal ordinances or the specific direction of the Engineer, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced and repaired at the expense of the Contractor to a condition equal to that before work began within a time frame approved by the Engineer.

3.07 WATER FOR TESTING AND FLUSHING: Water required for leakage testing and flushing shall be from a potable water source satisfactory to the utility. All water used for testing and flushing shall be paid for by the Contractor.

3.08 COST OF SAMPLING AND TESTING: All costs associated with flushing and leakage testing, shall be included in the unit price for pipe.

3.09 WATER AND SEWER LINE ORIENTATION:

A. Water Mains Crossing Above Sewer Lines: Potable water mains crossing above sanitary sewer lines (gravity and force mains) and storm sewers shall be laid to provide a minimum vertical distance of 18 inches between the invert of the water main and the crown of the sanitary sewer and/or storm sewer line. Where this minimum separation cannot be maintained, the crossing shall be arranged so that the water pipe joints and the sewer main joints are equal distance from the point of crossing with no less than 10 feet (outside of pipe to outside of pipe)between any two joints. Alternatively, the sanitary sewer and/or storm sewer main may be replaced 20 LF section(s) of ductile iron pipe with "polybond" lining, placed in a sleeve, or encased in concrete to obtain the equivalent of the required 10-foot separation of joints. However, the water or sewer line or both must be ductile iron in

the area of the crossing for ten feet in both directions. The method of obtaining separation shall be as indicated on the drawings or, or if not indicated on the drawings, as directed by the Engineer. The contractor shall notify the Engineer immediately upon encountering situations not indicated on the drawings where inadequate separation between water and sewer lines may occur.

B. Water Mains Crossing Below Sewer Lines: Water mains crossing below sanitary sewer and/or storm sewer lines, regardless of vertical separation, shall require that the sanitary sewer and/or storm sewer be replaced with "polylined" ductile iron pipe, placed in a sleeve, or encased in concrete to obtain a 10-foot minimum horizontal separation between any two pipe joints. However, the water or sewer line or both must be ductile iron in the area of the crossing for ten feet in both directions. The method of obtaining separation shall be as indicated on the drawings or , if not indicated on the drawings, as directed by the Engineer. Contractor shall notify the Engineer immediately upon encountering situations not indicated on drawings where inadequate separation between water and sewer lines may occur.

C. Horizontal Separation Between Water Mains and Sewer Lines: A minimum horizontal separation of 10 feet shall be maintained between all water main joints and all sewer line joints, regardless of whether the lines cross or rum parallel to each other. Water mains and sewer lines may be laid with less than 10 feet horizontal separation (outside of pipe to outside of pipe; 5 feet for reuse water mains) provided that one or more of the following conditions is satisfied:

1. The crown of the sewer line is a minimum of 18 inches below the invert of the water main.

2. The sewer line is constructed of or replaced with 20 LF section(s) of ductile iron pipe with "polybond" lining.

3. Sewer line is placed in a sleeve.

4. Sewer line is encased in concrete.

The method of obtaining separation shall be as indicated on the drawings or, if not indicated in the drawings, as directed by the Engineer. Contractor shall notify the Engineer immediately upon encountering situations not indicated on the drawings where inadequate separation between water and sewer lines may occur.

D. Concrete Encasement of Pipe: Where concrete encasement of pipe is required for obtaining separation from other pipes or for other reasons (e.g., inadequate cover), the pipe shall be encased with 3,000 psi concrete having a minimum thickness of 6 inches all around the outside of the pipe. Pipe must be supported in trench to allow 6

inches of concrete on all sides. Concrete must be mechanically vibrated into place. The Engineer or his representative must be present at the time of encasement.

3.10 PROTECTION: At the end of each workday, the mains under construction shall be plugged to prevent the entry of small animals and rodents. Temporary plugs shall be provided for this purpose.

3.11 RESTORATION OF DAMAGED SURFACES, STRUCTURES, AND PROPERTY: Where pavement, trees, shrubbery, fences, or other property and surface structures not designated as pay items have been damaged, removed, or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the contract documents, state laws, county or municipal ordinances, or the specific directions of the Engineer, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced or repaired at the expense of the Contractor to a condition equal to that before work began within a time frame approved by the Engineer.

3.12 RESTORATION AND CLEANUP:

A. Restoration:

1. General: Restoration of areas disturbed by the Contractor's operations shall begin as soon as practical. Contractor's restoration operations shall keep pace with utility installation. Engineer reserves the right to halt utility installation until restoration and cleanup requirements are satisfied.

2. Time Frame for Restoration: Restoration of areas disturbed by the Contractor's operations shall begin no later than 14 days and shall be completed (excluding punch list items) no later than 28 days from the time construction first began in the area. No more than 1,000 LF along the path of the work may be completely unrestored (excluding punch list items) at the end of each day.

B. Cleanup: The Contractor shall maintain the site of the work in a neat condition. The Contractor shall remove all excess materials, excess excavated materials, and all debris resulting from his operations a minimum of once per week.

END OF SECTION

SECTION 02730

PIPE WORK - FORCE MAINS

PART 1 - GENERAL

1.01 DESCRIPTION: Work under this Section consists of furnishing all materials, supplies, equipment and labor in accordance with the requirements set forth herein and as shown on the drawings.

1.02 APPLICABLE CODES, STANDARDS AND SPECIFICATIONS: The work under this Contract shall be in strict accordance with the following codes and standards.

A. All Local, County, Municipal and Federal Codes.

B. American National Standards Institute (ANSI).

C. American Society for Testing and Materials (ASTM).

D. American Water Works Association (AWWA).

E. American Association of State Highway and Transportation Officials (AASHTO).

F. Florida Department of Transportation Specifications (DOT).

G. Recommended Standards for Wastewater Facilities (10-States Standards).

H. Florida Dept. of Environmental Protection.

1.03 QUALITY ASSURANCE STANDARDS:

A. American National Standards Institute, Inc. (ANSI)/ American Water Works Association (AWWA).

1. ANSI/AWWA C105-88, Polyethylene Encasement for Ductile - Iron Piping for Water and Other Liquids.

2. ANSI/AWWA C111-90, Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings.

3. ANSI/AWWA C115-88, Flanged Ductile-Iron Pipe with Threaded Flanges.

4. ANSI/AWWA C150-R86, Thickness Design of Ductile-Iron Pipe.

5. ANSI/AWWA C151-86, Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.

6. ANSI/AWWA C153-88, Ductile-Iron Compact Fittings, 3 In. Through 16 In., for Water and Other Liquids.

7. AWWA C509-87, Resilient-Seated Gate Valves for Water and Sewage Systems.

8. AWWA C600-87, Installation of Ductile-Iron Water Mains and Their Appurtenances.

9. AWWA C900-89, Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution.

B. American Society for Testing and Materials (ASTM)

1. D1785-76, Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120.

2. D-2464, Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fillings, Schedule 80.

3. D2467-78, Socket Type Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

4. D2564-80, Solvent Chemicals for Poly (Vinyl Chloride) (PVC) Plastic Pipe and Fittings.

5. D2855-81, Making Solvent Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

C. Manufacturer's name and model numbers are listed to establish a standard of quality. Equivalent items of other manufacturers are acceptable.

1.04 SUBMITTALS:

A. Submit manufacturer's certification of materials' conformance to specifications.

B. Submit manufacturer's literature, catalog data and installation instructions.

C. Submit certified field pressure test reports.

1.05 PRODUCT DELIVERY AND HANDLING:

A. Exercise care to prevent damage of product during loading, transporting, unloading and storage.

B. Do NOT drop pipe or fittings.

C. Do not store directly on ground and assure that materials are kept clean.

D. Store material in areas approved by the Owner.

E. Store material in such a manner as to not create a nuisance or safety hazard.

PART 2 - PRODUCTS

2.01 PIPE:

A. General: Pipe shall be furnished free from defects impairing strength and durability and should be of best commercial quality for purpose specified. Structural properties shall be sufficient to safely sustain or withstand strains to which it is normally subjected.

B. Pipe Materials:

1. Ductile Iron (D.I.) ANSI/AWWA C151.:

a. Metal Thickness, ANSI/AWWA C150:

1) 3 and 4 In.: Class 51.
2) 6 in. and Larger: Class 50.
3) Jack and Bore Crossings: Class 52.

b. Interior Lining, ASTM D1248: Polyethylene lined.

c. Exterior Coating, Bituminous Coating, 1 Mil thick.

2. Polyvinyl Chloride (PVC) 4 In. and Larger:

a. Specification: AWWA C900.

b. Compound: PVC 12454-B, ASTM D 1784.

c. Thickness: Class 150, DR 18.

3. Polyvinyl Chloride (PVC), 3 In. and Smaller:

a. Specification: ASTM D1785.

b. Compound: PVC 12454-B, ASTM D1784.

c. Thickness: Schedule 80.

C. Pipe Joints:

1. Ductile Iron:

a. Mechanical: ANSI/AWWA C111.

b. Push On: ANSI/AWWA C111, single gasket type.

c. Flanged: ANSI B16.1, 125lb.

d. Restrained: Acceptable: Lock-Fast, American Ductile Iron Pipe; TR Flex, U.S. Pipe; Super-Lock, Clow Corporation.

2. Polyvinyl Chloride, 4 In. and Larger:

   a. Push On: ASTM F477 Elastomeric Gaskets

   b. Restrained: UNI-BELL B-13, Uni-Flange Restrainer.

3. Polyvinyl Chloride, 3 In. and Smaller:

   a. Screwed: ASTM D2464.

   b. Solvent Weld: ASTM D2855.

   c. Solvent: ASTM D2564.

D. Pipe Fittings:

1. Ductile Iron and Polyvinyl Chloride (PVC) 4 In. and Larger:

   a. ANSI/AWWA C153, compact fittings.

   b. ASTM D1248: Polyethylene Lined.

   c. Mechanical: ANSI/AWWA C111.

   d. Push On: AWSI/AWWA C111.

   e. Flanged: ANSI B16.1, 125 lb.

   f. Restrained-Ductile Iron: Same as Ductile Iron Pipe Joints.

   g. Restrained-PVC: Same as PVC Pipe Joints.

   h. Linings and Coatings: Same as for Ductile-Iron Pipe.

2. Polyvinyl Chloride (PVC) 3 In. and Smaller:

   a. ASTM D2464, Schedule 80 PVC threaded fittings.

   b. ASTM D2467, Schedule 80 PVC socket type fittings.

   c. ASTM D2855, solvent weld joints.

E. Pipe Marking and Identification:

1. Ductile Iron Pipe: Permanent marking tape, with the words "SANITARY FORCE MAIN" printed along the tape, shall be attached to the pipe for its entire length. In addition, similar marking tape shall be placed in the trench over the pipe, six to twelve inches below finished grade, for the entire length of pipe.

a. PVC Pipe: All PVC force main pipe shall be manufacturer's standard brown color or green color for sanitary force mains and lavender for reuse mains or shall have permanent marking tape attached with the words "SANITARY FORCE MAIN" printed along the tape. In addition, similar marking tape shall be placed in the trench over the pipe, six to twelve inches below finish grade, for the entire length of pipe.

b. All non-metallic water main pipe installed underground shall have a #14 gauge THHN trace wire (green in color for sewer and lavender for reuse) attached for locating purposes. Half hitches shall be made behind each pipe bell and on each side of a valve or fitting. Branch splices shall be made at all tees and service lines. Trace wire shall be run into valve boxes as shown on valve detail. Watertight splicing connectors shall be utilized for all splices. Contractor shall be responsible for continuity of trace wire.

2.02 PLUG VALVES:

A. Non-lubricated, eccentric plug type with cast iron body, stainless steel bearings, balanced plug coated with E.P.T. (ethylene-propylene terpolymer or neoprene).

1. Minimum port area:

Valves less than 24 inch: 80% of pipe area
Valves 24 inch or larger: 70% of pipe area

2. Valve shall be designed for easy conversion from wrench-operated to gear-operated in field.

B. Operators: All valves 8 inch or larger shall have totally enclosed worm and gear operators.

C. Accessories:

1. Buried Valves 6 Inch and Smaller: Provide 2-inch square nut.

2. Buried Plug Valves 8 Inch or Larger: Provide buried worm gear activator.

3. Valves Not Buried: Provide handwheels for valves equipped with geared operators and valve wrenches of adequate size and length for all valves without geared operators.

4. Acceptable Manufacturers or Equal: DeZurik, Ecolaire Valve Co., Dresser Industries or equal.

2.03 GATE VALVES:

A. Three Inch and Larger: Shall be AWWA C509, iron body, resilient seat, non-rising bronze stem with 2" square operating nut on buried valves, turn to left (counter clockwise) to open.

1. Working pressure of 200 psi.

2. Internal Metal Surfaces shall have two-part thermosetting epoxy coating, 4 mils thick.

3. Sealing Mechanism shall have zero leakage at 200 psi with flow in either direction.

4. End Conditions: Fit joints specified and/or required for piping.

5. Acceptable: Mueller Series A-2370, American CRS-80 or equal.

2.04 VALVE BOXES:

A. Provide at all manually operated valves installed on underground lines.

B. ASTM A-48, cast iron, Class 30-B, 3-piece screw extension type, with cover marked "SEWER" and flared base to suit valve furnished.

C. Acceptable: Figure No. F-2450, Clow Corporation; Catalog No. H10357, Mueller Co.; Figure No. E-3002, M & H Valve and Fittings Co. or equal.

2.05 PLASTIC LOCATING AND MARKING TAPE:

A. Pipe shall be plastic coated foil with a minimum width of 2 inches. Tape shall be highly visible and shall have the words "SANITARY FORCE MAIN" in at least 1" letters printed at least every 36 inches along the tape. Tape shall be located one foot below ground surface directly above the centerline of the pipe. Tape shall be Allen Marking Tape or equal.

PART 3 - EXECUTION

3.01 EXCAVATION:

A. General: The Contractor shall perform all excavation of every description and of whatever substances encountered to the depths indicated on the drawings or as necessary. This shall include all necessary clearing and grubbing of any foreign substance encountered within the structure or trench area. Excavated material suitable for backfill shall be piled in an orderly manner at a sufficient distance from the trench to prevent slides or cave-ins.

B. Protection of Existing Facilities and Utilities: All existing improvements such as pavements, conduit, poles, pipes and other structures, shall be carefully supported and fully protected from injury and, in case of damage, they shall be restored by the Contractor without compensation. Existing utilities and other underground obstructions are shown on the plans, but the accuracy of the locations and depths is not guaranteed. The Contractor shall contact all utilities prior to construction and arrange for the necessary assistance in locating and protecting the existing utilities. The Contractor shall be responsible for damages to these existing utilities and shall, in case they are damaged, restore them to their original condition.

C. Trench Excavation: The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint plus 8 in. each side of pipe for unsheeted or sheeted trench, with the maximum width of trench, measured at the top of the pipe, not to exceed the outside pipe diameter, plus 24 in., unless otherwise shown on the drawings. Trench walls shall be maintained vertical from the bottom of the trench to a line measured at the top of the pipe.

From the top of the pipe to the surface of the trench walls shall be as vertical as possible under soil conditions.

No more than 300 linear feet of trench shall be open in advance of the completed pipe laying operation without prior approval of the Engineer. Pipe trenches across roadways and driveways shall be backfilled as soon as pipe is installed. Where, in the opinion of the Engineer, adequate detour facilities are not available, no trench shall be left open across a roadway or commercial property driveway where adequate detour routes are not available for a period in excess of 30 minutes, or as directed by the governing authority. No trench shall be left open across any roadway or driveway for more than 24 hours. It shall be the Contractor's responsibility to provide traffic control and barricades as necessary.

D. Shoring, Sheeting and Bracing: The Contractor shall do all shoring, sheeting and bracing or provide other approved facilities required to perform and protect the excavation and as necessary for the safety of the public, the employees, and the preservation of existing roads, structures and other utilities. The top of such sheeting left in place shall be cut off at a minimum elevation of 2.5 ft. below finished grade. All excavation work shall be in accordance with the Florida Trench Safety Act.

E. Pavement Removal: The Contractor shall remove pavements as part of the trench excavation. The material from permanent pavement removal shall be carefully separated from trench excavation material and disposed of by the Contractor.

F. Boulder Removal: All rocks, stones, boulders or concrete, having any dimension larger than permitted to be used for backfill in the paragraph entitled "Backfilling" of these Specifications, shall be removed from the site and disposed of by the Contractor.

G. Disposal of Excess Materials: The Contractor shall dispose of the excavated materials not required or suitable for backfill. All surplus excavated material which is suitable for fill shall become property of the Contractor and shall be disposed of by the Contractor at his expense.

H. Unsuitable Soil Conditions and Overdepth Excavation: Where determined by Engineer or his representative that the soils encountered in the utility trench excavation are unsuitable for pipe bedding and/or backfill, the depth of excavation shall be increased as directed by Engineer or his representative. The bottom of the excavation shall be brought up to the proper excavation elevation utilizing suitable and properly-compacted backfill material or bedding material as directed by the Engineer or his representative. Bedding material if required, shall consist of ½" to 1" diameter gravel placed in bottom of trench at a thickness of 4 to 6 inches. Suitable backfill material shall then be installed and compacted over pipe as described in Paragraph 3.03. Contractor shall receive payment for "removal and replacement of unsuitable soils" as described in the Measurement and Payment Section of these specifications.

3.02 INSTALLATION OF FORCE MAINS:

A. General: Unless otherwise noted on the drawings or in other sections of this Specification, the pipe shall be handled and installed in strict accordance with the manufacturer's instructions and with the applicable AWWA or ASTM Standards.

1. Ductile Iron Pipe - AWWA C-600.

2. Polyvinyl Chloride Pipe - ASCE Manual No. 37, ASTM D2321.

3. If a conflict exists between the manufacturer's instructions and the AWWA or ASTM Standards, the manufacturer's instructions shall govern.

4. Examine area to receive pipe work for defects that adversely affect execution of work or cause deviation beyond allowable tolerances for piping clearances.

5. Carefully examine each section of pipe or valve before installation. Do not use defective or damaged pipe or materials. Remove such pipe or material from project site immediately.

B. Preparation: The Contractor shall use every precaution during construction to protect the pipe against the entry of nonpotable water, dirt, wood, small animals and other foreign material that would hinder the operation of the pipeline. Where the groundwater elevation is above the bottom of the trench, the Contractor shall provide suitable dewatering equipment. All piping shall be placed in a dry trench, unless wet trench installation is approved by the Engineer.

C. Depth of Cover: Unless otherwise shown on the drawings, or otherwise authorized by the Engineer, the pipe shall have a minimum cover of 30 inches in unpaved areas and 36 inches in paved areas.

D. Connections to Existing Mains: The Contractor shall make connections to existing mains as shown on the drawings. Connections shall be made only after arrangements have been completed by the Contractor with the Owner of the system and shall be under the System Owner's immediate supervision. Contractor shall be required to restrain existing pipe as necessary in accordance with pipe restraint schedule.

E. Pipe Thrust Restraints: Mechanical restrainers shall be installed as required to properly restrain all piping systems. At a minimum, restrainers shall be provided on all below-grade valves and fittings and at the required number of pipe joints in each direction. Required lengths of restrained pipe shall be as shown in pipe restraint schedule at end of this paragraph for the type of soil encountered. For above-grade piping, all valves and fittings shall be threaded, flanged or solvent welded with supports as required.

PIPE RESTRAINT SCHEDULE

MINIMUM LENGTH OF PIPE (IN FEET) REQUIRED TO BE RESTRAINED ON EACH SIDE OF A VALVE OR FITTING FOR SANDY SOILS (SW, SP, SM, SC)

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	≤22.5° BEND	TEE OR CROSS	VERTICAL		REDUCER[b]	VALVE	DEAD END
						LOW	HIGH			
PVC PIPE	≤4	18	18	18	18	18	22	36	18	52
	6	24	18	18	18	18	30	38	36	73
	8	31	18	18	18	18	40	69	36	96
	10	37	18	18	18	18	48	93	54	115
	12	43	18	18	18	18	56	99	54	136
	14	49	20	18	18	18	64	101	72	155
	16	55	23	18	18	18	72	103	72	174
	18	60	25	18	36	20	80	104	72	192
	20	65	27	18	36	21	87	105	72	211
	24	75	31	18	36	25	102	134	90	246
	30	88	37	18	36	29	122	185	90	295

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	≤22.5° BEND	TEE OR CROSS	VERTICAL		REDUCER[b]	VALVE	DEAD END
						LOW	HIGH			
DUCTILE IRON	≤4	18	18	18	18	18	18	18	18	33
	6	20	18	18	18	18	19	35	36	47
	8	26	18	18	18	18	25	44	36	61
	10	31	18	18	18	18	30	60	54	73
	12	37	18	18	18	18	36	63	54	86
	14	41	18	18	18	18	41	64	72	98
	16	46	19	18	36	18	46	66	72	111
	18	51	21	18	36	18	51	66	72	122
	20	56	23	18	36	18	56	67	72	134
	24	64	27	18	36	21	65	85	90	156
	30	75	31	18	36	25	78	118	90	188

PIPE RESTRAINT SCHEDULE

MINIMUM LENGTH OF PIPE (IN FEET) REQUIRED TO BE RESTRAINED ON EACH SIDE OF A VALVE OR FITTING FOR CLAYEY AND SILTY SOILS (CL, CH, ML, MH)

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	≤22.5° BEND	TEE OR CROSS	VERTICAL OFFSET[a]		REDUCER[b]	VALVE	DEAD END
						LOW	HIGH			
PVC PIPE	≤4	19	18	18	18	18	23	36	18	55
	6	26	18	18	18	18	32	40	36	77
	8	35	18	18	18	18	42	73	36	101
	10	42	18	18	18	18	50	98	54	121
	12	50	21	18	18	18	59	104	54	143
	14	57	23	18	36	20	67	106	72	163
	16	64	27	18	36	23	76	109	72	183
	18	71	29	18	36	25	84	109	72	202
	20	78	32	18	36	28	92	110	72	221
	24	92	38	18	36	33	107	140	90	258
	30	110	46	22	54	40	127	193	90	308

PIPE TYPE	PIPE SIZE	90° BEND	45° BEND	≤22.5° BEND	TEE OR CROSS	VERTICAL OFFSET[a]		REDUCER[b]	VALVE	DEAD END
						LOW	HIGH			
DUCTILE IRON	≤4	18	18	18	18	18	18	18	18	35
	6	22	18	18	18	18	20	25	36	49
	8	29	18	18	18	18	27	46	36	64
	10	35	18	18	18	18	32	62	54	77
	12	41	18	18	18	18	37	66	54	90
	14	47	20	18	18	18	43	67	72	103
	16	53	22	18	36	19	48	68	72	115
	18	59	24	18	36	21	53	69	72	127
	20	65	27	18	36	23	58	70	72	140
	24	76	31	18	36	27	67	89	90	162
	30	91	38	18	36	32	80	122	90	194

Assumptions:

1. Pipe Test Pressure = 150 PSI
2. Minimum Pipe Depth = 3.0 Feet
3. Laying Condition = Type 5
4. Safety Factor = 2.0

[a] "Low" represents the minimum length of pipe (in feet) required to be restrained on the low side of the vertical offset, which is typically downstream of the offset fitting. "High" represents the minimum length of pipe (in feet) required to be restrained on thehigh side of the vertical offset, which is typically upstream of the offset fitting. Required restrained lengths assume an offset angle $\leq 45^{\circ}$.

[b] Distance represents the linear feet of large diameter pipe upstream of the reducer required to be restrained. Restrain small diameter pipe at reducer at a minimum. If there is an unobstructed run downstream of the reducer (i.e. small diameter pipe) of at least 2.5 times the required length of large diameter pipe to be restrained, then restraint is required only at the reducer fitting. If small end of reducer is more than three pipe sizes smaller than large end, consult Engineer for required length to be restrained.

3.03 BACKFILLING:

A. Material: All backfill shall be excavated material, essentially free of organic material, asphaltic concrete, clay, concrete, boulders and other deleterious material.

1. Bedding and Pipe Embedment: The material in the bedding, around the pipe and to a depth of 1 ft. over the pipe, shall be sand or a mixture of sand, shell or crushed stone properly graded and mixed so that fine grain material from the side walls of the trench or backfill above the embedment will not migrate into the backfill material. The backfill shall meet the following limitations.

a. Ductile Iron Pipe - All material shall pass through a 3/4 in. square opening laboratory sieve.

b. Plastic Pipe - All materials shall pass through a 1/2 in. square opening laboratory sieve.

2. Above Pipe Embedment: The material shall be sand or a mixture of sandy material with rock, stone and shell. Rock, stone and shell shall pass through a 3-1/2 inch ring.

3. Top of Backfill: The top 12 inches of the backfill shall be topsoil and/or sandy material.

4. Additional Fill: If sufficient suitable backfill material is not available from the excavation, additional fill meeting the above requirements shall be provided by the Contractor.

B. Placing and Compaction:

1. Under Pavement: Where the excavation is made through existing or proposed pavements, including shoulders, curbs, driveways, sidewalks, or structures, the entire backfill to the subgrade of

the pavement or structures shall be made with predominantly sandy material free from rock, stones or organic matter, except that rocks passing a 3-1/2 inch ring will be permitted in the backfill between the elevation one foot above the top of the pipe and the bottom of the pavement subgrade.

The entire backfill material, including the material placed around and one foot above the pipe, shall be compacted to a density of not less than 98% of the maximum density, as determined by AASHTO T-180. Particular care shall be taken to insure that the backfill at the haunch is free from voids and is properly compacted. Compaction by flooding or puddling will be permitted only by written authorization from the Engineer.

Roads, walks and driveways consisting of broken stone, gravel, clay, marl, shell, shellrock, or a conglomerate of such materials, are not considered as being permanent pavement.

2. In Areas Not Under Permanent Pavement: Within right-of-ways or other areas where permanent pavement does not exist or is not proposed, including roads, walks and driveways consisting of broken stone, gravel, clay, marl, shell, shellrock or conglomerate, the entire backfill to the subgrade of the pavement or structures shall be made with predominantly sandy material free from rock, stones or organic matter, except that rocks having a maximum dimension of 3 ½ inch will be permitted in the backfill between the elevation 1 ft. above the top of the pipe and 1 ft. below the surface. Particular care shall be taken to insure that the backfill at the haunch is free from voids and is properly compacted. The bedding and embedment shall be compacted to a density of not less than 98 percent of maximum as determined by AASHTO T-180. The backfill material above 1 ft over the pipe shall be compacted to a density of not less than 85 percent of the maximum density, as determined by AASHTO T-180. Compaction by flooding or puddling will be permitted only by written authorization from the Engineer.

3. Miscellaneous: Backfilling around meter boxes, valve boxes and other structures shall be accomplished in the same manner as the connected pipe. Extreme care shall be used in backfilling wellpoint holes to prevent voids and settlement. If necessary, the holes should be plugged with a concrete slurry, such plugging to be at the expense of the Contractor.

4. Compaction Tests: The Engineer may at any time instruct the Contractor to partially excavate a previously backfilled trench or temporarily

backfilling of a short section of the trench for the purpose of obtaining measurements of the density of the backfill. The testing will be paid for by the Contractor. The cost of the partial excavation and restoration of the backfill will be paid for by the Contractor. Any test failures will be paid by the Contractor. Density and LBR tests shall be taken along the pipe at a maximum distance between tests of 300 feet.

3.04 CULVERT REMOVAL AND REPLACEMENT:

A. Culverts, catch basins and other drainage structures that are removed or damaged during construction shall be replaced with materials and structures equal and similar to those removed or damaged. Manhole covers and gratings shall be set at the original elevations unless otherwise directed.

B. The Contractor shall take precautions against the entry of excavated and other loose material resulting from his operations from entering catch basins, culverts and other drainage structures in the vicinity of his operations. He shall maintain the cleanliness of these drainage structures in a condition equal to that prior to the commencement of his operations during the construction. The Contractor shall be responsible for all damage to persons, roads, buildings, vehicles and other property resulting from the failure of the Contractor to maintain these drainage structures.

3.05 TESTING:

A. Flushing of Completed Pipelines: Contractor shall flush out system before conducting leakage/pressure tests in order to remove air, dirt, debris, etc. from pipe. Pipe must be full-line flushed meaning the temporary flushing discharge piping and fittings must be the same diameter as the pipe it is connected to, unless otherwise authorized by the Engineer. Minimum velocity for flushing shall be 2.5 fps. Install corporation stops at any high points in line in order to bleed air from pipe. Contractor shall make provisions to properly dispose of water from his flushing operations. Flooding of streets and private property shall not be permitted. Contractor shall arrange with the utility 24 hours in advance of the time of flushing for the availability of water.

B. Hydrostatic Pressure Test: The Contractor shall notify the Owner a minimum of 24 hours in advance of final pressure and leakage test. The pipe lines shall be tested in sections between every consecutive in-line valve, unless otherwise directed by the Engineer. The pressure required for the field hydrostatic pressure test shall average not less than 100 psi and shall be maintained between 95 and 105 psi for the duration of the test. The Contractor shall provide temporary plugs and blocking necessary to maintain the required test

pressure. Duration of pressure test shall be at least two hours.

C. Leakage Test: The leakage test shall be conducted concurrently with the hydrostatic pressure test and shall be of not less than two hours in duration. All leaks evident at the surface shall be repaired and leakage eliminated regardless of total leakage shown by test. Lines which fail to pass tests shall be repaired and retested as necessary until test requirements are complied with. Defective materials, pipes, valves, and accessories shall be removed and replaced. The pipe lines shall be tested in sections between every consecutive in-line valve unless otherwise directed by the Engineer. The line shall be filled with water and all air removed, and the test pressure shall be maintained in the pipe for the entire test period by means of a force pump to be furnished by the Contractor. Accurate means shall be provided by the Contractor for measuring the water required to maintain this pressure. The amount of water required is a measure of the leakage. No pipe installation will be accepted until the leakage is less than 10 gallons per inch of pipe diameter per mile of pipe per 24 hours.

D. Testing Plan: The Contractor must review his plan for testing with the Engineer at least two (2) working days before starting the test. The Contractor shall remove and adequately dispose of all blocking material and equipment after completion and acceptance of the field hydrostatic test, unless otherwise directed by the Engineer. Any damage to the pipe coating shall be repaired by the Contractor. Lines shall be totally free of debris prior to final acceptance.

3.07 WATER FOR FLUSHING AND TESTING: Water required for testing and flushing shall be from a potable water source satisfactory to the utility. All water used for testing and flushing shall be paid for by the Contractor.

3.08 COST OF TESTING: All costs associated with flushing and pressure testing force mains shall be included in the unit price for pipe.

3.09 WATER AND SEWER LINE ORIENTATION:

A. Water Mains Crossing Above Sewer Lines: Potable water mains crossing above sanitary sewer lines (gravity and force mains) and storm sewers shall be laid to provide a minimum vertical distance of 18 inches between the invert of the water main and the corner of the sanitary sewer and/or storm sewer line. Where this minimum separation cannot be maintained, the crossing shall be arranged so that the water pipe joints and the sewer main joints are equal distance from the point of crossing with no less than 10 feet (outside of pipe to outside of pipe) between any two joints. Alternatively, the sanitary sewer and/or storm sewer main may be replaced with 20 LF section(s) of

ductile iron pipe with "polybond" lining, placed in a sleeve, or encased in concrete to obtain the equivalent of the required 10-foot separation of joints. However, the water or sewer line or both must be ductile iron in the area of the crossing for ten feet in both directions. The method of obtaining separation shall be as indicated on the drawings or, if not indicated on the drawings, as directed by the Engineer. The Contractor shall notify the Engineer immediately upon encountering situations not indicated on the drawings where inadequate separation between water and sewer lines may occur.

B. Water Mains Crossing Below Sewer Lines: Water mains crossing below sanitary sewer and/or storm sewer lines, regardless of vertical separation, shall require that the sanitary sewer and/or storm sewer be replaced with "polylined" ductile iron pipe, placed in a sleeve, or encased in concrete to obtain a 10-foot minimum horizontal separation between any two pipe joints. However, the water or sewer line or both must be ductile iron in the area of the crossing for ten feet in both directions. The method of obtaining separation shall be as indicated on the drawings or, if not indicated on the drawings, as directed by the Engineer. Contractor shall notify the Engineer immediately upon encountering situations not indicated on drawings where inadequate separation between water and sewer lines may occur.

C. Horizontal Separation Between Water Mains and Sewer Lines: A minimum horizontal separation of 10 feet shall be maintained between all water main joints and all sewer line joints, regardless of whether the lines cross or run parallel to each other. Water mains and sewer lines may be laid with less than 10 feet horizontal separation (outside of pipe to outside of pipe; 5 feet for reuse water mains) provided that one or more of the following conditions is satisfied:

1. The crown of the sewer line is a minimum of 18 inches below the invert of the water main.

2. The sewer line is constructed of or replaced with 20 LF sections(s) of ductile iron pipe with "polybond" lining.

3. Sewer line is placed in a sleeve.

4. Sewer line is encased in concrete.

The method of obtaining separation shall be as indicated on the drawings or, if not indicated in the drawings, as directed by the Engineer. Contractor shall notify the Engineer immediately upon encountering situations not indicated on the drawings where inadequate separation between water and sewer lines may occur.

D. Concrete Encasement of Pipe: Where concrete encasement of pipe is required for obtaining separation from other

pipes or for other reasons (e.g., inadequate cover), the pipe shall be encased with 3,000 psi concrete having a minimum thickness of 6 inches all around the outside of the pipe. Pipe must be supported in trench to allow 6 inches of concrete on all sides. Concrete must be mechanically vibrated into place. The Engineer or his representative must be present at the time of encasement.

3.10 PROTECTION: At the end of each workday, the mains under construction shall be plugged to prevent the entry of small animals and rodents. Temporary plugs shall be provided for this purpose.

3.11 RESTORATION OF DAMAGED SURFACES, STRUCTURES, AND PROPERTY: Where pavement, trees, shrubbery, fences, or other property and surface structures not designated as pay items have been damaged, removed, or disturbed by the Contractor, whether deliberately or through failure to carry out the requirements of the contract documents, state laws, county or municipal ordinances, or the specific directions of the Engineer, or through failure to employ usual and reasonable safeguards, such property and surface structures shall be replaced or repaired at the expense of the Contractor to a condition equal to that before work began within a time frame approved by the Engineer.

3.12 RESTORATION AND CLEANUP:

A. Restoration:

1. General: Restoration of areas disturbed by the Contractor's operations shall begin as soon as practical. Contractor's restoration operations shall keep pace with utility installation. Engineer reserves the right to halt utility installation until restoration and cleanup requirements are satisfied.

2. Time Frame for Restoration: Restoration of areas disturbed by the Contractor's operations shall begin no later than 14 days and shall be completed (excluding punch list items) no later than 28 days from the time construction first began in the area. No more than 1,000 LF along the path of the work may be completely unrestored (excluding punch list items) at the end of each day.

B. Cleanup: The Contractor shall maintain the site of the work in a neat condition. The Contractor shall remove all excess materials, excess excavated materials, and all debris resulting from his operations a minimum of once per week.

END OF SECTION

DIVISION 11

Equipment

SECTION 11320

SUBMERSIBLE SEWAGE PUMPS AND PUMP STATIONS

PART 1 - GENERAL

1.01 SCOPE: Work covered by this section of the specifications shall consist of furnishing all labor, equipment, supplies, and materials necessary for performing all operations in connection with the construction of the wastewater pumping station and appurtenant facilities in accordance with the applicable drawings and specifications. Lift station shall consist of two submersible pumps located in a concrete wetwell. It shall be the Contractor's responsibility to supply a completely operating system.

1.02 QUALITY ASSURANCE: Pump manufacturer/supplier shall have been in business for a minimum of 15 years. Manufacturer shall have a major service center within 150 miles of the project site. Pump service representative shall be available at the site within 24 hours after notification by the Owner.

In order to unify responsibility for proper operation and service of the pumping units, it is the intent of these Specifications that all system components shall be furnished by a single manufacturer (unitary source).

1.03 GENERAL REQUIREMENTS:

A. Applicable Codes, Standards, and Specifications: The Work shall be in strict accordance with the following codes and standards:

1. FDEP Requirements.

2. American Society for Testing and Materials (ASTM).

3. National Electrical Code.

4. Occupational Safety and Health Standards (OSHA).

B. Assemblies or Units:

1. Where the plans and specifications require the Contractor to furnish and install an assembly or unit, the Contractor shall furnish all component parts as required by the manufacturer of the assembly or unit. Where duplicate or similar units are required, unless approved otherwise by the Engineer, only units furnished by the same manufacturer shall be furnished and installed. Pumps, motors, and control panel shall be supplied by the pump supplier.

2. Unless otherwise indicated in writing by the Engineer, the materials to be furnished shall be new, standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

1.04 SUBMITTAL:

A. Shop Drawings - Submit copies of shop drawings and product data for equipment furnished under this section.

B. Operating and Maintenance Manual - Furnish Operation and Maintenance Manuals titled "Operation and Maintenance Manuals" in accordance with Section 01300 SUBMITTAL.

C. Equipment Installation Certificate - The manufacturer shall provide a written report, through the Contractor and endorsed in writing by the Contractor, certifying that the equipment has been properly installed, checked and is ready for placement into routine permanent service.

D. The pumping station equipment components shall be warranted by the Contractor against defects in material or workmanship for a period of not less than one year after the date of final acceptance by the Owner. The warranty shall include responsibility for removal and reinstallation of the equipment, freight to and from the factory for repair, if necessary, and repairs to the equipment including labor and materials.

1.05 MANUFACTURER'S START-UP SERVICES: Furnish services of manufacturer's technical representative to inspect the completed installation, correct or supervise correction of any defects or malfunctions, and instruct operating personnel in proper operating and maintenance procedures as described in Part 3 of this section.

PART 2 - PRODUCTS

2.01 PUMPS AND MOTORS:

A. General: The pumps and motors shall be capable of handling raw, unscreened, sanitary sewage containing heavy sludge and fibrous materials without injurious damage during normal operation. Pumps shall be non-clog, submersible type with a directly-connected suitable submersible motor. The pumping units shall be designed to operate submerged or unsubmerged without damage. Each pump motor cable shall be suitable for submersible pump application as indicated thereon by a permanently embossed legend. The cable shall be sized in accordance with the NEC Standards for the actual motor load. All motors shall have moisture detectors in the oil reservoir. The submersible pumping units, complete with motor, to be furnished and installed in pumping station

shall satisfy the operating conditions, electric power requirements, and control requirements of these specifications. The motor shall have a service factor of at least 1.15. Pumps shall be model S3SD, as manufactured by Hydromatic or approved equal.

B. Pump Operating Conditions: Pump Station shall be a duplex system as shown on the drawings. Each pump shall have the following characteristics:

Primary Operating Point	100 gpm @ 11.0 ft TDH
Minimum Shutoff head	17 ft
HP	3/4 HP
Impeller Trim	5.88"
Motor RPM	1,150 RPM
Voltage	230 volts
Phase	1-phase
Discharge Size	3-inch

2.02 GUIDE RAILS: Guide rails shall be utilized to direct the pump in proper alignment with the stationary discharge piping. Rails shall be 2-inch diameter, schedule 40, 304 stainless steel. The pump shall be automatically connected to the discharge connection when lowered into place and shall be easily removed for inspection or service. There shall be no need for personnel to enter wetwell. Sealing of the pumping unit to the discharge connection shall be accomplished by a simple linear downward motion of the pump.

2.03 FLOAT MOUNTING BRACKET: A float mounting bracket shall be provided. Float mounting bracket shall provide cord grips to hold the level control cords and allow adjustment of level controls to desired pumping alarm levels. Continuous cords are to run from pump(s) and level controls to control panel. No splices shall be made in wiring. Float mounting bracket shall be fabricated from stainless steel. Float mounting bracket shall attach to access frame with 304 stainless steel fasteners.

2.04 LIFTING CHAIN/CABLE: Each pumping unit shall be provided with a lifting chain or cable made of 304 stainless steel. The lifting chain or cable shall be of sufficient length to extend from the pumping unit at one end to the top of the wetwell at the other end. The access frame shall provide a hook to attach the lifting chain or cable when not in use. The lifting chain or cable shall be sized according to the pump weight.

2.05 LIQUID LEVEL CONTROLS: Float switches shall be supplied to control wetwell level and alarm signal. The switches shall be sealed in a solid polypropylene float for corrosion and shock

resistance. The support wire shall have a heavy Neoprene jacket. A weight shall be attached to cord above the float to hold switch in place in wetwell and efficiently prevent sharp bends in the cord when the float operates. A quantity of three floats shall be provided to control level. An additional switch shall be provided for high water level alarm. Float switches shall be Rotofloat or equal.

A. The level control system shall be the mercury switch float type, incorporating weighted floats suspended from a stainless steel float holder in the wet well. Rising and falling liquid level in the wet well shall cause switches within the floats to open and close, providing start and stop signals for the level control components.

B. The level control system shall start the lead pump when the liquid level in the wet well rises to the "lead pump on" level. When the liquid is lowered to the "all pumps off" level, the system shall stop the pump. These actions shall constitute one pumping cycle. The alternator shall change lead pumps at the end of each cycle. A third float shall be provided to start the second pump in the event the level in the wet well rises to the "lag pump on" level, both pumps shall then run until the level is dropped to the "all pumps off" level.

C. Four float switch assemblies shall be supplied for installation by the Contractor. Each switch assembly shall contain a mercury-type switch and weight sealed in a polypropylene housing, and not less than 30 feet of cable.

D. The fourth float switch shall be provided to actuate a high water alarm relay. The signal relay shall complete a 115-volt AC circuit for an external alarm device. An electrical or mechanical indicator, visible on the front of the control panel, shall indicate that a high level exists. The signal relay shall maintain the alarm signal until the tank level has been lowered and the circuit has been manually reset.

E. An alarm silence switch and relay shall be provided to permit maintenance personnel to de-energize the external alarm device while corrective actions are underway. After silencing the alarm device, manual reset of the signal relay shall provide automatic reset of the alarm silence relay.

F. Float Switches shall be direct acting single pole mercury switch which actuates when the longitudinal axis of the float is horizontal and deactivates when the liquid level falls one inch (1") below the actuation elevation. Entire assembly (cable and float) shall be encapsulated to form a watertight and impact resistant unit. Float switches shall meet the following criteria:

1. Mercury switch rating (non-inductive) shall be ten (10) amps (minimum) at 120 volts, 60-hertz.

2. Float housing construction shall be polypropylene. Cable jacket shall be polyvinyl chloride (PVC).

3. Provide normally open or normally closed contacts as required.

G. Cable shall be polyvinyl chloride (PVC) type. Conductors shall be No. 18 gage (41 strand) rated 600 volts. Cable shall be continuous with no splices from the float switch to the control cabinet.

H. Float/Cable Hanger: A 300 series stainless steel cable holder with a minimum of six hooks of sufficient length and strength to provide support for each separate cable shall be furnished. The float/cable hanger shall be easily accessed from the hatch opening.

2.06 CONTROL PANEL:

A. A gasketed NEMA 3R stainless steel control panel with a locking 3-point latch and dead front door for controls shall be provided for each set of pumps. The panel shall be designed and built to provide the necessary components to safely run and control the pumps.

B. Properly sized heavy duty air circuit breakers shall be provided for each of the following: Main breaker, breakers for each pump, control breaker, and duplex receptacle breaker. Breakers shall be mounted on auxiliary back plate with cutouts through the dead front panel so that breaker faces will be flush with the dead front. All circuit breakers shall be sealed by the manufacturer after calibration to prevent tampering.

C. An open frame, across the line, NEMA rated magnetic starter shall be provided for each motor. Power contacts shall be double-break cadmium oxide silver. All motor starters shall be equipped to provide under voltage release and overload protection on all three phases. Overload reset button shall be mounted through the dead front door.

D. Each pump shall be provided with run light, seal failure light, over temperature light, H.O.A. switch and elapsed time meter.

E. The control panel shall be provided with one red pilot light for each pump motor. Light shall be wired in parallel with the related pump motor starter to indicate that the motor is or should be running.

F. Pump mode selector switches shall be connected to permit manual start and manual stop of each pump individually, and to select automatic operation of each pump. Manual operation shall override all shutdown systems, but not the motor overload relays. Switch contacts shall be rated 15 amperes minimum at 120 volts non-inductive.

G. Pump alternator relay shall be of electromechanical industrial design. Relay contacts shall be rated 10 amperes minimum at 120 volts non-inductive. A switch shall be provided to permit the operator to select automatic alternation of the pumps, to select pump number 1 to be the lead pump for each pumping cycle, or to select pump number 2 to be lead pump for each pumping cycle.

H. Six digit elapsed time meters (non-reset type) shall be connected to each motor starter to indicate the total running time of each pump in "hours" and "tenths of hours".

I. A surge protector, phase monitor and lightning arrestor shall be provided on the main leads into the panel.

J. A weatherproof, corrosion resistant portable generator receptacle and a 120V GFIC convenience receptacle shall be provided on the exterior of the panel.

PART 3 - EXECUTION

3.01 INSPECTION AND TESTING:

A. Upon completion of installation, in the presence of the Engineer, a qualified manufacturer's representative shall perform a preliminary test on the system to insure the functioning of all component parts to the satisfaction of the Engineer.

B. Approval of the preliminary test by the Engineer shall not constitute final acceptance of the equipment furnished.

C. After the system is in full operation, a full operating test shall be performed in the presence of the Engineer and a qualified manufacturer's representative. The manufacturer shall furnish all labor, materials and equipment required for such test and shall correct any deficiencies noted, by repairing or replacing the defective component and retesting as required until the equipment meets the satisfaction of the Engineer.

D. Operating personnel shall be trained in operation and maintenance of equipment at start-up. Instruction shall be given in operation, service, adjustments and routine maintenance. Recommended spare parts lists and Operation and Maintenance Manuals shall be provided and reviewed with Owner's operating personnel.

END OF SECTION