**ADDENDUM NO. 1 TO CONTRACT DOCUMENTS**

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|---|---|
| Date: | December 20, 2021 |
| Project: | OWASA University Lake Permanganate Facility |
| Owner: | Orange Water and Sewer Authority |
| Engineer: | Hazen and Sawyer |

To All Bidders:

Contractors submitting Proposals for the above-named Project shall take note of the following changes, additions, deletions, clarifications, etc., in the Contract Documents, which shall become part of and have precedence over anything contrarily shown or described in the Contract Documents, and all such shall be taken into consideration and be included in the Contractor's Bid Proposal.

All other general items, conditions, drawings, and specifications shall remain the same. Please acknowledge the receipt of Addendum No. 1 with the Bid Form.

Refer to the Attached Sheets.

**The return receipt requested with this communication will be deemed evidence that the bidder has received this Addendum and has followed the instructions outlined herein. Please sign, date, clearly print company name, and email this sheet back to Hazen and Sawyer at owasaulakeperm@hazenandsawyer.com.**

Company Name

Acknowledgement of Receipt

Date




Melanie Mann, P.E.

HAZEN AND SAWYER

**OWASA University Lake Permanganate Facility Project**

**Addendum No.1**

**SPECIFICATIONS:**

SECTION 02050 – DEMOLITION

Replace specification section in its entirety with the attached Section 02050.

SECTION 02200 – EARTHWORK

Replace specification section in its entirety with the attached Section 02200.

SECTION 02604 – UTILITY STRUCTURES

Replace specification section in its entirety with the attached Section 02604.

SECTION 02710 – STORM DRAINS AND ROOF DRAINS

Replace specification section in its entirety with the attached Section 02710.

SECTION 11306 – DIAPHRAGM METERING PUMPS

Page 11306 – 4 Replace Paragraph 2.03.D with the following:

D. Variable Frequency Drives

1. The Contractor shall retain full responsibility for the complete pump drive system and shall also retain overall responsibility for coordination between the pump manufacturer and the variable frequency drive manufacturer. VFD shall create a 480VAC 3-phase output for the motor.

2. The pump manufacturer shall coordinate torque and speed requirements with the motor vendor to ensure that the motor matches the torque and speed requirements of the driven load over the entire range of operation. In addition, the pump manufacturer shall coordinate the settings of the VFD with the pump to ensure proper operation. A written transmittal of the drive settings shall be sent to the Contractor prior to start-up of any equipment.

3. VFD panels shall be provided with the following local control devices, at a minimum, housed inside a NEMA 4X enclosure:

a. Manual speed control potentiometer with digital speed indication in strokes per minute

b. Hand-Off-Auto selector switch

c. Start and Stop pushbuttons

d. Run and Fail indicating lights

e. Diaphragm Rupture indicating light

f. Externally operable main circuit breaker style disconnect switch

4. The panels shall accept external current sources (4-20 mA) for primary speed control. The panels shall also accept local speed adjustment by using the speed control potentiometers. Speed regulations shall be ±1% with 95% load change. Panels shall include a fail dry output contact for remote fault indication to the PLC, such as power supply failure or loss of pacing signal, and relay contacts to indicate run status and ready status. The panels shall accept remote dry contact closure for remote start/stop control. The panels shall provide a 4-20 mA output signal corresponding to pump motor speed.

**APPENDICES:**

Add Appendix E, Record Drawings OWASA 20-inch Raw Water Main, dated May 1961.

**DRAWINGS**:

C8 Replace C8 – DEMOLITION PLAN - WARDEN'S HOUSE ALTERNATE BID with the attached C8 – DEMOLITION PLAN – WARDEN'S HOUSE ALTERNATE BID.

C9 Replace C9 - OVERALL SITE PLAN with the attached C9 – OVERALL SITE PLAN.

C10 Replace C10 - SITE PLAN with the attached C10 – SITE PLAN.

E201 Add the following Note 2:

"2. ALL CONDUIT CONNECTIONS IN THE RACEWAY SYSTEM BETWEEN THE RAW WATER PS RELAY PANEL, ASSOCIATED PULLBOXES, FLOW SENSORS AND FLOW SWITCHES SHALL BE RATED NEMA 6P."

**ATTACHMENTS**

Attachment #1: Section 02050 – Demolition
Attachment #2: Section 02200 – Earthwork
Attachment #3: Section 02604 – Utility Structures
Attachment #4: Section 02710 – Storm Drains and Roof Drains
Attachment #5: Appendix E, Record Drawings 20-inch Raw Water Main, 3 sheets
Attachment #6: Sheets C8, C9 and C10

**ATTACHMENT # 1**

SECTION 02050

DEMOLITION

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. The Contractor shall furnish all labor, materials and equipment in accordance with the requirements of Section 01520 - Maintenance of Utility Operations During Construction.

B. In addition, the Contractor shall demolish and remove all concrete and asphaltic paving, curbs, sidewalk, and miscellaneous yard structures as required and shown on the Contract Drawings during the construction work.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 01090 - Reference Standards

B. Section 01520 - Maintenance of Utility Operations During Construction

C. Section 01540 - Demolition and Removal of Existing Structures and Equipment

### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. References shall be in accordance with reference standards, codes, and specifications as set forth herein and in Section 02100 - Clearing, Grubbing, and Site Preparation.

## PART 2 -- EXECUTION

### 2.01 DEMOLITION

A. Existing concrete and asphaltic paving, curbs, sidewalk and miscellaneous yard structures within the areas designated for new construction work shall be completely demolished and all debris removed from the site.

B. Excavation caused by demolition shall be backfilled with fill free from rubbish and debris.

C. Work shall be performed in such manner as not to endanger the safety of the workmen or the public or cause damage to nearby structures.

D. Provide all barriers and precautionary measures in accordance with Owner's requirements and other authorities having jurisdiction.

E. Where parts of existing structures are to remain in service, demolish the portions to be removed, repair damage, and leave the structure in proper condition for the intended use. Remove concrete and masonry to the lines designated by drilling, chipping, or other suitable methods. Leave the resulting surfaces reasonably true and even, with sharp straight

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corners that will result in neat joints with new construction and be satisfactory for the purpose intended. Where existing reinforcing rods are to extend into new construction, remove the concrete so that the reinforcing is clean and undamaged. Cut off other reinforcing 1/2-inch below the surface and fill with epoxy resin binder flush with the surface.

F. Prior to the execution of the work, the Contractor, Owner and Engineer shall jointly survey the condition of the adjoining and/or nearby structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims. Copies of all photographs and other records from the joint existing conditions survey shall be provided to the Owner/Engineer before construction activities begin.

2.02 DISPOSAL OF MATERIAL

A. All debris resulting from the demolition and removal work shall be disposed of by the Contractor as part of the work of this Contract. Material designated by the Engineer to be salvaged shall be stored on the construction site as directed. All other material shall be disposed of off site by the Contractor at his expense.

B. Burning of any debris resulting from the demolition will not be permitted at the site.

- END OF SECTION -

**ATTACHMENT # 2**

# SECTION 02200

# EARTHWORK

## PART 1 -- GENERAL

### 1.01 THE REQUIREMENT

A. Furnish all labor, equipment and materials required to complete all work associated with excavation, including off-site borrow excavation, dewatering, backfill, drainage layers beneath and around structures, foundation and backfill stone, filter fabric, embankments, stockpiling topsoil and any excess suitable material in designated areas, in place compaction of embankments, coordinate for services with an independent Materials Testing Consultant for gradation and compaction testing of backfill and subgrades beneath foundations and roadways, excavation support, disposing from the site all unsuitable materials, providing erosion and sedimentation control grading, site grading and preparation of pavement and structure subgrade, and other related and incidental work as required to complete the work shown on the Drawings and specified herein.

B. All excavations shall be in conformity with the lines, grades, and cross sections shown on the Drawings or established by the Engineer.

C. It is the intent of this Specification that the Contractor conduct the construction activities in such a manner that erosion of disturbed areas and off-site sedimentation be absolutely minimized.

D. All work under this Contract shall be done in conformance with and subject to the limitations of the latest editions of the North Carolina Department of Transportation Standard Specifications for Roads and Structures and the North Carolina Erosion and Sediment Control Planning and Design Manual.

E. All fill material, processed stone, topsoil, etc. imported to the site and onsite material requested to be used shall be subjected to the testing requirements contained in Part 3 of this section. An independent Materials Testing Consultant retained by the Contractor shall perform all testing. Certified test results will determine if a material meets the Sections. The Contractor shall furnish all necessary samples for laboratory test and shall provide assistance and cooperation during field tests. The Contractor shall plan his operations to allow adequate time for laboratory tests and to permit taking of field density tests during compaction. Any costs of retesting required as a result of failure to meet compaction requirements shall be borne by the Contractor.

### 1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Requirements of related work are included in Division 1 and Division 2 of these Specifications.

### 1.03 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

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A. Without limiting the generality of the other requirements of the Specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced Specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. North Carolina Department of Transportation Standard Specifications for Roads and Structures, latest edition.

2. American Society for Testing and Materials (ASTM):

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| ASTM C127 | Test for Specific Gravity and Absorption of Coarse Aggregate. |
| ASTM C136 | Test for Sieve Analysis of Fine and Coarse Aggregates. |
| ASTM D422 | Particle Size Analysis of Soils. |
| ASTM D423 | Test for Liquid Limit of Soils. |
| ASTM D424 | Test for Plastic Limit and Plasticity Index of Soils. |
| ASTM C535 | Test for Resistance to Degradation of Large Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine. |
| ASTM D698 | Standard Method of Test for the Moisture Density Relations of Soils Using a 5.5 lb. (2.5 kg) Rammer and a 12inch (305 mm) Drop. |
| ASTM D1556 | Test for Density of Soil in Place by the Sand Cone Method. |
| ASTM D1557 | Test for Moisture Density Relations of Soils and Soil Aggregate Mixtures Using 10lbs. (4.5 kg) Rammer and 18inch (457 mm) Drop. |
| ASTM D2049 | Test Method for Relative Density of Cohesionless Soils. |
| ASTM D2167 | Test for Density of Soil in Place by the Rubber Balloon Method. |
| ASTM D2216 | Test for Laboratory Determination of Water (Moisture) Content of Soil, Rock, and Soil Aggregate Mixtures. |
| ASTM D2487 | Test for Classification of Soils for Engineering Purposes. |
| ASTM D6938 | Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) |

1.04 SUBSURFACE CONDITIONS

A. Information on subsurface conditions is referenced under Division 1, General Requirements.

B. Attention is directed to the fact that there may be water pipes, sanitary pipes, storm drains and other utilities located in the area of proposed excavation. Perform all repairs to same if excavation activities disrupt service. The Contractor shall contact Dig Safely North Carolina at phone number 811 or 1-800-632-4949 request an underground utility location mark-out at least three (3) working days, not including the day the request is called in, but

no more than ten (10) working days prior to the beginning of excavation. The Contractor shall also contact and request utility location mark-out from buried utility owners with utilities on the project site that are not participants of Dig Safely North Carolina.

1.05 SUBMITTALS

A. In accordance with the procedures and requirements set forth in Section 01300 - Submittals, the Contractor shall submit the following:

1. Name and location of all material suppliers.

2. Certificate of compliance with the standards specified above for each source of each material.

3. List of disposal sites for waste and unsuitable materials and all required permits for use of those sites.

4. Plans and cross sections of open cut excavations showing side slopes and limits of the excavation at grade.

5. Construction drawings and structural calculations for any types of excavation support required. Drawings and calculations shall be sealed by a currently registered Professional Engineer in the State of New York.

6. Monitoring plan and pre-construction condition inspection and documentation of all adjacent structures, utilities, and roadways near proposed installation of excavation support systems.

7. Dewatering procedures shall be in accordance with Section 3.06 of this Specification.

8. The Contractor shall notify the Engineer of the offsite or on-site sources of structural fill and submit to the Engineer a representative sample weighing approximately 50 lbs. The sample shall be delivered to a location designated by the Engineer.

1.06 PRODUCT HANDLING

A. Soil and rock material shall be excavated, transported, placed, and stored in a manner so as to prevent contamination, segregation and excessive wetting. Materials which have become contaminated or segregated will not be permitted in the performance of the work and shall be removed from the site.

1.07 USE OF EXPLOSIVES

A. Use of explosives is not allowed on the project site.

PART 2 -- PRODUCTS

2.01 SELECT FILL

A. Soils from the excavations meeting requirements in this section with the exceptions of topsoil and organic material may be used as Select Fill for backfilling, constructing embankments, reconstructing existing embankments, and as structural subgrade support, respectively.

B. Select fill used for embankment construction shall be soil, sand, or gavel classified per the Unified Soil Classification System (USCS) as SP, SM, SW, GP, GW with a maximum of 20 percent by weight fines passing the No. 200 sieve and a Maximum Plasticity Index (PI) of 6.

C. Granular Select Fill shall consist of sandy gravel or gravelly sand, free of organic material, environmental contaminants, snow, ice, frozen soil, or other unsuitable material, and be well-graded within the following limits:

| **U.S. Standard Sieve Size** | **Percent Finer by Weight** |
|---|---|
| 3 in. | 100 |
| No. 4 | 30-80 |
| No. 40 | 10-50 |
| No. 200 | 0-8 |

D. Select fill used for backfilling around and over pipe shall either be material as described above or a granular soil material with a Maximum Plasticity Index (PI) of 6.

E. Regardless of material used as select fill, select fill materials shall be compacted at a moisture content satisfactory to the Engineer, which shall be approximately that required to produce the maximum density of 958% of the Modified Standard Proctor maximum dry density at a moisture content satisfactory to the Engineer, except that the moisture content shall not be more than 1% below nor more than 4% above the optimum moisture content for the particular material tested in accordance with the ASTM D1557698.

F. Where excavated material does not meet requirements for Select Fill, Contractor shall furnish off-site borrow material meeting the specified requirements herein. Determination of whether the borrow material will be paid for as an extra cost will be made based on the contract documents.

G. When the excavated material from required excavations is suitable for use as backfill, bedding, or embankments, but is replaced with off-site borrow material for the Contractor's convenience, the costs associated with such work and material shall be borne by the Contractor.

H. Contractor shall stockpile on site in areas designated in the Contract Documents or as approved by the Owner to avoid hauling material offsite unless contaminated. No stockpiling of excavated material would be allowed within 50 feet or in a manner or location that would permit erosion and its subsequent sedimentation into storm drains, streams, ponds, wetlands or other natural areas.

2.02 TOPSOIL

A Topsoil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent. Muck soil shall not be considered topsoil.

B. Topsoil shall have not less than 20 percent fine textured material (passing the NO. 200 sieve) and not more than 15 percent clay.

C Topsoil treated with soil sterilants or herbicides shall be so identified to the purchaser.

D. Topsoil shall be relatively free of stones over 1 1/2 inches in diameter, trash, noxious weeds such as nut sedge and quackgrass, and will have less than 10 percent gravel.

E. Topsoil containing soluble salts greater than 500 parts per million shall not be used.

2.04 GEOTEXTILES

A. The Contractor shall provide geotextiles as indicated on the Drawings and specified herein. The materials and placement shall be as indicated under Section 02274 - Geotextiles.

PART 3 -- EXECUTION

3.01 STRIPPING OF TOPSOIL

A. In all areas to be excavated, filled, paved, or graveled the topsoil shall be stripped to its full depth and shall be deposited in storage piles on the site, at locations designated by the Engineer, for subsequent reuse. Topsoil shall be kept separated from other excavated materials and shall be piled free of roots and other undesirable materials.

3.02 EXCAVATION

A. All material excavated, regardless of its nature or composition, shall be classified as UNCLASSIFIED EXCAVATION. Excavation shall include the removal of all soil, rock, weathered rock, rocks of all types, boulders, conduits, pipe, and all other obstacles encountered and shown to be removed within the limits of excavation shown on the Drawings or specified herein. The cost of excavation shall be included in the Lump Sum Bid Price and no additional payment will be made for the removal of obstacles encountered within the excavation limits shown on the Drawings and specified herein.

B. All suitable material removed in the excavation shall be used as far as practicable in the formation of embankments, subgrades, and shoulders, and at such other places as may be indicated on the Drawings or indicated by the Engineer. No excavation shall be wasted except as may be permitted by the Engineer. Refer to the drawings for specific location and placement of suitable excavated materials in the formation of embankments, backfill, and structural and roadway foundations. THE ENGINEER AND/OR MATERIALS TESTING CONSULTANT WILL DESIGNATE MATERIALS THAT ARE UNSUITABLE. The Contractor shall furnish off site disposal areas for the unsuitable material. Where suitable materials containing excessive moisture are encountered above grade in cuts, the Contractor shall construct above grade ditch drains prior to the excavation of the cut material when in the opinion of the Engineer and/or materials testing consultant such measures are necessary to provide proper construction.

C. All excavations shall be made in the dry and in such a manner and to such widths as will give ample room for properly constructing and inspecting the structures and/or piping they are to contain and for such excavation support, pumping and drainage as may be required. Excavation shall be made in accordance with the grades and details shown on the Drawings and as specified herein.

D. Excavation slopes shall be flat enough to avoid slides that will cause disturbance of the subgrade or damage of adjacent areas. Excavation requirements and slopes shall be as indicated in the Drawings. The Contractor shall intercept and collect surface runoff both at the top and bottom of cut slopes. The intersection of slopes with natural ground surfaces, including the beginning and ending of cut slopes, shall be uniformly rounded as shown on the Drawings or as may be indicated by the Engineer. Concurrent with the excavation of cuts the Contractor shall construct intercepting berm ditches or earth berms along and on top of the cut slopes at locations shown on the Drawings or designated by the Engineer. All slopes shall be finished to reasonably uniform surfaces acceptable for seeding and mulching operations. No rock or boulders shall be left in place which protrude more than 1 foot within the typical section cut slope lines, and all rock cuts shall be cleaned of loose and overhanging material. All protruding roots and other objectionable vegetation shall be removed from slopes. The Contractor shall be required to submit plans of open-cut excavation for review by the Engineer before approval is given to proceed.

E. It is the intent of these Specifications that all structures shall bear on an aggregate base, crushed stone or screened gravel bedding placed to the thickness shown on the Drawings, specified in these Specifications, or not less than 6-inches. Bedding for process piping shall be as specified in Section 15000 - Basic Mechanical Requirements, or as shown on the Drawings.

F. The bottom of all excavations for structures and pipes shall be examined by the Engineer and/or materials testing consultant for bearing value and the presence of unsuitable material. If, in the opinion of the Engineer and/or materials testing consultant, additional excavation is required due to the low bearing value of the subgrade material, or if the in-place soils are soft, yielding, pumping and wet, the Contractor shall remove such material to the required width and depth and replace it with thoroughly compacted select fill, and/or crushed stone or screened gravel as indicated by the Engineer. Payment for such additional work ordered by the Engineer shall be made as an extra by a Change Order in accordance with the General Conditions and Division 1. No payment will be made for subgrade disturbance caused by inadequate dewatering or improper construction methods.

G. All cuts shall be brought to the grade and cross section shown on the Drawings, or established by the Engineer, prior to final inspection and acceptance by the Engineer.

H. Slides and overbreaks which occur due to negligence, carelessness or improper construction techniques on the part of the Contractor shall be removed and disposed of by the Contractor as indicated by the Engineer at no additional cost to the Owner. If grading operations are suspended for any reason whatsoever, partially completed cut and fill slopes shall be brought to the required slope and the work of seeding and mulching or other required erosion and sedimentation control operations shall be performed.

I. Where the excavation exposes sludge, sludge contaminated soil or other odorous materials, the Contractor shall cover such material at the end of each workday with a minimum of 6-inches and a maximum of 24-inches of clean fill. The work shall be an odor abatement

measure and the material shall be placed to the depth deemed satisfactory by the Engineer for this purpose.

3.03 EXCAVATION SUPPORT

A. The Contractor shall furnish, place, and maintain such excavation support which may be required to support sides of excavation or to protect structures, pipes, and utilities from possible damage and to provide safe working conditions. The Contractor shall be exclusively responsible for maintaining structure integrity without overstressing and damaging existing structures, pipes, and utilities resulting from the Contractor's desires to temporarily place, move, or remove loads on or adjacent to existing structures, pipes, and utilities. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he may order additional supports put in at the expense of the Contractor. The Contractor shall be responsible for the adequacy of all supports used and for all damage resulting from failure of support system or from placing, maintaining and removing it.

B. Selection of and design of any proposed excavation support systems is exclusively the responsibility of the Contractor. Contractor shall submit drawings and calculations on proposed systems sealed by a Professional Engineer currently registered in the State of North Carolina.

C. The Contractor shall exercise caution in the installation and removal of supports to insure that no excessive or unusual loadings or vibrations are transmitted to any new or existing structure. The Contractor shall promptly repair at his expense any and all damage that can be reasonably attributed to installation or removal of excavation support system.

D. Contractor shall monitor movement and vibration in the excavation support systems as well as movement and vibration at adjacent structures, utilities and roadways near excavation supports. Contractor shall submit a monitoring plan developed by the excavation support design engineer. All pre-construction condition assessment and documentation of adjacent structures on-site and off-site shall be performed by the Contractor. If any sign of distress such as cracking or movement occurs in any adjacent structure, utility or roadway during installation of supports, subsequent excavation, service period of supports, subsequent backfill and construction, or removal of supports, Engineer shall be notified immediately. Contractor shall be exclusively responsible for repair of any damage to any roadway, structure, utility, pipes, etc. both on-site and off-site, as a result of his operations.

E. All excavation supports shall be removed upon completion of the work except as indicated herein. The Engineer may permit supports to be left in place at the request and expense of the Contractor. The Engineer may order certain supports left permanently in place in addition to that required by the Contract. The cost of the materials so ordered left in place, less a reasonable amount for the eliminated expense of the removal work omitted, will be paid as an extra by a Change Order in accordance with the General Conditions and Division 1. Any excavation supports left in place shall be cut off at least two (2) feet below the finished ground surface or as directed by the Engineer.

3.04 PROTECTION OF SUBGRADE

A. To minimize the disturbance of bearing materials and provide a firm foundation, the Contractor shall comply with the following requirements:

1. Use of heavy rubber-tired construction equipment shall not be permitted on the final subgrade unless it can be demonstrated that drawdown of groundwater throughout the entire area of the structure is at least 3 feet below the bottom of the excavation (subgrade). Even then, the use of such equipment shall be prohibited should subgrade disturbance result from concentrated wheel loads.

2. Subgrade soils disturbed through the operations of the Contractor shall be excavated and replaced with compacted select fill or crushed stone at the Contractor's expense as indicated by the Engineer.

3. The Contractor shall provide positive protection against penetration of frost into materials below the bearing level during work in winter months. This protection can consist of a temporary blanket of straw or salt hay covered with a plastic membrane or other acceptable means.

3.05 PROOFROLLING

A. The subgrade of all structures and all areas that will support pavements or select fill shall be proofrolled. After stripping of topsoil, excavation to subgrade and prior to placement of fills, the exposed subgrade shall be carefully inspected by probing and testing as needed. Any topsoil or other organic material still in place, frozen, wet, soft, or loose soil, and other undesirable materials shall be removed. The exposed subgrade shall be proofrolled with a heavily loaded tandem-wheeled dump truck to check for pockets of soft material hidden beneath a thin crust of better soil. Any unsuitable materials thus exposed shall be removed and replaced with an approved compacted material.

3.06 DEWATERING

A. The Contractor shall do all dewatering as required for the completion of the work. Procedures for dewatering proposed by the Contractor shall be submitted to the Engineer for review prior to any earthwork operations. All water removed by dewatering operations shall be disposed of in accordance with the North Carolina Sedimentation Pollution Control Act.

B. The dewatering system shall be of sufficient size and capacity as required to control groundwater or seepage to permit proper excavation operations, embankment construction and reconstruction, subgrade preparation, and to allow concrete to be placed in a dry condition. The system shall include a sump system or other equipment, appurtenances and other related earthwork necessary for the required control of water. The Contractor shall drawdown groundwater to at least 3 feet below the bottom of excavations (subgrade) at all times in order to maintain a dry and undisturbed condition.

C. The Contractor shall control, by acceptable means, all water regardless of source. Water shall be controlled and its disposal provided for at each berm, structure, etc. The entire periphery of the excavation areas shall be ditched and diked to prevent water from entering the excavation. The Contractor shall be fully responsible for disposal of the water and shall provide all necessary means at no additional expense to the Owner. The Contractor shall be solely responsible for proper design, installation, proper operation, maintenance, and any failure of any component of the system.

D. The Contractor shall be responsible for and shall repair without cost to the Owner, any damage to work in place and the excavation, including damage to the bottom due to heave and including removal of material and pumping out of the excavated area. The Contractor shall be responsible for damages to any other area or structure caused by his failure to maintain and operate the dewatering system proposed and installed by the Contractor.

E. The Contractor shall take all the steps that he considers necessary to familiarize himself with the surface and subsurface site conditions, and shall obtain the data that is required to analyze the water and soil environment at the site and to assure that the materials used for the dewatering systems will not erode, deteriorate, or clog to the extent that the dewatering systems will not perform properly during the period of dewatering. Copies of logs of borings and laboratory test results are available to the Contractor. This data is furnished for information only, and it is expressly understood that the Owner and Engineer will not be held responsible for any interpretations or conclusions drawn therefrom by the Contractor.

F. Prior to the execution of the work, the Contractor, Owner and Engineer shall jointly survey the condition of adjoining structures. Photographs and records shall be made of any prior settlement or cracking of structures, pavements, and the like, that may become the subject of possible damage claims.

3.07 EMBANKMENTS

A. The Contractor shall perform the construction of embankments in such a manner that cut and fill slopes will be completed to final slopes and grade in a continuous operation. The operation of removing excavation material from any cut and the placement of embankment in any fill shall be a continuous operation to completion unless otherwise permitted by the Engineer.

B. Surfaces upon which embankments are to be constructed shall be stripped of topsoil, organic material, rubbish and other extraneous materials. After stripping and prior to placing embankment material, the Contractor shall compact the top 12-inches of in place soil as specified under Paragraph 3.09, COMPACTION.

C. Any soft or unsuitable materials revealed before or during the in place compaction shall be removed as indicated by the Engineer and/or materials testing consultant and replaced with select fill.

D. Ground surfaces on which embankment is to be placed, shall be scarified or stepped in a manner which will permit bonding of the embankment with the existing surface. The embankment soils shall be as specified under Part 2 - Products, and shall be deposited and spread in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width of the cross section, and shall be kept approximately level by the use of effective spreading equipment. Hauling shall be distributed over the full width of the embankment, and in no case will deep ruts be allowed to form during the construction of the embankment. The embankment shall be properly drained at all times. Each layer of the embankment shall be thoroughly compacted to the density specified under Paragraph 3.09, COMPACTION.

E. The embankment or fill material in the layers shall be of the proper moisture content before rolling to obtain the prescribed compaction. Wetting or drying of the material and manipulation when necessary to secure a uniform moisture content throughout the layer

shall be required. Should the material be too wet to permit proper compaction or rolling, all work on all portions of the embankment thus affected shall be delayed until the material has dried to the required moisture content. Samples of all embankment materials for testing, both before and after placement and compaction, will be taken at frequent intervals. From these tests, corrections, adjustments, and modifications of methods, materials, and moisture content will be made to construct the embankment.

F. Where embankments are to be placed and compacted on hillsides, or when new embankment is to be compacted against embankments, or when embankment is built in part widths, the slopes that are steeper than 4:1 shall be loosened or plowed to a minimum depth of 6 inches or, if in the opinion of the Engineer, the nature of the ground is such that greater precautions should be taken to bind the fill to the original ground then benches shall be cut in the existing ground as indicated by Engineer.

G. When rock and other embankment material are excavated at approximately the same time, the rock shall be incorporated into the outer portions of the embankments and the other material which meets the requirements for select fill shall be incorporated into the formation of the embankments. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the final grade. Stones, fragmentary rock, or boulders larger than 12-inches in their greatest dimension will not be allowed in any portions of embankments and shall be disposed of by the Contractor as indicated by the Engineer. When rock fragments or stone are used in embankments, the material shall be brought up in layers as specified or directed and every effort shall be exerted to fill the voids with finer material to form a dense, compact mass which meets the densities specified for embankment compaction.

3.08 BACKFILLING

A. All structures and pipes shall be backfilled with the type of materials shown on the Drawings and specified herein. Select fill shall be deposited in successive, uniform, approximately horizontal layers not exceeding 8-inches in compacted depth for the full width. Stones or fragmentary rock larger than 4-inches in their greatest dimension will not be allowed within the top 6-inches of the ground nor within 6 inches of pipes. No stone or fragmentary rock larger than 12-inches in their greatest dimension will be allowed for any portion of backfill. Compaction shall be in accordance with the requirements of Paragraph 3.09, COMPACTION.

B. Where excavation support is used, the Contractor shall take all reasonable measures to prevent loss of support beneath and adjacent to pipes and existing structures when supports are removed. If significant volumes of soil cannot be prevented from clinging to the extracted supports, the voids shall be continuously backfilled as rapidly as possible. The Contractor shall thereafter limit the depth below subgrade that supports will be installed in similar soil conditions or employ other appropriate means to prevent loss of support.

3.09 COMPACTION

A. The Contractor shall compact embankments, backfill, crushed stone, aggregate base, and in place subgrade in accordance with the requirements of this Section. The densities specified herein refer to percentages of maximum density as determined by the noted test methods. Compaction of materials on the project shall be in accordance with the following schedule:

| | Density % Std. Proctor (D698) | Density % Mod. Proctor (D1557) | Max. Lift Thickness as Compacted Inches |
|---|---|---|---|
| Embankments Beneath Structures, Pavements, and Sidewalks* | 98 | 95 | 8 |
| Other Embankments | 95 | 92 | 8 |
| Backfill Around Structures | 95 | 92 | 8 |
| Backfill in Pipe Trenches | 95 | 92 | 8 |
| Crushed Stone Beneath Structures and Pavements | ** | ** | 12 |
| Select Sand | -- | 98 | 8 |
| Aggregate Base Course (ABC) Beneath Pavements and Structures | -- | 98 | 8 |
| Crushed Stone Backfill | ** | ** | 12 |
| Crushed Stone Pipe Bedding | ** | ** | 12 |
| In place Subgrade Beneath Structures, Pavements, and Sidewalks | 98 | 95 | Top 12-inches |

* Embankments beneath structures shall be considered to include a zone 10 feet out from the foundation of the structure extending down to the natural ground on a 45° slope.

** The aggregate shall be compacted to a degree acceptable to the Engineer by use of a vibratory compactor and/or crawler tractor.

B. Field density tests will be made by the Materials Testing Consultant to determine if the specified densities have been achieved, and these tests shall be the basis for accepting or rejecting the compaction. In-place density tests will be performed in accordance with ASTM D 1556, ASTM D 2167, or ASTM D 2922. The Engineer in conjunction with the materials testing consultant will be the judge as to which test method will be the most appropriate. Failure to achieve the specified densities shall require the Contractor to re-compact the material or remove it as required. The Contractor shall, if necessary, increase his compactive effort by increasing the number of passes, using heavier or more suitable compaction equipment, or by reducing the thickness of the layers. The Contractor shall adjust the moisture contents of the soils to bring them within the optimum range by drying them or adding water as required.

C. Testing will be performed as frequently as deemed necessary by the Engineer and/or materials testing consultant. As a minimum, one in-place density test shall be performed for each 1000 cubic yards of embankment placed and 500 cubic yards of backfill placed or one test performed each day for either.

3.10 VIBRATION MONITORING

A. Vibration monitoring shall be performed at nearby structures when compaction work is ongoing. A single monitoring point using vibration monitoring equipment capable of detecting velocities of 0.1 inch/second or less and survey measurements shall be used for vibration monitoring at each of the nearest structures. An elevation measurement on nearby structures shall be taken before compaction work starts, and then at least twice a day during the work with one reading taken at the conclusion of the day's operations. Elevation measurements shall be recorded to an accuracy of 0.001 foot. If at any time the Contractor detects settlement or heave of 0.005-feet or more, or vibration levels of 0.5 inch/second or more, the vibratory compaction shall be stopped immediately, and the Engineer notified.

## 3.11 REMOVAL OF EXCESS AND UNSUITABLE MATERIALS

A. The Contractor shall remove and dispose of off-site all unsuitable materials. Within thirty (30) consecutive days after Notice to Proceed, the Contractor shall submit to the Engineer for review all required permits and a list of disposal sites for the unsuitable materials. If the disposal site is located on private property, the submittal shall also include written permission from the owner of record.

B. All unsuitable materials shall be disposed of in locations and under conditions that comply with federal, state and local laws and regulations.

C. The Contractor shall obtain an off-site disposal area prior to beginning demolition or excavation operations.

D. All excess and unsuitable materials shall be hauled in trucks of sufficient capacity and tight construction to prevent spillage. Trucks shall be covered to prevent the propagation of dust.

E. When all excess and unsuitable material disposal operations are completed, the Contractor shall leave the disposal sites in a condition acceptable to the Owner and Owner(s) of the disposal site(s).

## 3.12 BORROW EXCAVATION

A. Description

The work covered by this section consists of the excavation of approved material from borrow sources and the hauling and utilization of such material as required on the Drawings or directed by the Engineer. It shall also include the removing, stockpiling, and replacement of topsoil on the borrow source; the satisfactory disposition of material from the borrow source which is not suitable for use; and the satisfactory restoration of the borrow source and haul roads to an acceptable condition upon completion of the work.

Borrow excavation shall not be used before all available suitable unclassified excavation has been used for backfill and incorporated into the embankments.

B. Coordination with Seeding Operations

The Contractor shall coordinate the work covered by this section with the construction of embankments so that the requirements of Section 02200 are met.

C. Materials

All material shall meet the requirements of Division 2 shown below:

Borrow Material.....Section 02200, Subsection 2.01 - Select Fill

D. Construction Methods

1. General

The surface of the borrow area shall be thoroughly cleared and grubbed and cleaned of all unsuitable material including all organics, topsoil, etc., before beginning the excavation. Disposal of material resulting from clearing and grubbing shall be in accordance with Section 02100.

Each borrow operation shall not be allowed to accumulate exposed, erodible slope area in excess of 1 acre at any one given time without the Contractor's beginning permanent seeding and mulching of the borrow source or other erosion control measures as may be approved by the Engineer.

The topsoil shall be removed and stockpiled at locations that will not interfere with the borrow operations and that meet the approval of the Engineer. Temporary erosion control measures shall be installed as may be necessary to prevent the erosion of the stockpile material. Once all borrow has been removed from the source or portion thereof, the stockpiled topsoil shall be spread uniformly over the source.

Where it is necessary to haul borrow material over existing roads, the Contractor shall use all necessary precautions to prevent damage to the existing roads. The Contractor shall also conduct his hauling operations in such a manner as to not interfere with the normal flow of traffic and shall keep the traffic lanes free from spillage at all times.

2. Owner Furnished Sources

Where borrow sources are furnished by the Owner the location of such sources will be as designated on the Drawings or as directed by the Engineer.

The Owner will furnish the necessary haul road right-of-way at locations designated by the Engineer. All haul roads required shall be built, maintained, and when directed by the Engineer, obliterated, at no cost to the Owner. Where the haul road is to be reclaimed for cultivation the Contractor shall plow or scarify the area to a minimum depth of 8 inches.

The borrow sources shall be left in a neat and presentable condition after use. All slopes shall be smoothed, rounded, and constructed not steeper than 3:1. Where the source is to be reclaimed for cultivation the source shall be plowed or scarified to a minimum depth of 8 inches, disc harrowed, and terraces constructed. The source shall be graded to drain such that no water will collect or stand and a functioning drainage system shall be provided.

All sources shall be seeded and mulched in accordance with Section 02910.

3. Contractor Furnished Sources

Prior to the approval of any off-site borrow source(s) developed for use on this project, the Contractor shall obtain certification from the State Historic Preservation Officer of the State Department of Cultural Resources certifying that the removal of the borrow material from the borrow source(s) will have no effect on any known district, site building, structure, or object that is included or eligible for inclusion in the National Register of Historic Places. A copy of this certification shall be furnished to the Engineer prior to performing any work on the proposed borrow source.

The approval of borrow sources furnished by the Contractor shall be subject to the following conditions:

a. The Contractor shall be responsible for acquiring the right to take the material and any rights of access that may be necessary; for locating and developing the source; and any clearing and grubbing and drainage ditches necessary.

Such right shall be in writing and shall include an agreement with the Owner that the borrow source may be dressed, shaped, seeded, mulched, and drained as required by these Specifications after all borrow has been removed.

b. Except where borrow is to be obtained from a commercial source, the Contractor and the property owner shall jointly submit a borrow source development, use, and reclamation plan to the Engineer for his approval prior to engaging in any land disturbing activity on the proposed source other than material sampling that may be necessary. The Contractor's plan shall address the following:

(1) Drainage

The source shall be graded to drain such that no water will collect or stand and a functioning drainage system shall be provided. If drainage is not practical, and the source is to serve as a pond, the minimum average depth below the water table shall be 4 feet or the source graded so as to create wetlands as appropriate.

(2) Slopes

The source shall be dressed and shaped in a continuous manner to contours which are comparable to and blend in with the adjacent topography, but in no case will slopes steeper than 3:1 be permitted.

(3) Erosion Control

The plan shall address the temporary and permanent measures that

the Contractor intends to employ during use of the source and as a part of the reclamation. The Contractor shall prepare a plan and obtain all necessary permits to provide for the use of staged permanent seeding and mulching on a continual basis while the source is in use and the immediate total reclamation of the source when no longer needed.

4. Maintenance

During construction and until final acceptance the Contractor shall use any methods approved by the Engineer which are necessary to maintain the work covered by this section so that the work will not contribute to excessive soil erosion.

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**ATTACHMENT # 3**

SECTION 02604

UTILITY STRUCTURES

PART 1 -- GENERAL

1.01 THE REQUIREMENT

A. Furnish all materials, labor, equipment, and tools required for the design, fabrication, delivery and installment of utility structures and appurtenances in accordance with the Drawings and as specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 – Earthwork

B. Section 03200 – Reinforcing Steel

C. Section 03250 – Concrete Accessories

D. Section 03300 – Cast-in-Place Concrete

E. Section 03400 – Precast Concrete

F. Section 05540 – Castings

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

A. Without limiting the generality of the other requirements of the specifications, all work herein shall conform to the applicable requirements of the following documents. All referenced specifications, codes, and standards refer to the most current issue available at the time of Bid.

1. ASTM C478 – Specification for Precast Reinforced Concrete Manhole Sections

2. ASTM C857 – Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

3. ASTM C990 - Specifications for Joints in Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

1.04 SUBMITTALS

A. Submit samples and/or Shop Drawings in accordance with Section 01300 - Submittals.
B. In addition to items listed in Section 03400 - Precast Concrete, Shop Drawings shall include, but not be limited to:

1. Complete layout and installation Drawings and schedules with clearly marked dimensions.

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2. Material certificates on all piping materials.

3. Structural design calculations sealed by a P.E. registered in the State of North Carolina. Design calculations for precast manholes and vaults shall include confirmation structures adequately resist flotation when they are totally empty and subjected to groundwater full height of structure.

4. Results of leakage test

## PART 2 -- PRODUCTS

### 2.01 PRECAST MANHOLES, VAULTS, AND METER BOXES

A. Precast utility structures shall be furnished with waterstops, sleeves and openings as noted on the Drawings. Box out for wall pipes shall conform accurately to the sizes and elevations of the adjoining pipes. Precast utility structures shall be watertight and conform to the requirements of ASTM C 478 and ASTM C857 with the following modifications there to:

1. Materials shall conform to Section 03400 - Precast Concrete.

2. Manholes shall meet the following:

a. Manhole section shall have an internal diameter of 4'-0", unless noted otherwise.

b. Minimum manhole wall thicknesses shall be 5 inches for 4 foot and 5 foot diameter manholes, 6 inches for 6 foot diameter manholes and 7 inches for 7 foot diameter manholes.

c. Manholes and utility structures shall include ballast concrete and/or other means necessary to ensure manholes resist flotation when empty and subjected to groundwater full height of structure.

d. Precast manholes and utility structures shall be as manufactured by Oldcastle Precast, Jensen Precast, or equal.

3. The date and name of manufacturer shall be marked inside each precast section.

4. No more than two lift holes may be cast or drilled in each section.

5. Dimensions shall be as shown on the Drawings.

6. Covers and frames shall be as specified in Section 2.13.
7. Mechanical Details such as piping, electrical, and other details shall be as shown on the Drawings.

B. Joints between manhole and utility structures riser sections and at base slabs shall be groove type.

2.02 BRICK

A. Brick shall be sound, hard-burned common brick conforming to ASTM C32, Grade MS.

2.03 MORTAR

A. Mortar shall conform to Section 04100 - Mortar and Masonry Grout.

2.04 CONCRETE

A. Concrete shall conform to Section 03300 - Cast-in-Place Concrete.

2.05 REINFORCING

A. Reinforcing shall conform to Section 03200 - Reinforcing Steel.

2.06 PRECAST CONCRETE

A. Precast concrete shall conform to Section 03400 - Precast Concrete.

2.07 CONCRETE BLOCK

A. Concrete block shall be solid, rectangular concrete masonry units conforming to ASTM C139.

2.08 CASTINGS

A. Castings shall conform to Section 05540 - Castings. Casting shall be of the type and size indicated on the Drawings.

2.09 STEPS

A. Steps shall be constructed of Grade 60 steel reinforcing rod (min. 1/2-inch) and completely encapsulated with a wear resistant and chemical resistant rubber.

B. Each step shall have a minimum vertical load resistance of 800 pounds and a minimum pull-out resistance of 400 pounds.

C. The steps shall have 11-inch minimum tread width and shall be placed at 16-inches on center, as shown on the Drawings.

D. Steps shall be cast in place with the concrete.

E. Steps shall only be installed as shown on the Drawings or required in the Specifications.

2.10 JOINT SEALANT

A. Joint sealant shall be a preformed flexible sealant conforming to the requirements of ASTM C990, paragraph 6.2, Butyl Rubber Sealant. Joint sealant shall be Pro-Stik Butyl Sealant by Press-Seal, Butyl-Nek Join Sealant by Henry, CS-102 Butyl Rubber Sealant for all Precast Structures by ConSeal, or equal.

2.11 FLEXIBLE RUBBER SLEEVE

A. The spring set type shall have a stainless steel interior power sleeve or expander and shall be the PSX assembly by Press-Seal Gasket Corporation, the Kor-N-Seal assembly by National Pollution Control Systems, or Lock Joint Flexible Manhole Sleeve by Interpace Corp.

B. The cast-in-place type shall conform to ASTM C923 and shall include stainless steel take up clamps.

C. Flexible seal assemblies shall permit at least an eight (8) degree deflection from the center line of the opening in any direction while maintaining a watertight connection.

2.12 RUBBER BLADDER

A. The rubber bladder seal shall conform to ASTM C923 suitable for pressure testing at 10 psi minimum, with a 3/8 inch minimum wall thickness.

B. The rubber bladder seal shall contain an environmentally safe, anti-bacterial compound which turns into a high viscosity gel when in contact with pressurized water.

C. The rubber bladder seal shall be NPC Contour Seal by Kor-N-Seal, or equal.

2.13 COVERS AND FRAMES

A. Covers and frames shall comply with Section 05540 - Castings and shall be provided by the utility structure manufacturer.

B. Manhole covers and frames shall meet the following requirements:

1. Locate so that there is ready access to the manhole steps

2. Clear opening shall be a minimum of 22 inches, unless otherwise indicated on the Drawings.

3. All manhole frames and covers shall be bolt down type, Neenah Model R 6461, or equal.

4. Storm drain grated inlet frames and grates shall be Neenah R-1878-B7G, East Jordan Iron Works V5660, or equal.

5. Curb inlet frames and grates shall be Neenah R-3067, East Jordan Iron Works EJ 7030, or equal, and shall include frame, grate, and hood.

C. Vault covers shall have lifting handles and shall be bolted with stainless steel bolts complying with Section 05050 - Metal Fastening.

D. Frames and covers shall be identical throughout the Contract.

2.14 GRATES

A. Grates shall comply with Section 05540 - Castings.

2.15 CONCRETE BALLAST

A. Concrete ballast shall be Class B concrete in conformance with Section 03300 - Cast-in-Place Concrete. Ballast shall be provided as necessary to ensure manhole resists flotation when empty and subjected to full height groundwater conditions.

2.16 FLEXIBLE JOINT SEALER

A. Flexible joint sealer shall be a rubber ring waterstop as manufactured by Fernco Joint Sealer Co., or equal.

2.17 EPOXY BONDING AGENT

A. Epoxy bonding agent shall conform to Section 03250 - Concrete Accessories.

PART 3 -- EXECUTION

3.01 DESIGN CRITERIA

A. Minimum structural design loading for underground precast concrete vaults shall be as indicated in ASTM C857, unless otherwise noted herein. Precast items subjected to vehicular traffic shall be designed for H-20 traffic loading. Other precast items shall be designed for a vertical live load of 300 psf.

B. Walls of precast items shall be designed for a vertical surcharge of 100 psf.

C. Precast manholes and vaults shall be designed to resist flotation when totally empty and subjected to groundwater full height of the manhole/vault.

3.02 FABRICATION AND CASTING

A. Fabrication and casting shall conform to Section 03400 - Precast Concrete, and to Section 03300 - Cast-in-Place Concrete.

B. All base sections designated to receive concrete ballast and all electrical manholes shall extend monolithically a minimum of 6 inches beyond the outside face of the wall for the entire periphery. All other utility structures shall have a standard base.

C. Utility structures built around existing pipe shall have a cast-in-place base slab.

3.03 HANDLING, TRANSPORTING, AND STORING

A. Handling, transporting, and storing of precast items shall comply with Section 03400 - Precast Concrete.

3.04 INSTALLATION

A. Installation shall conform with Section 03400 - Precast Concrete and with the manufacturer's recommendations or to Section 03300 - Cast-in-Place Concrete.

B. Frames and covers or grates shall be set so that tops are at elevations indicated on the Drawings or flush with finished grade where no elevation is indicated.

C. Joints between riser sections shall be sealed with joint sealant.

D. All openings in utility structures shall have flexible rubber sleeves sized to fit the connecting pipe and installed to provide watertight joints in accordance with the manufacturer's recommendations. The interior of the sleeve shall be filled with Class B concrete.

E. Openings that are too large for flexible rubber sleeves shall utilize rubber bladder seals which are expanded by water injected using a pressure pump.

F. All units shall be installed plumb and level.

G. All lift holes and joints shall be filled with non-shrink grout conforming to Section 03600, grout inside and out.

H. The manhole frames shall be set to their required elevations either with grade rings or with two or three courses of brick masonry laid around the top of the upper wall section. Such brick work shall be given a 1-inch mortar coat on the inside and out.

I. Concrete ballast shall be placed so that it bears directly on the utility structure base against the outer wall monolithically encircling the structure for the full height indicated on the Drawings. Additional ballast may be required where the depth or elevation of the structure varies from the Drawings.

J. Brick or Concrete Block

Brick or concrete block shall be laid with broken joints and all horizontal and vertical joints filled with cement-sand mortar. Outside of walls shall be plastered with a minimum 1-inch-thick coat of cement-sand mortar troweled smooth.

K. Connection to Existing Pipe

1. Verify the diameter and invert elevation of existing pipe to be connected to new utility structures prior to beginning work on the structures.

2. Provide adequate protection to prevent damage to the existing pipe.

3. Provide adequate means for plugging and/or transferring the existing flow in the pipe to allow for the construction of inverts and grouting.

4. Cut off the existing pipe sufficiently for connection to the new structure and remove.

5. Thoroughly clean all foreign matter and coat the pipe surface with epoxy adhesive where the pipe joins the new structure.

6. Install a flexible joint sealer around the pipe.

7. Grout inside and outside of wall penetration with nonshrink grout.

L. Backfill structures in accordance with Section 02200 - Earthwork.

M. Clean all structures of any accumulation of silt, debris, or foreign matter and keep clean until final acceptance of the work.

N. Excavation shall conform to Section 02200 - Earthwork.

O. Structure bases shall bear on a minimum of 8 inches of compacted stone unless otherwise indicated on the Drawings.

P. Channel Inverts

1. Inverts shall be placed using Class B concrete with forms sufficient to provide a smooth half-round shape as shown on the Drawings. Manhole bases employing full depth precast inverts are acceptable.

2. Where the slope of the line does not change through a manhole, a constant slope shall be maintained in the invert. Where slope changes occur within a given manhole, the transition shall be smooth and shall occur at the approximate center of the manhole.

3. Inverts shown on the Drawings are taken at the center of the manhole unless otherwise noted.

3.05 ADJUSTMENTS TO EXISTING UTILITY STRUCTURES

A. Adjust structures as indicated on the Drawings using concrete or cast-iron adjustment rings by approved methods.

B. Clean covers and inlet castings of all foreign material.

3.06 ADJUSTING COLLARS AND FINAL ADJUSTMENTS

A. Adjusting collars shall be as shown on the Drawings. Final adjustments shall be made so that the manhole ring and cover will be smooth and flush with the finished grade of the adjacent surface, or as otherwise indicated on the Drawings for manholes shown above grade.

3.07 LEAKAGE TESTING FOR MANHOLES

A. All manholes shall be vacuum tested as specified below. Refer to Section 22 14 00 – Storm Drains and Roof Drains for storm water pipe testing methods and requirements and Section 45 05 00 – Basic Mechanical Requirements for sanitary pipe testing methods and requirements.

B. Manhole vacuum testing shall include the following minimum requirements:

1. Testing shall be done in accordance with ASTM C1244-05 (or latest revision).

2. Prior to testing all pipes, holes, and vents entering manhole shall be plugged and braced.

3. Contractor shall have an approved test head and copy of instructions for use by the manufacturer.

4. Contractor shall furnish two (2) certified and calibrated vacuum test gauges for the test.

   A vacuum of 10-inch hg shall be drawn on the manhole, the valve on the vacuum line of the test head closed, and the vacuum pump shut off. The time for the vacuum pressure to drop to 9-inch hg shall be measured. If the test time meets or exceeds the test time as specified in Table 1, the manhole is acceptable; otherwise, the test has failed and the manhole should be checked for leaks, repaired, and re-tested.

**Table 1**
**Minimum Vacuum Test Times (Seconds) for Various Manhole Diameters and Depths**

**Manholes Ø (inches)**

| **epth (ft)** | **48** | **60** | **72** | **84** | **96** | **.08** | **.20** |
|---|---|---|---|---|---|---|---|
| **6'** | 15 | 20 | 25 | 29 | 34 | 38 | 43 |
| **8** | 20 | 26 | 33 | 38 | 45 | 51 | 57 |
| **10** | 25 | 33 | 41 | 48 | 56 | 63 | 71 |
| **12** | 30 | 39 | 49 | 57 | 67 | 76 | 85 |
| **14** | 35 | 46 | 57 | 67 | 78 | 89 | .00 |
| **16** | 40 | 52 | 67 | 76 | 89 | .01 | .14 |
| **18** | 45 | 59 | 73 | 86 | .00 | .14 | .28 |
| **20** | 50 | 65 | 81 | 95 | .11 | .26 | .42 |
| **22** | 55 | 72 | 89 | .05 | .22 | .39 | .56 |
| **24** | 59 | 78 | 97 | .14 | .33 | .52 | .70 |
| **26** | 64 | 85 | .05 | .24 | .44 | .64 | .85 |
| **28** | 69 | 91 | .13 | .33 | .55 | .77 | .99 |
| **30** | 74 | 98 | .21 | .43 | .66 | .89 | ?13 |
| **d. VF** | 2.5 | 3.25 | 4.0 | 4.75 | 5.5 | 6.5 | 7.0 |

3.08 FLUSHING AND TESTING OF SEWERS

A. Obstruction – After backfilling, all sewers shall be inspected for obstructions and shall be flushed with water. Flushing shall be a minimum velocity of 2.5 feet per second for a duration acceptable to the Engineer. Flushing shall remove all dirt, stones, pieces of wood and other debris which accumulated in the sewer during construction. The Contractor shall provide a means acceptable to the Engineer for removal of debris flushed from each section of sewer. If after flushing, any obstructions remain, they shall be removed at the Contractor's expense.

B. Visual Inspection – Sewer lines shall be visually inspected from every manhole by use of mirrors, television cameras, or other devices for visual inspection, and the lines shall all exhibit a fully circular pattern when viewed from one manhole to the next. Lines which do not exhibit a true line and grade or have structural defects shall be corrected to meet these qualifications. Any visual water infiltration of water into the manhole shall be repaired using hydraulic cement or other approved materials.

C. Leakage – Sewers shall be tested for leakage. The program of testing shall fit the conditions as mutually determined by the Engineer and the Contractor. The Contractor shall take all necessary precautions to prevent any joints from drawing while the sewers or their appurtenances are being tested. The Contractor shall, at his own expense, correct any excess leakage and repair any damage to the pipe and their appurtenances, or to any structures resulting from or caused by these tests.

D. Leakage Test Procedure – Each section of sewer shall be tested by closing the lower end of the sewer to be tested and the inlet sewer of the upper manhole with stoppers and filling the pipe and manhole with water to a point 6 feet above the crown of the open sewer in the upper manhole, or, if ground water is present, 6 feet above the sections average adjacent ground water level as indicated by a monitor well installed adjacent to each manhole. The line shall be filled with water prior to testing and allowed to stand until the pipe has reached its maximum absorption, but not less than two (2) hours. After maximum absorption has been reached, the head shall be reestablished and tested for at least six (6) hours maintaining the head specified above by measured additions of water. The sum of these additions shall be the leakage for the test period.

    1. If ground water is present to a height of at least 6 feet above the crown of the sewer at the upper end of the pipe section to be tested, the leakage test may be made by measuring the rate of infiltration using a suitable weir or other measuring device approved by the Engineer. Whether the test is made by infiltration or exfiltration, the allowable leakage shall not exceed 100 gallons per day per inch of diameter per mile of sewer being tested.

    2. Where the actual leakage exceeds the allowable, the Contractor shall discover the cause and correct it before the sewer will be accepted. For the purpose of this subsection, a section of sewer is defined as that length of sewer between successive manholes or special structures or stub-outs for future connections.

E. Low Pressure Compressed Air Test – If the leakage cannot be located by infiltration or exfiltration testing, this type test may be used. The pipeline shall be considered acceptable, when tested at an average pressure of 3.0 psi greater than the average back pressure of any groundwater that may submerge the pipe, if the section under test does not lose air at a rate greater than 0.0030 cfm per sq. ft. of internal pipe surface.

F. Deflection Test – No sooner than thirty (30) days after final backfill installation, each section of PVC pipe shall be checked for vertical deflection using an electronic deflectometer or a rigid "GoNoGo" device. Vertical deflection shall not exceed five (5) percent of the inside pipe diameter for PVC pipe.

    1. Where the actual deflection exceeds the allowable, the Contractor shall discover the cause and correct it before the pipe will be acceptable. For the purpose of

this subsection, a section of sewer is defined as that length of sewer between successive manholes or special structures or stubouts for future connections.

G. Cost of Testing and Repairs – Any and all work necessary to bring the line into conformance with the infiltration and deflection specifications shall be performed by the Contractor at no extra cost to the Owner. All apparent sources of infiltration and excessive deflection shall be repaired by the Contractor.

1. The Contractor shall provide all water, plugs, hoses, pumps, equipment, etc. necessary for the proper flushing and testing of the sewers.

- END OF SECTION -

**ATTACHMENT # 4**

SECTION 02710

STORM DRAINS AND ROOF DRAINS

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Furnish all labor, equipment and materials in connection with the installation and testing of exterior underground Storm drains and Roof drains as shown on the Contract Drawings and specified herein.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 02200 – Earthwork

1.03 REFERENCE SPECIFICATIONS, CODES AND STANDARDS

1. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe

2. ASTM C361 - Standard Specification for Reinforced Concrete Low-Head Pressure Pipe

3. ASTM C443 - Standard Specification for Joints in Concrete Pipe and Manholes, Using Rubber Gaskets

4. ASTM C478 – Standard Specification for Precast Reinforced Concrete Manhole Sections

5. ASTM C857 – Minimum Structural Design Loading for Underground Precast Concrete Utility Structures

6. ASTM C969 - Standard Practices for Infiltration and Exfiltration Testing of Installed Precast Concrete Pipe Sewer Lines

7. ASTM C990 – Standard Specification for Joints in Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

8 ASTM C1103 - Standard Practice for Joint Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines

9.. ASTM C1619 – Standard Specification for Elastomeric Seals for Joining Concrete Structures

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10. ASTM C1628 – Standard Specification for Joints for Concrete Gravity Flow Sewer Pipe, Using Rubber Gaskets

11. ASTM D 2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.

12. ASTM D 3350 – Standard Specifications for Polyethylene Plastic Pipe and Fitting Material.

13. AWWA C 110 – Standard Specification for Ductile Iron Pipe & Fittings for Water and Other Liquids.

14. ASTM C 150 – Standard Specification for Portland Cement

15. AWWA C 151 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water.

16. ASTM F 447 – Standard Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe.

17. AASHTO R82-17

18. AASHTO M 198 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants

19. AASHTO M 294 – Standard Specifications for Corrugated Polyethylene Pipe (12" to 36").

20. AASHTO Section 30 – Thermoplastic Pipe.

1.04 SUBMITTALS

A. Furnish and submit shop drawings and certificates for the piping work as outlined in the General Conditions and Division 1.

B. Special care shall be exercised during delivery, distribution and storage of the pipe and fittings to prevent damage. Damaged pipe will be rejected and shall be replaced at the Contractor's expense. Storage of pipe and fittings, prior to use, shall be in such a manner as to keep the materials clean and dry.

PART 2 - PRODUCTS

2.01 REINFORCED CONCRETE PIPE (RCP) – STORM DRAINS AND CULVERTS

A. Pipe and Joints

1. Reinforced concrete pipe for storm drains and culverts shall conform to ASTM Standard C76, Class III, Wall thickness B, unless otherwise noted on the Contract Drawings. Elliptical reinforcement will not be permitted. All pipe shall be aged at the manufacturing plant for at least fourteen (14) days before delivery to the job site. All pipe shall be of the sizes indicated on the drawings

2. Pipe joints shall be designed per ASTM C-1628 –19. Pipe shall be provided with tongue and groove.

B. Gaskets

1. Gaskets shall be leak-resistant with elastomeric seals (gaskets) made of bitumen or butyl rubber, both meeting the physical requirements prescribed in Specification ASTM C-990 for gaskets.

C. Joint Lubricant

1. Joint lubricant shall be of the type recommended by the manufacturer. Use of petroleum-based lubricants is not permitted.

2.02 Ductile Iron Pipe (DIP) – ROOF DRAINS

A. Pipe

1. Shall be centrifugally cast in metal molds or sand lined molds in accordance with ANSI A21.51 (AWWA C151) of grade 70-50-05 ductile iron. The above standard covers ductile iron pipe with nominal pipe sizes from three (3) inches up to and including fifty-four (54) inches in diameter.

2. Shall have a rated working pressure of 150 psi.

3. Shall be a minimum PC 150.

B. Fittings

1. Shall be manufactured in accordance with ANSI A21.10 (AWWA C110).

2. Shall be manufactured of grade 70 - 50 - 05 ductile iron.

3. Shall have a rated working pressure of 250 psi.

4. Grey iron fittings which conform to the specifications contained herein may be used with ductile iron pipe providing the piping systems minimum working pressure is met or exceeded, and only where ductile iron fittings are not manufactured for a specific fitting.

C. Coatings and Linings for Pipe and Fittings

1. The standard asphaltic coating shall be applied to the exterior wall of the pipe and fittings in accordance with ANSI A21.51 (AWWA C151).

2. The pipe and fittings shall be cement mortar lined to twice the standard thickness in accordance with ANSI A21.4 (AWWA C104) except as specified in the pipe schedule. A seal coat of asphaltic material shall be applied to the mortar lining.

D. Joints

1. Joints shall be push on type in accordance with ANSI A21.11 (AWWA CIII).

2.03 SMOOTH LINED CORRUGATED HIGH-DENSITY (HDPE) POLYETHYLENE PIPE - STORM DRAINS AND CULVERTS

A. General

1. Smooth lined corrugated high-density polyethylene (HDPE) pipe shall be used for storm drains and shall be BLUE SEAL watertight HDPE pipe as manufactured by Hancor, Inc., N-12 WT IB (Watertight) Pipe by ADS, Inc., or approved equal.

B. Pipe and Fittings

1. Smooth lined HDPE pipe and fittings shall conform to AASHTO M252-TYPE S for 4" to 10"φ and AASHTO M294 - TYPE S for 12" to 36"φ. All pipes shall be of the sizes indicated on the drawings.

C. Joints

1. Joints shall be watertight bell and spigot type; Hancor, Inc. BLUE SEAL, ADS, Inc. N-12 WT IB, or equal.

D. Foundation Drains

1. Foundation drains shall conform to AASHTO M252-TYPE C. Drains shall have drilled perforations and be Heavy Duty-AASHTO Pipe as manufactured by Hancor, Inc., Single Wall Corrugate Pipe by ADS, Inc., or approved equal.

2.04 BACKFILL MATERIAL

A. The material obtained from excavation of the pipe trench or elsewhere on site with a particle size not greater than 3 inches shall be used for pipe backfill if they conform with the soil classes given in Table 1. Imported materials meeting the criteria of Table 1 may also be used.

**TABLE 1 – ACCEPTABLE BACKFILL MATERIAL AND COMPACTION REQUIREMENTS**

| SOIL CLASSIFICATIONS |
|---|

| DESCRIPTION | ASTM D 2321 | ASTM D 2487 | AASHTO M 43 | Minimum Standard Proctor Density % |
|---|---|---|---|---|
| Graded or crushed, crushed stone, gravel | Class I | -- | 5<br>56 | Dumped |
| Well-graded sand, gravels and gravel/sand mixtures, poorly graded sand, gravels and gravel/sand mixtures; little or no fines | Class II | GW<br>GP<br>SW<br>SP | 57<br>6 | 95% |
| Silty or clayey gravels, gravel/sand/silt or gravel and clay mixtures; silty or clayey sands, sand/clay or sand/silt mixtures | Class III | GM<br>GC<br>SM<br>SC | Gravel and Sand (<10% fines) | 95% |

PART 3 – EXECUTION

3.01 INSPECTION

A. Each length of pipe and fittings delivered to the property shall be inspected by the Contractor, in the presence of the Engineer, for flaws, cracks, dimensional tolerances and compliance with the referenced Standards. The Contractor shall provide the Engineer with suitable templates or calipers for checking pipe dimensions. Only lengths of pipe and fittings accepted by the Engineer and so marked may be installed in the work.

3.02 INSTALLATION

A. Trenching, bedding and backfilling shall be as specified in Section 02200 - Earthwork of these Specifications and Section 2.04 Backfill Material of this Specification. Under no condition shall pipe be laid in water or when trench conditions or weather are unsuitable for such work.

B. All pipes and fittings shall be handled carefully in loading and unloading. They shall be lifted by hoists or lowered on skidways in such a manner as to avoid shock. Derricks, ropes or other suitable equipment shall be used for lowering the pipe into the trench. Pipe and fittings shall not be dropped or dumped.

C. Each pipe and fitting shall be inspected before it is lowered into the trench. The interior of the pipe and all joint surfaces shall be thoroughly cleaned and shall thereafter be maintained clean. The open ends of pipe shall be securely plugged whenever pipe laying is not in progress.

D. Pipe and fittings shall be selected so there will be as small a deviation as possible at the joints and so inverts present a smooth surface. All joints shall be installed, made up, and inspected in accordance with approved printed instructions of the manufacturer. Pipe and fittings which do not fit together to form a tight joint will be rejected.

E. Cutting of reinforced concrete pipe will be permitted only at connections to structures and be accomplished by abrasive saws. Cutting of other pipe materials shall be done only with mechanical cutters and in accordance with the manufacturer's recommendations.

F. Pipe shall be laid accurately to the lines and grades shown on the drawings or as directed by the Engineer.

G. If an adequate foundation for the pipe is not available at the desired depth, additional excavation shall be required, and the foundation brought to desired grade with suitable granular material.

H. Rock outcroppings, very soft soils such as muck, and other similar materials not providing proper foundation support shall be removed/replaced with suitable granular material.

I. Bedding material directly under the pipe invert shall be left in native condition and not compacted. Pipe shall be placed on the bedding, then backfilled under the pipe haunches before further backfill is placed.

J. Class I materials may be dumped around pipe. Voids shall be eliminated by knifing under and around the pipe or by other approved technique.

L. Inorganic silts, and gravelly, sandy, or silty clays, and other Class IV materials (not shown in Table 1) shall not be used for pipe backfill.

M. Any section of the pipe found defective in material, alignment, grade, joints, or otherwise, shall be satisfactorily corrected by the Contractor at no additional cost to the Owner.

3.03 COMPACTION

A. General

1. Place and assure backfill and fill materials achieve an equal or higher degree of compaction than undisturbed materials adjacent to the work.

2. In no case shall degree of compaction below “Minimum Compactions” specified be accepted.

B. Compaction Requirements: Unless noted otherwise on the Drawings or more stringently by other sections of these Specifications, comply with following trench compaction criteria:

**TABLE 2 – - MINIMUM COMPACTIONS**

| LOCATION | SOIL TYPE | DENSITY |
|---|---|---|
| 1. Compacted select backfill: | | |
| All applicable areas | Cohesive soil | 95 percent of maximum dry density by ASTM D698 |
| | Cohensionless soils | 75 percent of maximum relative density by ASTM D4253 and |

| | | | |
|---|---|---|---|
| | | | ASTM D4254 |
| 2. | Common trench backfill: | | |
| | Under pavements roadways surfaces, D698 within highway right-of-ways, adjacent to retaining walls | Cohesive soils | 95 percent of maximum dry density by ASTM D698 |
| | | Cohensionless soils | 75 percent of maximum relative density by ASTM D4253 and ASTM D4254 |
| | Under turfed, sodded plant seeded, non-traffic areas | Cohesive soils | 95 percent of maximum dry density by ASTM D698 |
| | | Cohensionless soils | 75 percent of maximum relative density by ASTM D4253 and ASTM D4254 |

C. Ensure backfill materials have moisture content within three (3) percent of optimum moisture content at the time of placement.

3..04 INSPECTION AND TESTING

A. General

1. The Contractor shall provide at his own expense, all labor, material, video and measuring devices, water, plugs, or other equipment necessary to perform the required tests. All tests shall be performed in the presence of the Engineer. Disposal of water shall be in accordance with Section 01010 – Summary of Work.

B. Tests by Manufacturer

1. Reinforced Concrete Storm Drains and Culverts - An infiltration and exfiltration test for the pipe shall be made at the place of manufacture. Certified test results shall be submitted. The infiltration or exfiltration allowance shall not exceed the limits as set in the “Performance requirements for Joints” paragraph in ASTM C443 – 12 (2017) or ASTM C990-09 (2014), depending on the type of gasket specified.

2. DIP and HDPE - An infiltration and exfiltration test for the pipe shall be made at the place of manufacture. Certified test results shall be submitted. The infiltration or exfiltration allowance shall not exceed 250 gallons per inch of pipe diameter per mile per day. One joint test for each two hundred feet of pipe to be furnished.

C. Field Test - Visual Inspection

1. Examine structures and pipes for:

a. Physical damage.

b. Indication of displacement of pipes or structures, reinforcement, forms, or bedding.

c. Porous areas or voids.

d. Proper placement of seals, gaskets, and embedments.

e. Visible infiltration.

2. Verify structures and pipes are set to proper line, grade as per the Contract Drawings, and are plumb.

3. Verify structure and pipe dimensions and thickness match Contract Drawings.

4. Measure inside dimensions of all flexible (HDPE) pipe prior to installation. Use these dimensions when sizing the mandrel should deflection testing be required.

   a. Using light to inspect pipe shall be done following pipe trench backfill is compacted and brought to grade or pavement subgrade.

   b. Full pipe diameter shall be visible for entire length of each section between structures.

   c. No less than half pipe diameter shall be visible for horizontal alignment.

5. The Contractor shall be responsible to provide video recording of all installed storm sewer systems at least 30 days after completion of backfill and one month before Owner or Engineer gives final acceptance for the two-year warranty. The recording shall be made using a color camera, self-propelled or other, having sufficient light to show detail of problem areas and joints. Camera speed shall not exceed 3 feet per second. If problems or concerns are seen by the operator, then the camera shall be reversed and an extended look at the area will be recorded. All recordings will have time, date, and footage displayed. Supplement the video recording with a written log or orally recorded tape log noting observations, findings, and deficiencies shown on the video tape.

   a. The video recording inspection shall be performed by an outside independent testing agency acceptable to the Owner or Engineer.

   b. The video tape and log will be given to the Engineer for review. If the Engineer finds any problems with the storm sewer, the Contractor will repair the problem and re-camera the repaired area before final acceptance will be given, at no added cost to the Owner.

   c. Video recording of storm sewer may be waived if pipe diameter is sufficient for human access, as determined by the Engineer. A log shall be developed for such inspection.

d. One copy of the video tape and log will become permanent property of the Engineer and Owner as record.

D. Field Test - Manhole Testing

1. The finished manholes shall be as watertight as the pipe system of which it is part. See Specification 02604 – Utility Structures for manhole testing criteria.

2. Observed leaks (infiltration or exfiltration) at any time within the warranty period shall be cause for rejection.

E. Repair

1. Repair or replace any unacceptable pipe at no additional cost to the Owner.

1. Repair all visible leaks.


2. Remove any concrete webs or protrusions.

4. Remove form ties and repair tie holes.

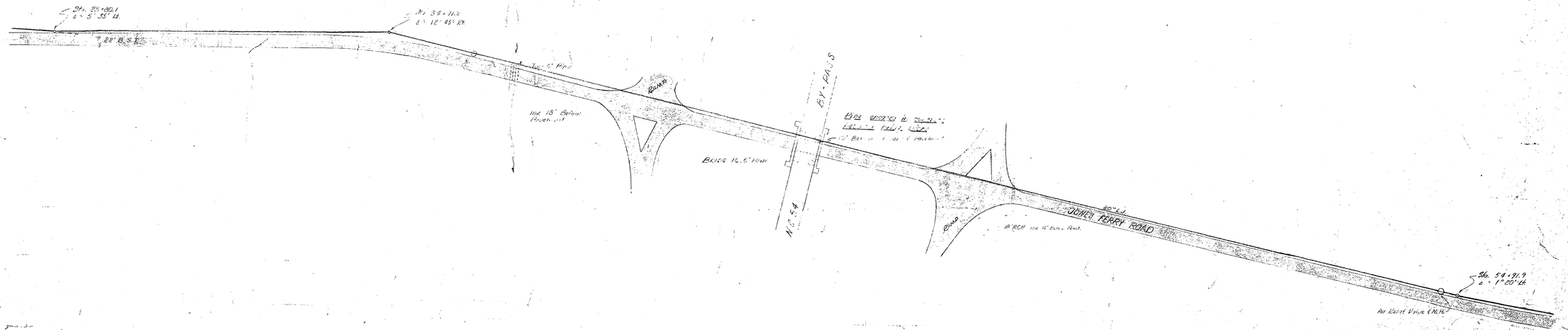
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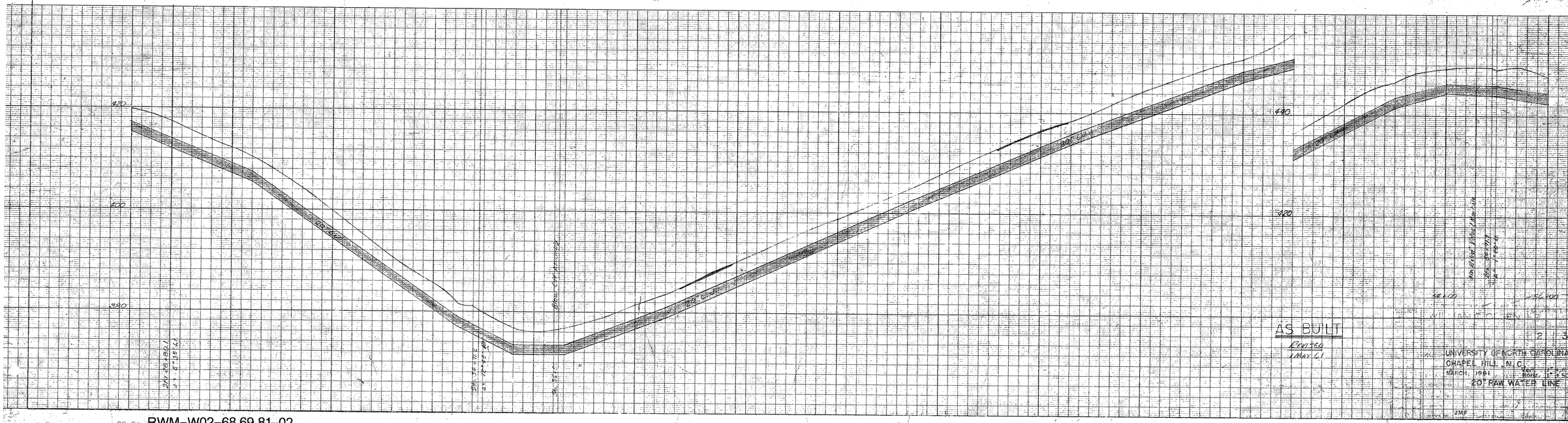
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**ATTACHMENT # 5**




RWM-W02-68,69,81-01



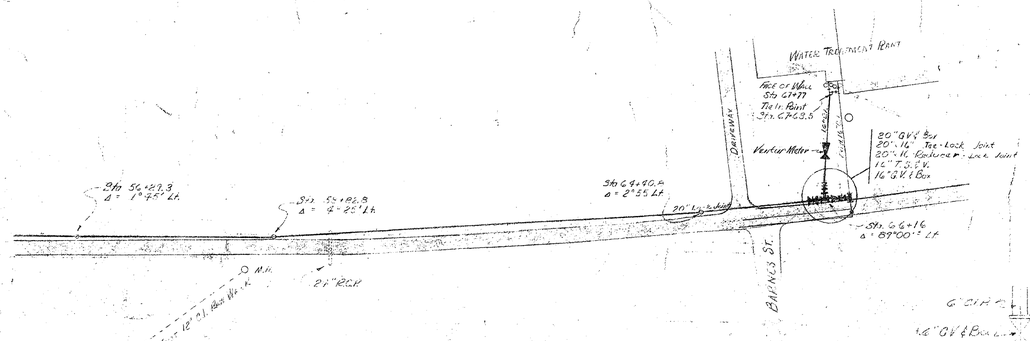

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REVISED
1 MAY 61

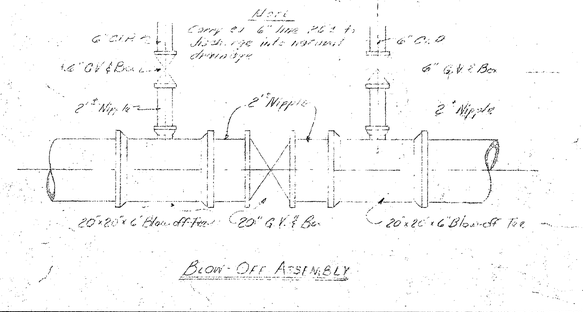
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UNIVERSITY OF NORTH CAROLINA
CHAPEL HILL, N.C.
MARCH, 1961 Horiz. 1"=50'
20" RAW WATER LINE

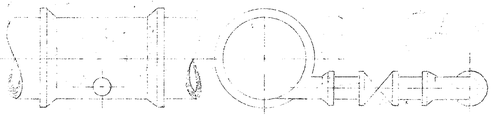
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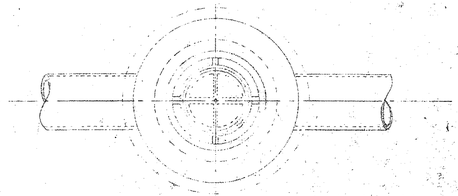


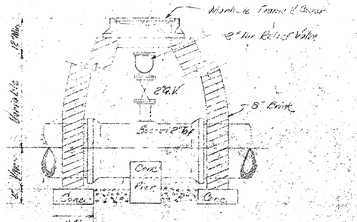

BLOW-OFF ASSEMBLY

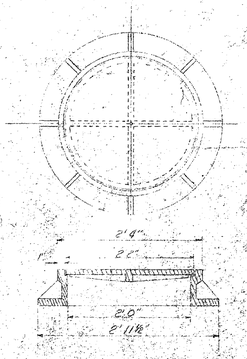


TYPICAL BLOW-OFF No. 3



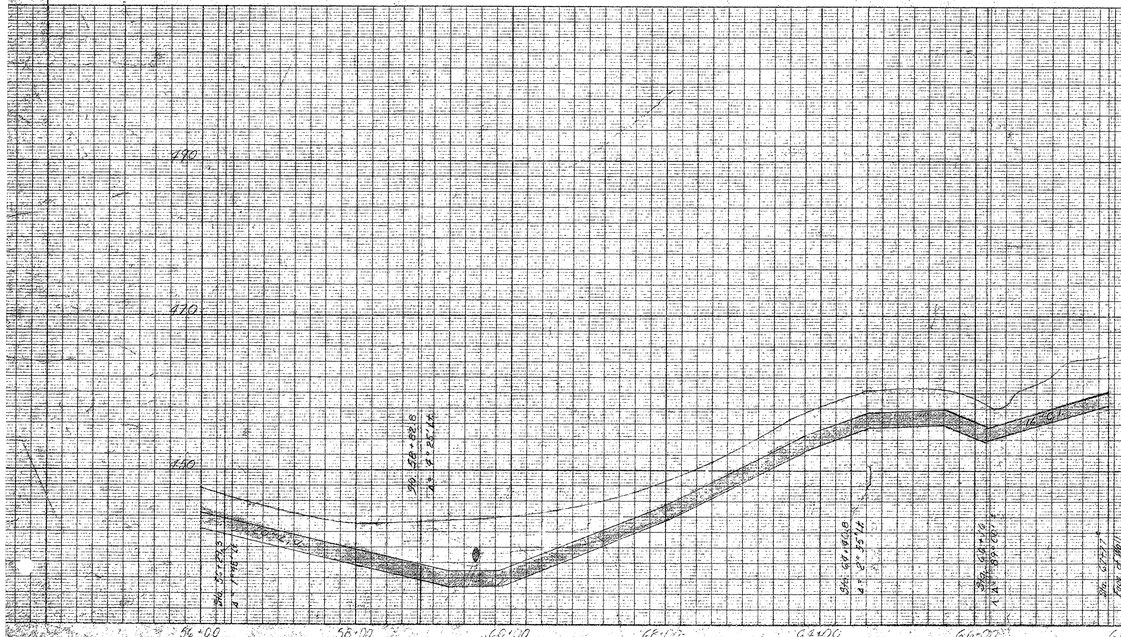
PLAN




FRAME & COVER

Sectional Elevation
Air Relief Valve & Manhole
N.T.S.




AS BUILT
Revised
1 Mar 61

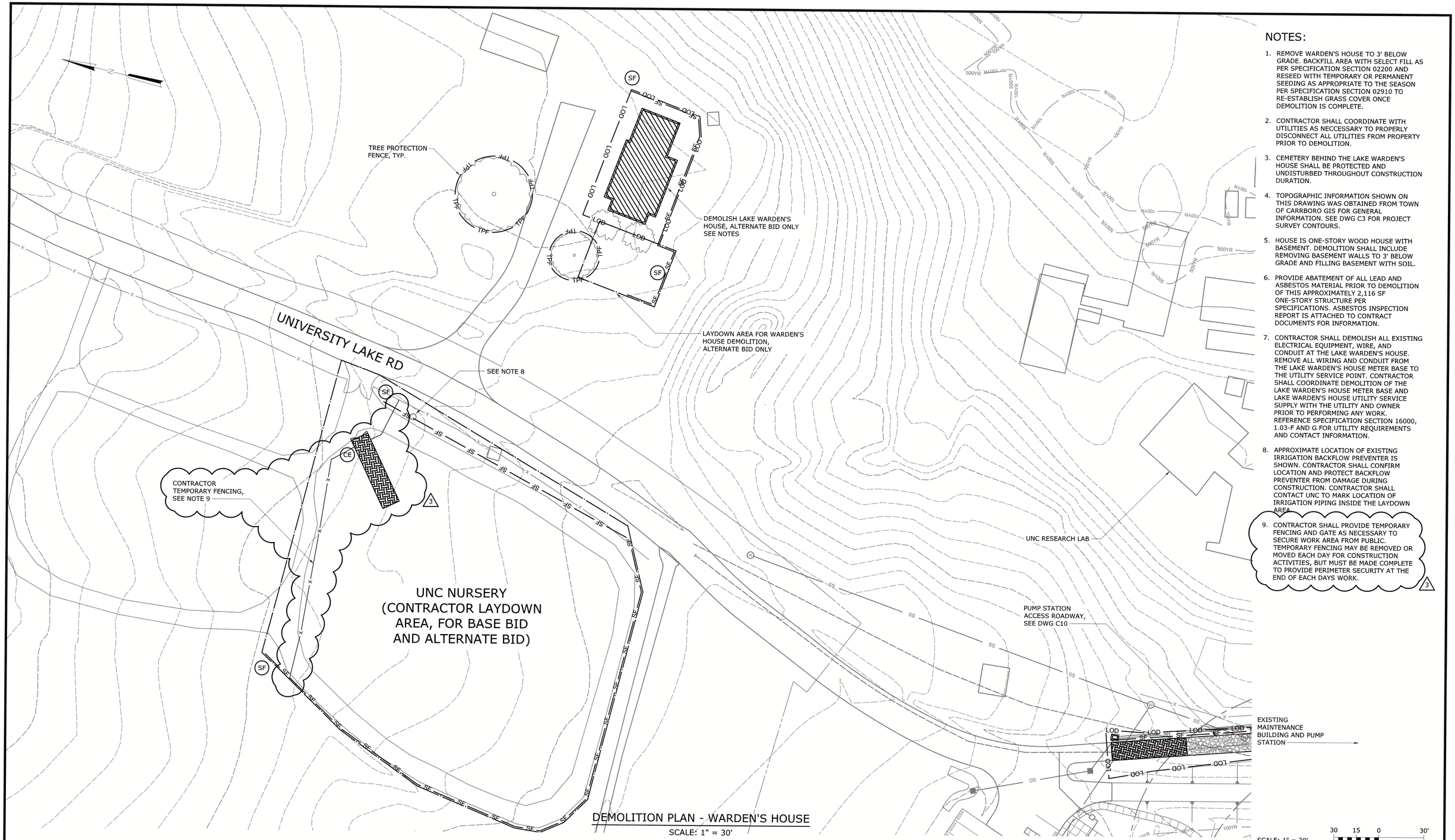
3 3

UNIVERSITY OF NORTH CAROLINA
CHAPEL HILL, N.C.
MARCH, 1961 Horiz. 1" = 50'
Vert. 1" = 5'
20" RAW WATER LINE

JMF

RWM-W02-68,69,81-03

**ATTACHMENT # 6**




DEMOLITION PLAN - WARDEN'S HOUSE

SCALE: 1" = 30'

## NOTES:

1. REMOVE WARDEN'S HOUSE TO 3' BELOW GRADE. BACKFILL AREA WITH SELECT FILL AS PER SPECIFICATION SECTION 02200 AND RESEED WITH TEMPORARY OR PERMANENT SEEDING AS APPROPRIATE TO THE SEASON PER SPECIFICATION SECTION 02910 TO RE-ESTABLISH GRASS COVER ONCE DEMOLITION IS COMPLETE.
2. CONTRACTOR SHALL COORDINATE WITH UTILITIES AS NECCESSARY TO PROPERLY DISCONNECT ALL UTILITIES FROM PROPERTY PRIOR TO DEMOLITION.
3. CEMETERY BEHIND THE LAKE WARDEN'S HOUSE SHALL BE PROTECTED AND UNDISTURBED THROUGHOUT CONSTRUCTION DURATION.
4. TOPOGRAPHIC INFORMATION SHOWN ON THIS DRAWING WAS OBTAINED FROM TOWN OF CARRBORO GIS FOR GENERAL INFORMATION. SEE DWG C3 FOR PROJECT SURVEY CONTOURS.
5. HOUSE IS ONE-STORY WOOD HOUSE WITH BASEMENT. DEMOLITION SHALL INCLUDE REMOVING BASEMENT WALLS TO 3' BELOW GRADE AND FILLING BASEMENT WITH SOIL.
6. PROVIDE ABATEMENT OF ALL LEAD AND ASBESTOS MATERIAL PRIOR TO DEMOLITION OF THIS APPROXIMATELY 2,116 SF ONE-STORY STRUCTURE PER SPECIFICATIONS. ASBESTOS INSPECTION REPORT IS ATTACHED TO CONTRACT DOCUMENTS FOR INFORMATION.
7. CONTRACTOR SHALL DEMOLISH ALL EXISTING ELECTRICAL EQUIPMENT, WIRE, AND CONDUIT AT THE LAKE WARDEN'S HOUSE. REMOVE ALL WIRING AND CONDUIT FROM THE LAKE WARDEN'S HOUSE METER BASE TO THE UTILITY SERVICE POINT. CONTRACTOR SHALL COORDINATE DEMOLITION OF THE LAKE WARDEN'S HOUSE METER BASE AND LAKE WARDEN'S HOUSE UTILITY SERVICE SUPPLY WITH THE UTILITY AND OWNER PRIOR TO PERFORMING ANY WORK. REFERENCE SPECIFICATION SECTION 16000, 1.03-F AND G FOR UTILITY REQUIREMENTS AND CONTACT INFORMATION.
8. APPROXIMATE LOCATION OF EXISTING IRRIGATION BACKFLOW PREVENTER IS SHOWN. CONTRACTOR SHALL CONFIRM LOCATION AND PROTECT BACKFLOW PREVENTER FROM DAMAGE DURING CONSTRUCTION. CONTRACTOR SHALL CONTACT UNC TO MARK LOCATION OF IRRIGATION PIPING INSIDE THE LAYDOWN AREA.
9. CONTRACTOR SHALL PROVIDE TEMPORARY FENCING AND GATE AS NECESSARY TO SECURE WORK AREA FROM PUBLIC. TEMPORARY FENCING MAY BE REMOVED OR MOVED EACH DAY FOR CONSTRUCTION ACTIVITIES, BUT MUST BE MADE COMPLETE TO PROVIDE PERIMETER SECURITY AT THE END OF EACH DAYS WORK. (3)

SCALE: 1" = 30'

30 15 0 30'

| REV | ISSUED FOR | DATE | BY |
|---|---|---|---|
| 3 | ADDENDUM 1 | 12/2021 | MM |
| 2 | CONSTRUCTION | 12/2021 | MM |
| 1 | REGULATORY REVIEW | 03/2020 | MM |

PROJECT ENGINEER: M. MANN
DESIGNED BY: S. NASH
DRAWN BY: S. NASH
CHECKED BY: M. SANTOWASSO

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE 0 1/2" 1"

NORTH CAROLINA PROFESSIONAL SEAL 18560 ENGINEER L. MICHAEL SANTOWASSO
12/20/21

Hazen
HAZEN AND SAWYER
4011 WESTCHASE BOULEVARD, SUITE 500
RALEIGH, NORTH CAROLINA 27607
LICENSE NO. : C-0381

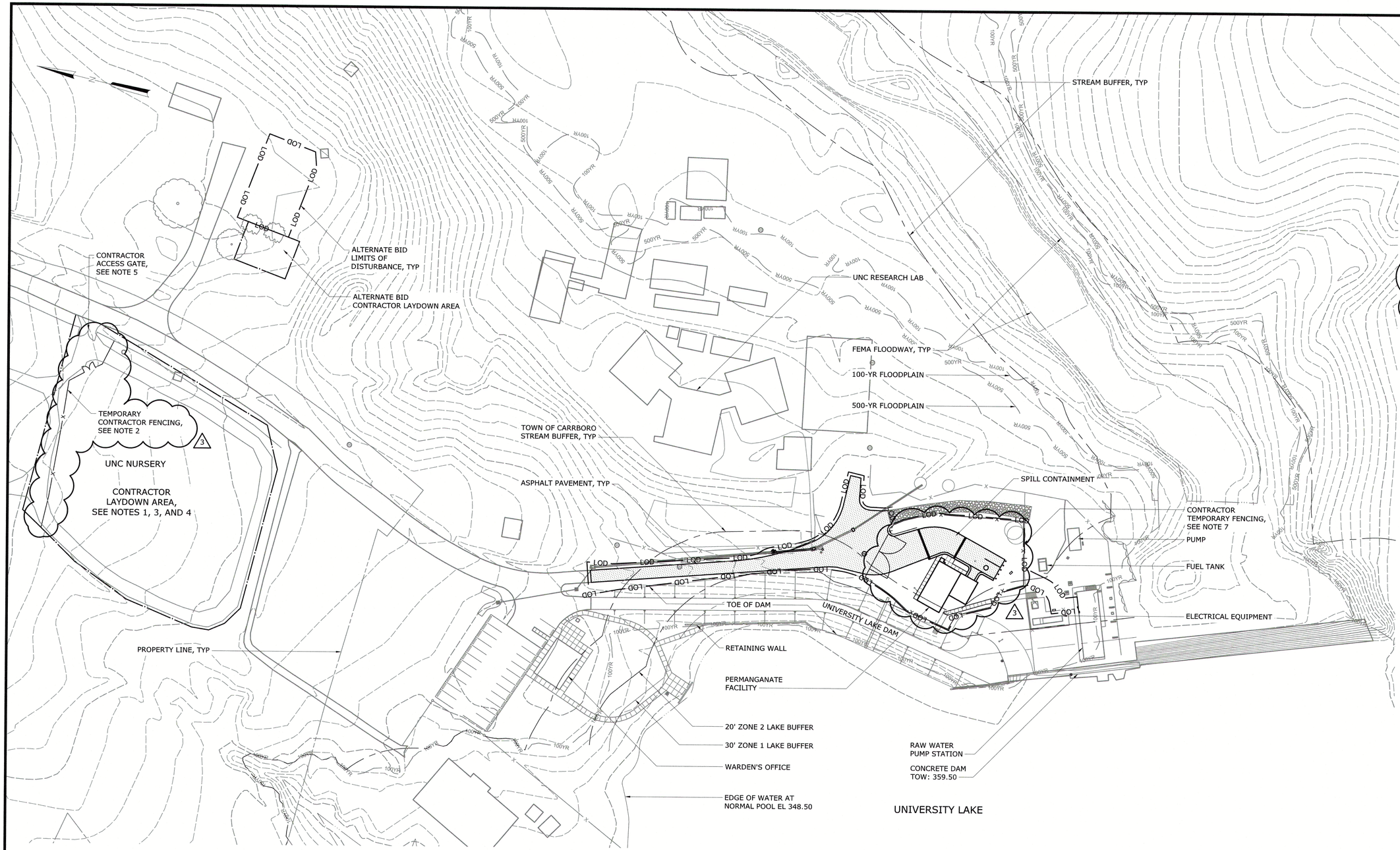
ORANGE WATER AND SEWER AUTHORITY
CARRBORO, NORTH CAROLINA

UNIVERSITY LAKE
PERMANGANATE FACILITY

CIVIL
DEMOLITION PLAN - WARDEN'S HOUSE
ALTERNATE BID

DATE: DECEMBER 2021
HAZEN NO.: 32258-014
CONTRACT NO.: 01
DRAWING NUMBER: C8

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## NOTES:

1. UNC NURSERY MAY BE USED AS CONTRACTOR LAYDOWN AREA. TREE PROTECTION SHALL BE INSTALLED FOR ALL TREES WITHIN THE LAYDOWN AREA.
2. TEMPORARY FENCING SHALL BE CONSTRUCTED TO DEFINE THE LIMITS OF THE LAYDOWN AREA FROM ADJACENT NURSERY AREA.
3. CONTRACTOR SHALL LOCK ACCESS GATE TO LAYDOWN AREA AT THE END OF EACH WORK DAY AND ANYTIME CONTRACTOR IS NOT ON SITE.
4. ONCE CONSTRUCTION IS COMPLETE, TEMPORARY FENCING SHALL BE REMOVED AND LAYDOWN AREA SHALL BE RESEEDED AND RESTORED TO ORIGINAL GRADE.
5. CONTRACTOR SHALL BE CAUTIOUS OF LOW HANGING OVERHEAD POWER LINE ON EAST SIDE OF UNIVERSITY LAKE ROAD.
6. ENTRANCE TO THE UNC RESEARCH FACILITY SHALL REMAIN ACCESSIBLE AT ALL TIMES.
7. CONTRACTOR SHALL PROVIDE TEMPORARY FENCING AND GATE AS NECESSARY TO SECURE WORK AREA FROM PUBLIC. TEMPORARY FENCING MAY BE REMOVED OR MOVED EACH DAY FOR CONSTRUCTION ACTIVITIES, BUT MUST BE MADE COMPLETE TO PROVIDE PERIMETER SECURITY OF THE END OF EACH DAYS WORK.

| EROSION CONTROL LIMITS OF DISTURBANCE | |
|---|---|
| BASE BID = | 1.87 ACRES |
| ALT BID = | 2.03 ACRES |

## OVERALL SITE PLAN

SCALE: 1" = 50'

SCALE: 1" = 50' (50 25 0 50')

| REV | ISSUED FOR | DATE | BY |
|---|---|---|---|
| 3 | ADDENDUM 1 | 12/2021 | MM |
| 2 | CONSTRUCTION | 12/2021 | MM |
| 1 | REGULATORY REVIEW | 03/2020 | MM |

| | |
|---|---|
| PROJECT ENGINEER: | M. MANN |
| DESIGNED BY: | S. NASH |
| DRAWN BY: | S. NASH |
| CHECKED BY: | M. SANTOWASSO |

IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE (0 1/2" 1")

NORTH CAROLINA PROFESSIONAL SEAL 18560 ENGINEER L. MICHAEL SANTOWASSO

12/20/21

Hazen

HAZEN AND SAWYER
4011 WESTCHASE BOULEVARD, SUITE 500
RALEIGH, NORTH CAROLINA 27607
LICENSE NO. : C-0381

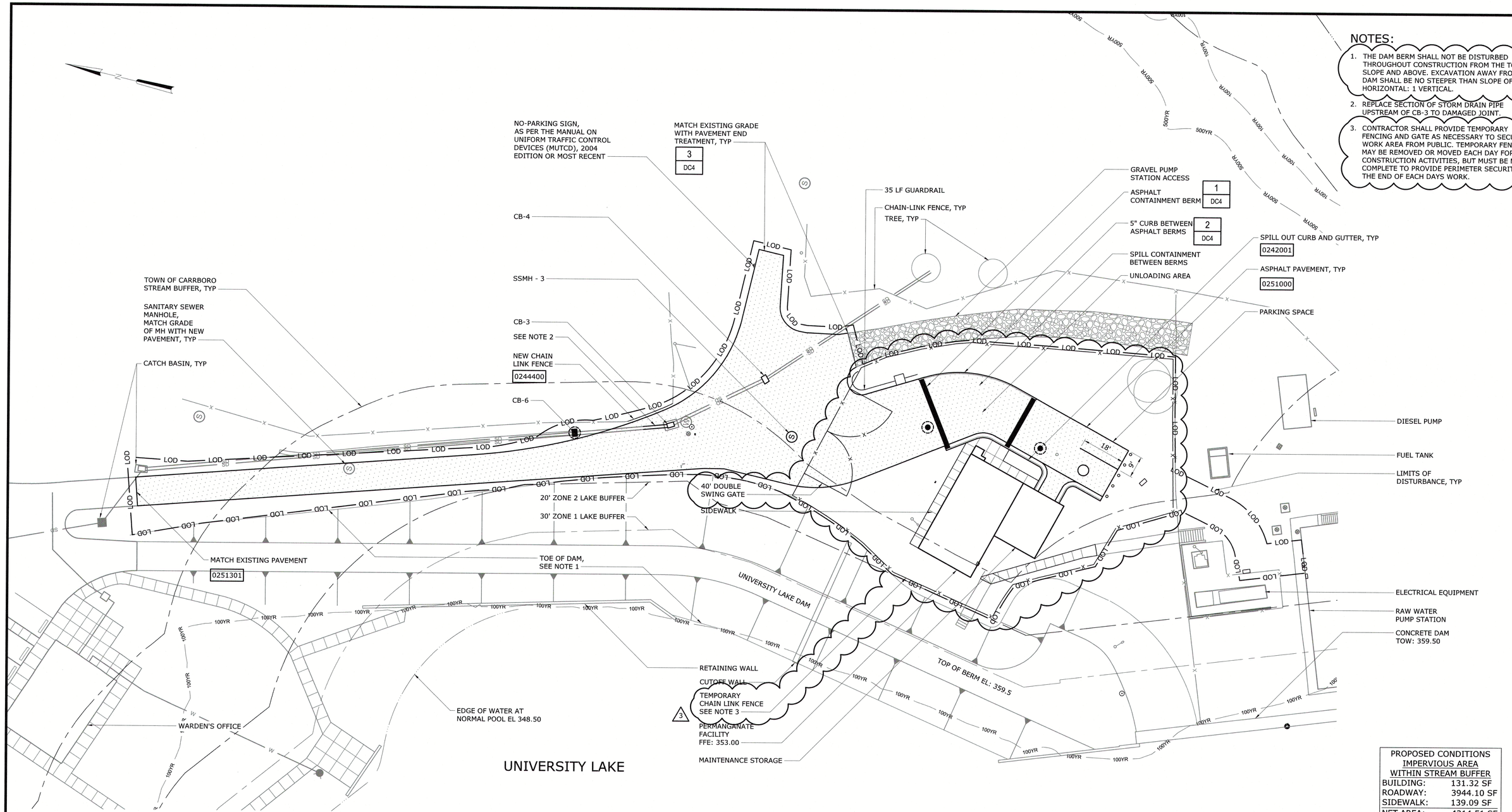
ORANGE WATER AND SEWER AUTHORITY
CARRBORO, NORTH CAROLINA

UNIVERSITY LAKE
PERMANGANATE FACILITY

CIVIL
OVERALL SITE PLAN

| | |
|---|---|
| DATE: | DECEMBER 2021 |
| HAZEN NO.: | 32258-014 |
| CONTRACT NO.: | 01 |
| DRAWING NUMBER: | C9 |

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| PROPOSED CONDITIONS IMPERVIOUS AREA WITHIN STREAM BUFFER | |
|---|---|
| BUILDING: | 131.32 SF |
| ROADWAY: | 3944.10 SF |
| SIDEWALK: | 139.09 SF |
| NET AREA: | 4214.51 SF |

## SITE PLAN

SCALE: 1" = 20'

SCALE: 1" = 20' (20 10 0 20')

| REV | ISSUED FOR | DATE | BY |
|---|---|---|---|
| 3 | ADDENDUM 1 | 12/2021 | MM |
| 2 | CONSTRUCTION | 12/2021 | MM |
| 1 | REGULATORY REVIEW | 03/2020 | MM |

PROJECT ENGINEER: M. MANN
DESIGNED BY: S. NASH
DRAWN BY: S. NASH
CHECKED BY: M. SANTOWASSO
IF THIS BAR DOES NOT MEASURE 1" THEN DRAWING IS NOT TO FULL SCALE 0 1/2" 1"

NORTH CAROLINA PROFESSIONAL SEAL 18560 L. MICHAEL SANTOWASSO ENGINEER
12/20/21

Hazen
HAZEN AND SAWYER
4011 WESTCHASE BOULEVARD, SUITE 500
RALEIGH, NORTH CAROLINA 27607
LICENSE NO. : C-0381

ORANGE WATER AND SEWER AUTHORITY
CARRBORO, NORTH CAROLINA

UNIVERSITY LAKE
PERMANGANATE FACILITY

CIVIL
SITE PLAN

DATE: DECEMBER 2021
HAZEN NO.: 32258-014
CONTRACT NO.: 01
DRAWING NUMBER: C10

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